Polish Yers and the Finer Structure of Output-Output Correspondence

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0. Introduction
The fundamental problem posed by Slavic alternating vowels, called yers, is represented by the three nominal paradigms in (1). In (1b) a full vowel appears throughout the inflectional paradigm; the stem is invariant. In (1c) the stem is also invariant and ends in a cluster regardless of the following inflection. The paradigm in (1a) contains the yer (underlined). This vowel is phonetically identical to [e] in (1b), but unlike the vowel in (1b), the yer only appears when the following inflection is null, creating an alternating in the stem.

(1) Three representative paradigms

a. Yer vowel - 'sweater'  b. Full vowel - 'bicycle'  c. Final cluster - 'Peter'
sfstr-Ø (NOM.SG.)  rover-Ø (NOM.SG.)  p'otr-Ø (NOM.SG.)
sfstr-a (GEN.SG.)  rover-a (GEN.SG.)  p'otr-a (GEN.SG.)
sfstr-ami (INSTR.PL.)  rover-ami (INSTR.PL.)  p'otr-ami (INSTR.PL.)

From these three paradigms, which are all fully productive and span both native and borrowed lexical strata in Polish, it can be seen that the stem alternation in (1a) is not due to epenthesis or deletion of regular [e]. Deletion of [e] in [sfstr-a] is excluded by the existence of [rover-a], wherein the vowel is maintained in an identical context. On the other hand, epenthesis of [e] in [sfstr-Ø] is excluded by the existence of [p'otr-Ø], wherein an identical final cluster is tolerated. For these reasons previous accounts have unanimously treated yers as abstract vowels, underlyingly distinct from regular [e].

This paper presents a novel, Optimality Theoretic (Prince and Smolensky 1993) analysis of yers, with focus on patterns in derived paradigms, inflectional paradigms of items that also involve derivational morphology. §1 presents a brief

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sketch of previous work. §2 argues that in OT, the types of alternations exhibited by yers are predicted by richness of the base, and an analysis is proposed. §3 introduces a novel type of output-output correspondence called CONTEXTUAL IDENTITY, which accounts for the patterns observed in derived paradigms.

1. Background
There is a large body of literature on yers in Slavic, and providing a detailed review is not possible due to space restrictions (Gussmann 1980, Rubach 1984, 1985, Spencer 1986, Szpyra 1989, 1992, Piotrowski et al. 1992, Yearley 1995, Rowicka 1999, Scheer in press). All previous accounts, however, treat yers as abstract vowels, differing from full vowels by the lack of a root node, melodic specification, or special feature settings. Furthermore, many of the previous accounts rely on some form of a rule called "Lower," which vocalizes a yer when followed by another yer in the next syllable (Gussmann 1980, Rubach 1984, 1985, Spencer 1986, Szpyra 1989). Yers are deleted otherwise. For example, the input /VCECEi/ (where /Ei/ is an underlying yer) would surface as [VCeC], while /NCEC/ would surface as [VCC].

As noted by some authors, however, the rule of Lower is not phonologically motivated (Szpyra 1992, Yearley 1995, Rowicka 1999, Scheer in press). There is nothing particular about the presence of a yer vowel that should bring about the vocalization of a yer in a preceding syllable, suggesting that this view is a descriptive artifact. In addition, these accounts have to postulate abstract representations in which null inflections are actually underlying yers that never surface. For example, the underlying form of the nominative case of sweater would be /sfeTierEi/; the final yer never appears on the surface. This rule was designed to account for patterns in derived paradigms, where multiple consecutive yers vocalize. These patterns will be addressed in §2.2.

2. Yers in Simple Paradigms
This section lays out the basics of the analysis and presents the account of the paradigms in (1). Richness of the Base (RotB) implies that all languages undergo absolute neutralization of some input segments. In most cases these processes do not play an active role in the grammar; however, RotB predicts the existence of languages wherein multiple repairs of offending inputs are possible, yielding alternations. Slavic yers are one such case where repairs depend on context.

(2) Polish vowel inventory

<table>
<thead>
<tr>
<th></th>
<th>i</th>
<th>i</th>
<th>u</th>
<th>ɛ</th>
<th>o</th>
<th>a</th>
<th>ɪ</th>
<th>ɔ</th>
</tr>
</thead>
<tbody>
<tr>
<td>high</td>
<td>+</td>
<td>+</td>
<td></td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>+</td>
<td>−</td>
</tr>
<tr>
<td>low</td>
<td>−</td>
<td>−</td>
<td></td>
<td>ɛ</td>
<td>−</td>
<td>+</td>
<td>−</td>
<td></td>
</tr>
<tr>
<td>tense</td>
<td>−</td>
<td>+</td>
<td>+</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>+</td>
</tr>
<tr>
<td>back</td>
<td>−</td>
<td>+</td>
<td>+</td>
<td>−</td>
<td>+</td>
<td>−</td>
<td>−</td>
<td>+</td>
</tr>
<tr>
<td>round</td>
<td>−</td>
<td>−</td>
<td>+</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>−</td>
</tr>
</tbody>
</table>
Polish Yers and Output-Output Correspondence

Thus, like previous accounts, this account assumes an underlying distinction between [e] and the yer despite their surface neutralization. In contrast to previous accounts, however, the weakness of yers is attributed here to universal markedness constraints. In particular, the feature combination [xhighb][fintense] (where α≠β) of yers is marked due to the articulatory effort associated with these antagonistic tongue height and tongue retraction positions (Archangeli and Pulleybank 1994). The full set of vowel features in Polish is shown in (2). While there are two yers in Polish, the front /i/ and back /u/, this paper presents an analysis of undervar and suffixed forms in which only the front yer appears. Both yers differ from their full vowel counterparts by the setting for the high feature, and both violate a markedness constraint against a mismatch on the high and tense features: *([xhighb][fintense]). This constraint is abbreviated as *t.

When /i/ vocalizes, as in the case of [sfet-i-Ø], the value for the [high] feature changes from [+high] to [−high], violating the standard faithfulness constraint IDENT[high]. On the other hand, when the yer /u/ deletes, as in [sfet-a], the standard faithfulness constraint MAX-V, which penalizes deletion of vowels, is violated. In other words, the yer may never surface faithfully: it must either lower or delete entirely. This means that *i is ranked above the two faithfulness constraints: *i >> IDENT[high], MAX-V.

Whether the yer vocalizes or deletes depends on the inflectional material that follows it. In particular, vocalization occurs if and only if the following inflection is null. There is a straightforward explanation for this behavior: when the inflection is null, the vocalization of the yer prevents a complex cluster word finally: *[sfet-i-r]. When, on the other hand, inflection provides a vowel, the second consonant of the cluster may syllabify with the inflection, avoiding a complex coda: [sfet-i-Ø]. Thus *COMPLEXCODA compels the vocalization of yers: that is, the violation of IDENT[high]. This is shown in (3): candidate (3b) is ruled out by the *COMPLEXCODA violation, and the optimal candidate (3a) violates IDENT[high].

(3) Yer vocalization

<table>
<thead>
<tr>
<th>[sfet-Ø]</th>
<th>*i</th>
<th>*COMPLEXCODA</th>
<th>IDENT[high]</th>
<th>MAX-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. sfet-i-r</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. sfet</td>
<td></td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>c. sfet-i-r</td>
<td>*i</td>
<td></td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

Yers delete when their presence is not required by syllable structure constraints; this means IDENT[high] is ranked above MAX-V. (4) shows the optimi-

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1 The back yer may be observed in prefixed verbs. Some previous accounts attribute palatalization to the presence of the front yer and lack thereof to the back yer (Rabach 1984); in the present account only surface [e] is derived from underlying /i/.
2 A similar situation is described by Hyman (2001) in the African language Gunu. Hyman proposes two vowels, U and I, which are high, lax vowels that never surface faithfully due to rounding and ATR vowel harmony.
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zation of [sfrtr-a]; here a yer that does not repair a complex coda is deleted. Note that this constraint ranking does not predict any alternations for full vowels. Although MAX-V is ranked relatively low, there are no markedness constraints penalizing full vowels, and they would always surface faithfully. In the tableau in (5), the optimal candidate (5a) violates no constraints.

(4) Yer deletion

<table>
<thead>
<tr>
<th>[sfrtr-a]</th>
<th>*₁</th>
<th>*CMPLXCd</th>
<th>Id[HI]</th>
<th>MAX-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. sfr#.tr.ra</td>
<td></td>
<td></td>
<td>*₁</td>
<td></td>
</tr>
<tr>
<td>b. sfr.tra</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>c. sfr.tr.ra</td>
<td></td>
<td>*₁</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(5) Faithfulness of full vowels

<table>
<thead>
<tr>
<th>[rove-a]</th>
<th>*₁</th>
<th>*CMPLXCd</th>
<th>Id[HI]</th>
<th>MAX-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ro.ve.ra</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. ro.vra</td>
<td></td>
<td>*₁</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

While *COMPLEXCODA compels yer vocalization, complex codas are in general possible in Polish, as the form [potɔr] demonstrates. To allow complex codas to surface faithfully in general, Dep-V must be ranked above *COMPLEXCODA. The faithful candidate (6b) is optimal despite its complex coda. Thus, yer vocalization is a case of emergence of the unmarked: a markedness constraint that is violated on the surface still plays an active role in the grammar, acting as the driving force behind yer vocalization.

(6) Grammaticality of complex codas

<table>
<thead>
<tr>
<th>[potɔr-Ø]</th>
<th>*₁</th>
<th>Dep-V</th>
<th>*CMPLXCd</th>
<th>Id[HI]</th>
<th>MAX-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. pot.ter</td>
<td></td>
<td></td>
<td>*₁</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. potør</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

(7) Yer vocalization (a) and deletion (b) in tri-consonantal clusters

<table>
<thead>
<tr>
<th>[marxiv-Ø]</th>
<th>*₁</th>
<th>*CMPLXCd</th>
<th>Id[HI]</th>
<th>MAX-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. mar.xiv</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. marxiv-a/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. mar.xva</td>
<td></td>
<td></td>
<td>*₁</td>
<td></td>
</tr>
<tr>
<td>d. mar.xva</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

The account of syllable-driven yer vocalization presented here has the advantage of accounting for previously unexplained systematic gaps in yer vocalization patterns. All word-final yer vocalization follows the template XCC-Y ~ XCtC-Ø,
where Y is any overt inflection, and X, any vowel or consonant. In addition to
forms like [sfltr-Ø] ~ [sfltr-a], there are many cases where the yer breaks up a
sequence of three consonants, for example [marxv-a] ~ [marxvf] 'carrot'. These
cases also follow straightforwardly from the proposed constraint ranking, yielding
yer vocalization before null inflection (7a) and deletion otherwise (7b).

In contrast, alternations of the type CCC-Y ~ CeCC-Ø, where a yer vocalizes
between the first and second consonant of the triple, are conspicuously absent.
The present analysis correctly predicts their absence: if there were an underlying
yer between the first and second consonants of a stem-final cluster, it would
always delete. Tableau (8) shows the optimization of hypothetical input /marxv-
Ø/, with a yer between the first and second consonants.

(8) Yer deletion in tri-consonantal clusters

<table>
<thead>
<tr>
<th>[marxv-Ø]</th>
<th>*1</th>
<th>*CmplxCd</th>
<th>ID[Hi]</th>
<th>Max-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. marxv</td>
<td></td>
<td>*</td>
<td>!</td>
<td>*</td>
</tr>
<tr>
<td>*= b. marxv</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Yers vocalize to prevent complex codas, and in this case, vocalizing the yer in
(8a) does not prevent a complex coda. Deletion is chosen even before null inflec-
tion (8b). The optimal candidate has a tri-consonantal word-final cluster, which
is not uncommon in Polish: coda clusters up to length five are observed. In sum, this
section argues that not only does RotB predict the existence of alternating vowels
like yers, whose deletion and vocalization depend on syllable structure, but, in
addition, its consideration in combination with a more phonologically motivated
yer vocalization process explains a systematic gap in yer vocalization patterns.

3. Yers in Derived Paradigms

3.1. Yers in Suffixes

When a suffix containing a yer, the diminutive [-ik-], is attached to stems from
paradigms (1b) or (1c), the resulting patterns are identical to those observed in
simple paradigms (9). Although the morphology is more complex, the generaliza-
tion remains the same: the yer of the suffix is vocalized when it prevents a com-
plex coda [p'otr-ek] and deleted otherwise [p'otr-k-a].

(9) Simple and derived paradigms: stems with full vowels (a) and clusters (b)

<table>
<thead>
<tr>
<th>Underlying form</th>
<th>Simple paradigm</th>
<th>Derived paradigm</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. 'bicycle'</td>
<td>rovër (NOM.SG.)</td>
<td>rover-ek-Ø (NOM.SG.)</td>
</tr>
<tr>
<td>(FEM.)</td>
<td>rovër-a (GEN.SG.)</td>
<td>rover-k-a (GEN.SG.)</td>
</tr>
<tr>
<td>b. 'Peter'</td>
<td>p'otr (NOM.SG.)</td>
<td>p'otr-ek-Ø (NOM.SG.)</td>
</tr>
<tr>
<td>(MASC.)</td>
<td>p'otr-a (GEN.SG.)</td>
<td>p'otr-k-a (GEN.SG.)</td>
</tr>
</tbody>
</table>

These patterns follow from the grammar already introduced. The yer of the
suffix is vocalized to prevent the *CmplxCoda violation caused by deletion.
(10a). In (10b) deleting the yer does not create a complex coda because the [r] can syllabify with the onset of the following syllable. The next section will address in more detail the fact that the correct output contains a word-medial [trk] cluster.

<table>
<thead>
<tr>
<th></th>
<th>/p/otrk-õ/</th>
<th>*1</th>
<th>DEP-V</th>
<th>*COMPLXCOD</th>
<th>Id[H1]</th>
<th>MAX-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>p/otrk</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>b.</td>
<td>/p/o.trk.ka/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>p/ot.rka</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>p/o.trk.ka</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

3.2. Multiple Yers

In complex forms with multiple yers, the vocalization of yers cannot be explained by syllable structure alone. When the diminutive /-tk-/ is suffixed (11), multiple consecutive yers surface: underlying /sfet-õ-ik-õ/ surfaces as [sfet-r-õ-ik-õ], with three yers vocalizing in a row. Vocalizing two of these yers would be sufficient to satisfy *COMPLEXCODA, but cases such as *[sfet-r-õ-ik-õ] are not observed. It is for these patterns that the rule of “Lower” in previous work was designed, but as discussed earlier, this apparent simplicity was at the expense of a phonologically motivated process and transparent underlying representations for inflectional material. In other words, the previous accounts had treated the patterns in morphologically complex forms as the basic generalization and had to manipulate underlying forms of morphologically simple forms to predict their behavior. The approach taken here is the opposite: the patterns in general are viewed as driven by syllable structure, and the goal of the present section is to account for the more complex behavior in derived paradigms.

(11) Regular derived paradigms

<table>
<thead>
<tr>
<th></th>
<th>Simple paradigm</th>
<th>Diminutive paradigm</th>
<th>Dbl. diminutive paradigm</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>‘sweater’</td>
<td>sfet-õ (NOM.SG.)</td>
<td>sfet-r-õ (NOM.SG.)</td>
</tr>
<tr>
<td>(masc)</td>
<td>sfet-ã (GEN.SG.)</td>
<td>sfet-k-ã (GEN.SG.)</td>
<td>sfet-t-ã (GEN.SG.)</td>
</tr>
<tr>
<td>b.</td>
<td>‘pearl’</td>
<td>perw-õ (NOM.SG.)</td>
<td>perw-r-õ (NOM.SG.)</td>
</tr>
<tr>
<td>(fem)</td>
<td>perw-ã (GEN.PL.)</td>
<td>perw-k-ã (GEN.PL.)</td>
<td>perw-t-ã (GEN.PL.)</td>
</tr>
<tr>
<td>c.</td>
<td>‘bottle’</td>
<td>butl-ã (NOM.SG.)</td>
<td>butl-r-ã (NOM.SG.)</td>
</tr>
<tr>
<td>(fem)</td>
<td>butl-i (GEN.PL.)</td>
<td>butl-k-i (GEN.PL.)</td>
<td>butl-t-i (GEN.PL.)</td>
</tr>
</tbody>
</table>

At first glance these patterns suggest a cyclic effect, instantiated as Base Identity (Benua 1995, Burzio 1994, Kenstowicz 1996) in Optimality Theory. The nominative singular [sfet] seems to act as base for the derived [sfetr] and [sfetka] (11a) (see Yearly 1995 for such a proposal for Russian yers). However, upon closer inspection, Base Identity cannot be the solution. First, only one case in the simple paradigm provides the correct base; even if the appropriate case
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could be stipulated as nominative singular [sfetr], this would make the wrong prediction for feminine and neuter nouns, which appear with null inflection in the genitive plural [pergw] (11b). Even more problematically, this approach would fail to account for stems from inflectional paradigms with no zero-marked case whatsoever, which occurs with some feminine nouns (11c). There is no base in the simple paradigm for bottle that could be used to predict the appearance of a yer in the derived paradigms. None of the simple forms vocalize the yer: no matter how a base is defined, yer vocalization in the diminutive will be excluded by any cyclic OT account, including derivational OT.

The accurate generalization is that base selection favors a certain phonological shape for the base, and is independent of the base’s morphological properties and its existence as an independent word. This behavior suggests a second possible solution, Paradigm Uniformity or Uniform Exponentence (Kenstowicz 1996, McCarthy 2005), which requires inflectional stems to remain constant throughout a paradigm. As McCarthy argues, this approach allows for stem uniformity and overapplication of some process, in this case yer vocalization. However, the standard definition of Paradigm Uniformity does not apply here, because it is not the inflectional stem that remains invariant. In fact, the inflection stem varies between [sfetrk] and [sfetrk] depending on the inflection. It is the derivational stem [sfetrk], the morpheme to which the diminutive is attached, that remains uniform: [[sfetrk]-e-k] and [[sfetrk]-k-a].

(12) Raising in simple paradigms and leveling in derived paradigms

<table>
<thead>
<tr>
<th>NOM.SG.</th>
<th>GEN.SG.</th>
<th>NOM.SG.</th>
<th>GEN.PL.</th>
<th>INSTR.SG.</th>
<th>GEN.SG.</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Simple paradigm – ‘hole’ (MASC.)</td>
<td>duw</td>
<td>do.wu</td>
<td>do.wem</td>
<td>do.wuf</td>
<td>kro.va</td>
</tr>
<tr>
<td>b. Simple paradigm – ‘cow’ (FEM.)</td>
<td>kro.va</td>
<td>kro.vi</td>
<td>kro.vò</td>
<td>kruf</td>
<td></td>
</tr>
<tr>
<td>c. Derived paradigm – ‘little hole’ (MASC.)</td>
<td>do.wèk</td>
<td>dow.ka</td>
<td>dow.k’em</td>
<td>dow.kuf</td>
<td></td>
</tr>
<tr>
<td>d. Derived paradigm – ‘little cow’ (FEM.)</td>
<td>kruf.ka</td>
<td>kruf.ki</td>
<td>kruf.kò</td>
<td>kru.vèk</td>
<td></td>
</tr>
</tbody>
</table>

There is a second process, raising, that provides further support for this observation. Raising of [o] to [u] occurs in closed syllables. This process applies regularly in simple paradigms with [o] occurring in open syllables (do.w-u), (kro.v-a) and [u] in closed syllables (do.wu), (kru.f) (12a-b). In derived paradigms raising either uniformly overapplies (feminine nouns (12d)) or uniformly underapplies (masculine nouns (12c)). Previous authors have accounted for the choice of [o] or [u] in the derived paradigm by appealing to the privileged status of the nominative singular case, but they have provided no explanation of why there is leveling in the derived paradigms and regular application in the simple paradigms (Kraska-Szlenk 1995, Kenstowicz 1996). This phenomenon mirrors that of the overapplication of yer vocalization: yer vocalization applies regularly in simple paradigms, vocalizing to prevent complex codas, and uniformly overapplies in the stems of derived paradigms, vocalizing even when no complex codas would be created by their deletion. Standard Paradigm Uniformity cannot account for the discrepancies observed between simple and derived paradigms.
These phenomena suggest that the typology of output-output correspondence is finer grained than just the disjunction of Base Identity and Paradigm Uniformity. The stems of derived paradigms exhibit a stronger leveling effect than those in simple paradigms. To account for this effect, this analysis proposes a novel type of output-output correspondence called **Contextual Correspondence**:

(13) Contextual Correspondence: Two surface forms x and x’ are in Contextual Correspondence if both conditions (a) and (b) hold:

a. x and x’ are surface realizations of some morpheme /X/, and
b. x and x’ are each part of morphologically complex representations, [(z)x]y] and [((w)x]y’) (or [y’x([iz])]) and [y’[x’([w])]]) respectively, where y and y’ are surface realizations of a single morpheme /Y/.

(13a) identifies Contextual Correspondence as a surface-to-surface correspondence relation. (13b) requires that the surface realizations of the morphemes in correspondence, x and x’, occur in identical morphological contexts. In particular, the morpheme exterior to /X/ in both structures must be /Y/. The optional morphemes [z] and [w], written ([z]) and ([w]), indicate that /X/ itself may be an affix attached to the (possibly complex) morphemes [z] and [w] and need not be a root.

This definition is exemplified in (14). The two realizations of A, in (14a) and (14b), are in Contextual Correspondence due to the presence of B in both structures. The two Bs in (14a) and (14b) are not in Contextual Correspondence because the outer morphological material varies between C and D.

(14) Contextual Identity schema and example

a. [[A]–[B]–C]  [[sfrtr]_{1c} -tk_{1a} -\emptyset_{1c}]

b. [[A]–[B]–D]  [[sfrtr]_{1c} -tk_{1a} -\alpha_{1d}]

c. [[E]–[B]–D]  [[kratrr]_{1c} -tk_{1a} -\alpha_{1d}]

Contextual Correspondence holds between all morphemes, not just roots. It holds between affixes in identical morphological contexts as well: the realizations of B in (14b) and (14c) are in Contextual Correspondence due to the identical morphological context D in both words. Thus, Contextual Correspondence is a contextual version of Uniform Exponent (Kenstowicz 1996): it applies to all morphemes but only under uniformity of context. CONTEXTUAL IDENTITY is the constraint requiring identity between morphemes in Contextual Correspondence. Contextual Identity should be viewed as a family of constraints, separable into different constraints for different types of morphemes. Whether these effects may be collapsed into one constraint in general, as they may in Polish, is an empirical question that must be determined by examination of other languages.

In addition to the empirical evidence supporting Contextual Correspondence, the framework of Burzio (1998, 2002, 2005) provides theoretical support. Under Burzio’s Representational Entailments Hypothesis, each aspect of the representation (phonological, morphological or semantic) entails each of the other aspects.
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Higher order entailments, induced by higher similarity of representations, imply stronger faithfulness between related forms. This applies directly in the case of Contextual Correspondence; the higher dimensional similarity imposed by the presence of identical outer morphological material implies stronger faithfulness.

To complete the analysis of derived paradigms, one final constraint is required in addition to Contextual Identity. The latter requires that the base be uniform. However, for an input paradigm such as /butl-/ik-X/ there remain two possibilities: uniformly selecting [butl-] or uniformly selecting [butl-]. In the present grammar [butl-] would be the optimal choice because vocalizing yers comes at a higher cost than deleting them. This is not the correct output, however; [butl-] is chosen as the stem. The paradigms in (15) (repeated from (9b) and (11c)) demonstrate that the constraint responsible for ruling out [butl-] must be a faithfulness constraint. In particular, a word-medial tri-consonantal cluster is not problematic in [pîôtr-k-a] (15b), although this cluster could be repaired by vocalizing the yer: *pîôtr-gk-a. The only difference between the two forms that could predict the vocalization of the yer in (15a) is the presence of a stem yer in the input. The constraint employed here is MAX-V^3, which prohibits the deletion of two consecutive vowels. Thus, while [pîôtr-k-a] involves deletion of only one vowel, MAX-V^3 excludes [butl-k-a] due to the deletion of both yers.

(15) Simple and derived paradigms: stems with yers (a) and final clusters (b)

<table>
<thead>
<tr>
<th>Underlying form</th>
<th>Simple paradigm</th>
<th>Derived paradigm</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ‘bottle’</td>
<td>butl-a (NOM.SG.)</td>
<td>butl-k-a (NOM.SG.)</td>
</tr>
<tr>
<td>(FEM.)</td>
<td>butl-l (GEN.PL.)</td>
<td>butl-gk-Ø (GEN.PL.)</td>
</tr>
<tr>
<td>b. ‘Peter’</td>
<td>pôtr-a (GEN.SG.)</td>
<td>pôtr-k-a (GEN.SG.)</td>
</tr>
<tr>
<td>(MASC.)</td>
<td>pôtr (NOM.SG.)</td>
<td>pôtr-gk-Ø (NOM.SG.)</td>
</tr>
</tbody>
</table>

(16) shows the interaction of Contextual Identity, MAX-V^3, and the other constraints in selecting the correct base and diminutive allomorph. Contextual Identity requires uniformity of the root within the paradigm as well as consistency of the diminutive across roots within the same inflectional category. These Contextual Correspondence relations are explicitly indicated on the second line of the input. The term “NOUN-gk-Ø” refers to other classes of nouns with the diminutive and nominative singular case inflection, exemplified by [rîôtr-gk-Ø] and [pôtr-gk-Ø] in (9). This correspondence requires that the diminutive surface as [k] when followed by zero inflection. Likewise, “NOUN-k-a” refers to the genitive counterparts of these other nouns (also in (9)) and requires that the diminutive surface as [k] in the genitive singular case. Thus, there are three identity criteria at work: one requiring the root to be invariant; the second requir-

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3 While there are a number of possible alternative faithfulness constraints, evidence that this is the correct constraint comes from alternations that occur with prefixed verbs. In these cases, there are two consecutive yers, for example /îz-bîraw/ ‘he collected’, and two grammatical outputs, differing in aspect: zîbraw, zîbîraw. Max-V^3 prevents the deletion of both yers.
ing surface [ek] in the nominative singular case; and the third requiring surface
[k] in the genitive singular case.

Candidate (16a) violates CI three times: once because the root varies; once
because an inconsistent allomorph is used before nominative case inflection; and
finally, once because an inconsistent allomorph is used before genitive case
inflection. (16b) vocalizes the diminutive yer in the genitive case, violating
Contextual Identity, and (16c) deletes two consecutive vowels, violating MAX-V2.
The winning candidate (16d) has a uniform root and selects the same allomorph
of the diminutive as other nouns with the same inflection do (9).

(16)  Yer vocalization in paradigm with multiple consecutive yers

<table>
<thead>
<tr>
<th></th>
<th>*CMPLXCD</th>
<th>CI</th>
<th>MAX-V2</th>
<th>ID[HI]</th>
<th>MAX-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. sfetér-k, sfetér-k-a</td>
<td>*!</td>
<td>***</td>
<td>**</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>b. sfetér-k, sfetér-k-a</td>
<td>*!</td>
<td>**</td>
<td>**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. sfetér-k, sfetér-k-a</td>
<td>*!</td>
<td>*</td>
<td>***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. sfetér-k, sfetér-k-a</td>
<td></td>
<td>***</td>
<td>*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In sum, while yer vocalization in general is driven by principles of syllabifica-
tion, patterns in derived paradigms reveal additional factors at work. Both the
distribution of yers and the uniform over- or underapplication of raising in derived
paradigms support a more fine-grained model of output-output correspondence,
including Contextual Correspondence. While Contextual Identity is never violated
in Polish, further work in other languages is needed to determine whether it
should be considered a single constraint or a family of related constraints.

4.  Discussion

This paper has extended the scope of previous work on Polish yers by providing
an Optimality Theoretic analysis of yer vocalization patterns in both morphologi-
cally simple and complex environments. Syllable structure conditions, although
often obscured by the seemingly inexhaustible size of the Polish syllable, are
responsible for the basic vowel-zero alternations found in morphologically simple
words. Thus, although these constraints are not ranked high enough to eliminate
complex clusters in Polish altogether, the effect of these constraints can nonethe-
less be observed when yers allow unmarked structures to surface. In addition, in
this work, yers alternate with zero due to their marked feature combination rather
than some abstract structural deficiency.

As a result of these two choices, the neutralization process itself as well as the
distribution of vowel-zero alternations both follow from language-universal
principles rather than from Slavic-specific (or even Polish-specific) rules like
Lower. Assuming Richness of the Base, all languages necessarily exhibit neutrali-
zation of vowels. The Slavic yer neutralization differs only in the fact that two
repairs are systematically observed for a vowel, with deletion as default and
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vocalization occurring when syllable complexity is at stake. Otherwise, the
distribution of yer vocalization follows from the usual universal syllabification
properties. This allows abstract representations of words to be eliminated: there is
no longer a need to postulate unobserved yers just to force vocalization of pre-
ceding yers. In addition, Richness of the Base allows further restrictions on
syllable structure to be identified, and in OT these restrictions can account for the
lack of certain types of vowel-zero alternations in Polish, namely alternations in
sequences of three or more consonants.

The patterns of yer vocalization in morphologically complex words follow
from a new type of output-output correspondence called Contextual Correspon-
dence. Cyclicity cannot account for the patterns in question due to the difficulty,
both theoretical and empirical, in defining a morphological base. In this analysis,
the observed cyclic effects are due to Contextual Identity, which selects a mor-
phological base for a derived paradigm using independent preferences of the
grammar. Contextual Identity applies to stems within derived paradigms due to
the consistent morphological contexts in which they occur. Contextual Identity is
also shown to be crucial in the selection of affix allomorphs that occur in identical
morphological contexts. Under this view, affixes can also form a type of "para-
digm," depending on the morphological contexts in which they occur. Contextual
Identity applies to affixes, just as it does to stems, when they occur in the context
of identical morphemes. In addition, Contextual Identity is motivated by the noted
vowel-raising patterns, in which derived paradigms level while simple paradigms
apply raising regularly. While the Polish yer and raising patterns provide a non-
trivial testing ground for the development of Contextual Identity, further work in
other domains and languages will be needed to fully understand its (universal)
effects, limits, and scope of application.

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