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Ewa Czaykowska-Higgins
M.I.T.

THE DISTINCTNESS OF INFLECTION AND DERIVATION IN POLISH

Ewa Czaykowska-Higgins

M.I.T.[1]

The phonology of Polish contains several rules whose behaviour has interesting implications for two current issues in morphological and phonological theory: first, whether the distinction which has been assumed by most linguists between derivational and inflectional morphology is a real one; and, second, whether phonological rules constitute a single rule system stated once in the grammar as a block (as argued for in Mohanan and Mohanan 1984, Kiparsky 1986, etc.), or whether they can belong to domains, and so constitute separate mini-phonologies (see Pesetsky 1979, Kiparsky 1982). In Polish, as I show below, the cyclic phonological rules function in two distinct blocks which correspond to a distinction between the derivational and the inflectional morphemes of the language; thus the rules provide evidence for a distinction between derivation and inflection, and for a model in which rules can belong to domains.

The paper is organized as follows: first, I present the rules of Polish and motivate an analysis which divides the rules into two blocks; second, I argue on the basis of Polish and other languages, in favour of an inflection/derivation distinction; and third, I discuss the implications of this analysis for a model of Lexical Phonology and Morphology.

1 Polish

The underlying inventory of segments in Polish contains, in addition to labial and velar consonants, three series of coronals -- dento-alveolars (/t,s,c/ and corresponding voiced and sonorant consonants), palato-alveolars (/š,ž,č,dž/) and pre-palatals (/ś,ź,ć,dź,ń/). Consonants from all places of articulation except pre-palatal alternate with corresponding palatalized, or alveo- or pre-palatal segments in palatalizing environments (that is, preceding the [-back] non-nasal vowels or the glide /j/): thus, labials become palatalized, coronals change their values for [anterior] and [distributed], and velars become coronals (for a complete description of the palatalization rules see Rubach 1984).

In this paper I will focus on only three of the palatalization rules, and on one rule affecting the quality of the high back unrounded vowel [y].[2] These rules, as well as all other rules which cause consonant alternations, are lexical and subject to Strict Cyclicity. This fact has been demonstrated at length in Rubach (1984). Rubach provides two types of evidence that rules are cyclic. The first type of evidence comes from rules which never apply morpheme-internally, and which do apply in environments derived by phonological rule, or by morpheme concatenation. The second type of evidence comes from rules which are ordered before cyclic rules and which therefore must themselves be cyclic. All of the rules are lexical in that none of them apply across word-boundaries. Given the constraints on the length of this paper, I will not discuss Rubach's arguments further, but will simply assume them.

1.1 The rules

The rules being focussed on here are presented in (1)-(4).[3] The formulation of the rules is not crucial to the point of this paper.

The first rule under discussion is First Velar Palatalization. It changes underlying velar obstruents to corresponding alveo-palatal affricates or fricative in the environment of a [-back] segment:[4]

(1) First Velar Palatalization (FVP)

/k,g,x/ --> [č,dž,š]/___+i,e,j

a.	/pše+krok+i+ć/	pšekročyć	'to overstep'
b.	/noso-rog+ec/	nosorožec	'rhinoceros'
c.	/drobjazg+ek/	drobjaždžek	'trifle-diminutive'
d.	/gmax+isk+o/	gmašysko	'building-augmentative'

Second Velar Palatalization changes underlying velar stops to corresponding alveolar affricates, also in the environment of [-back] segments:

(2) Second Velar Palatalization (SVP)

/k,g,/ --> [c,dz]/___+i,e,j

a.	/vjelk+i/	vjelcy	'great, masc. nom. pl.'
b.	/drog+e/	drodze	'road, fem. loc/dat sg.'

Strident Palatalization changes the alveo-palatal fricative [š] to the pre-palatal [ś] in the environment of a following [i]:

(3) Strident Palatalization (SP)

[š] --> [ś]/___+i

a.	/kapeluš+isk+o/	kapelušisko	'hat-aug'
b.	/miłš+i/	miłśi	'nicer, masc. nom. pl.'

And finally, Fronting causes an underlying back unrounded high vowel to front in the environment of a preceding velar. The effect of Fronting is best illustrated by comparison of the form bogini 'goddess', in which the [y] of the suffix [+yn] is fronted following the [g], with the form gospodyni 'landlady', where no fronting has occurred.

(4) Fronting (FR)[5]

/y/ --> [i]/velars__

a.	/bog+yn+i/	bogini	'goddess' cf. gospodyni 'landlady'
b.	/drog+y/	drogi	'road, fem. g. sg.' cf. żaby 'frog, g. sg.'

1.2 Two blocks of rules

The rules given above fall into two blocks depending on which morphemes trigger their application. To begin, I discuss an ordering paradox in Polish.

1.2.1 Strident palatalization

The paradox involves the rules of Strident Palatalization and First Velar Palatalization. As indicated above, Strident Palatalization changes an alveo-palatal fricative [š] into a pre-palatal fricative [ś]. There are two sources for the alveo-palatal fricative in Polish -- [š] can be underlying as in the examples in (3a,b), or it can be derived from the underlying velar fricative [x] (see (5)):

(5) derivation

a.	/gmax+isk+o/	gmašysko	'building-aug.'
b.	/sux+i+ć/	sušyć	'to dry'
c.	/pux+ist+y/	pušysty	'fluffy'

In (5), FVP has applied to yield the alveo-palatal fricative; at this point in the derivation, the environment for SP is met because the initial vowel of all the suffixes in (5) is the high, front [i]. As (5) shows, however, SP does not apply after FVP. If it did, an incorrect form would be derived. (6) provides examples of derivations which illustrate that the correct ordering of the two rules must be SP first, and FVP second:

(6) a.

/gmax+isk+o/	
SP	n/a
FVP	š
SP	blocked by SCC
FVP	n/a
Retr	y

gmašysko

b.

/gmax+isk+o/	
FVP	š
SP	ś
FVP	n/a
SP	n/a
Retr	n/a

*gmaśisko

There are some forms in Polish in which SP is found to apply both to an underlying [š] and to the [š] derived from the velar fricative. In (7a) we see an underlying [š] palatalized to the pre-palatal; but in (7b) and (7c), we see forms in which the velar fricative has become a pre-palatal fricative:

(7) inflection

a.	/milš+i/	milśi	'nicer, masc. nom. pl.'
b.	/mnix+i/	mniśi	'monk, " '
c.	/ćix+i/	ćiśi	'quiet ones " '

To derive a form like (7b) mniśi 'monks', FVP must feed SP. The correct and incorrect orderings of the two rules are shown in the derivations of mniśi in (8):

(8)

a. /mnix+i/		b. /mnix+i/
FVP	š	SP n/a
SP	ś	FVP š
	mniśi	*mnišši

The ordering paradox, then, lies in the fact that SP must be ordered both before and after FVP.

It turns out that when SP is ordered before FVP, the suffix triggering SP is always derivational. But when the ordering is the opposite, the triggering suffix is always inflectional (see (5) and (7)). The morphemes which I refer to here as inflectional include all and only those morphemes which appear in word-final position and which do not change or establish the category-membership of the roots, stems or words to which they are attached; these morphemes indicate case, number, gender, and person. All other morphemes do change or establish category-membership and as such are derivational.

Since the number of inflectional affixes triggering SP is small (2 or 3 suffixes trigger the rule), it is possible to suppose that there are in fact two rules of SP, one of which is morphologically conditioned, and ordered after FVP, the other of which is phonologically conditioned and ordered before FVP. Alternatively, one could suppose that there are two blocks of cyclic rules in Polish, and that relative ordering of the two palatalization rules is different in the two blocks. Two other sets of facts make the latter hypothesis the more likely one.

1.2.2 Fronting

As (4) indicates, Fronting causes a back unrounded vowel to become [-back] in the environment of a preceding velar. Comparing (9) and (10), it becomes clear that FR is sometimes triggered by all three velar consonants (see (9)), but sometimes, as in (10), it is triggered only by the velar stops.

(9) derivation

	/-yn-/ 'feminine'		
a.	/bog+yn+i/	bogini	'goddess'
b.	/čwonk+yn+i/	čwonkini	'member, fem.'
c.	/monarx+yn+i/	monarxini	'monarch, fem.'
	/-yv-/ 'derived imperfective'		
d.	/o+bjeg+yv+a+ć/	objegivać	'run around'
e.	/vy+swux+yv+a+ć/	vyswuxivać	'listen'

(10) inflection

	/-y/ 'fem. gen. sg.'		
a.	/wǫk+y/	wǫki	'meadow'
b.	/drog+y/	drogi	'road'
c.	/pax+y/	paxy	'armpit'
	/-yx/ 'masc. gem. pl. adj.'		
d.	/krutk+yx/	krutkix	'short'
e.	/dwug+yx/	dwugix	'long'
f.	/gwux+yx/	gwuxyx	'deaf'

It turns out that all three velars cause FR to occur when the triggering suffix is derivational; but when the trigger is inflectional, only the velar stops cause FR. To account for these facts, one needs to postulate two rules which reflect the two similar, but different, phonological and morphological environments that trigger FR. It is significant, however, that the distinction in the morphological environments in which Fronting occurs parallels that found in the behaviour of Strident Palatalization. In both cases, although the actual morphemes which trigger the strident palatalizations and the fronting rules are different, the distinction between the classes of morphemes which trigger the two variants of both sets of rules is the same -- derivational suffixes trigger one variant, inflectional suffixes trigger the other. If we postulate two blocks of cyclic rules in Polish, which interact with the two types of morphology, we are able to account for the variants of SP and of FR without having to encode directly in the rules the morphological factors which condition them. In terms of simplicity, such an analysis would be preferable to one in which all four of the rules under discussion would be specified for morphological conditioning. In fact, there are two more rules, First Velar Palatalization, and Second Velar Palatalization, which also have to be distinguished morphologically.

1.2.3 Velar palatalizations

Although the two velar palatalizations (see (1) and (2)) occur in the same phonological environments, the rules have slightly different inputs and different outputs. Furthermore, the morphological environments in which they occur are distinct. (11) contains examples of the environments in which SVP occurs. Both of the suffixes illustrated in (11) are inflectional:

(11) inflection

a.	/žek+e/	žece	'river, dat./loc. sg.' cf. *žeče
b.	/nog+e/	nodze	'leg, " '
c.	/mux+e/	muše	'fly, " '
d.	/krutk+i/	krutcy	'short, masc. nom. pl.'
e.	/drog+i/	drodzy	'dear, " '

In fact, SVP is never triggered by derivational suffixes, but only by inflectional ones. FVP is triggered by inflectional suffixes, as shown by (11c), but in inflection it only acts on the velar fricative. Forms such as *žeče, where the output of a velar palatalization is an alveo-palatal rather than a dento-alveolar affricate, simply do not occur when the morpheme triggering the palatalization is inflectional. Conversely, derivational morphemes only trigger the application of FVP, and never of SVP, as seen in (12):

(12) derivation

a.	/kšyk+e+ć/	kšyceć	'to shout'	cf. *kšyceć
b.	/sok+ist+y/	sočysty	'juicy'	
c.	/śneg+isk+o/	śnežysko	'snow-aug.'	
d.	/strax+i+ć/	strašyć	'to frighten'	

Again, the facts given in (11) and (12) can be accounted for in two ways: by encoding morphological environments in the rules, or by postulating for Polish two blocks of rules, as suggested above, and ordering SVP only in that block of rules which interacts with inflectional morphology. In both cases, SVP would have to be ordered before FVP, as it bleeds FVP. The second alternative is not only simpler than the first, but it also captures the generalization which has been emerging in the course of the discussion, that certain rules of the Polish phonology behave differently depending on whether they are triggered by derivational or by inflectional morphemes. I propose, therefore, that Polish has two strata within the domain of the word-level

cyclic rules which correspond to the morphological distinction between derivation and inflection. The two strata are given in (13):

(13)

Derivation	Inflection
SP	SVP
FVP	FVP
FR (k,g,x)	SP
	FR (k,g)

2 Distinguishing inflection and derivation

Linguistic theory has traditionally assumed a distinction between derivation and inflection. This distinction has, however, been questioned by various linguists. Lieber (1980), for example, argued that for purposes of word-formation there is no formal distinction between the two types of morphemes: both types have to be specified in the lexicon, both have the same kinds of lexical entries. The Polish data provide crucial evidence for the debate over the derivation/inflection distinction because they show that phonological processes can be restricted to derivational or inflectional morphology. And Polish is not the only language in which such restrictions obtain.

2.1 Columbian Salish

Evidence for a distinction between inflection and derivation in Columbian Salish comes largely from the behaviour of the Columbian Stress Rule given in (14):

(14) Columbian Stress Rule (CSR):

> Assign stress to the rightmost accented vowel, or, if there is no accented vowel, assign stress to the rightmost vowel in the word.

Columbian, like Russian and Sanskrit, has both accented and unaccented morphemes underlyingly (accents are indicated by asterisks). (15) illustrates the basic behaviour of the CSR:[6]

(15) a. /ck -n -stu -Ø -n/ cəkstúnn '1sg throw 3sg'
throw-con-caus-3sg-1sg

b. /ck -n -stu -wa -s/ cəkstwás '3sg throw 3sg'
throw-con-caus-obv-3sg

c. /k^{w}*an-ɬ -t -si -t/ k^{w}á*rct '1pl carry 2sg'
take-redir-trans-2sg-1pl

d. /wak^{w}*-tuɬ -t -wa -s/ wak^{w}tú*rtus '3sg hide 3sg'
hide-redir-trans-obv-3sg

(15a) and (15b) illustrate stress-assignment to the rightmost vowel when no accented morphemes appear in the word. In (15c), the root morpheme is accented; stress is therefore assigned to it, rather than to a vowel on its right, even though this means that stress is assigned to the initial syllable. And in (15d), the root is accented, but so is the suffix -tuɬ- 'redirectional'. Stress is thus assigned to -tuɬ- since it contains the rightmost accented vowel.

The CSR does not apply straightforwardly in all words, however. (16a) shows that the morpheme -min- 'relational' is not accented since stress is assigned to the accented root. If -min- were accented, it would take stress away from the root. But in (16b), we see that this unaccented suffix, -min-, receives stress even though it is not rightmost in the word:

(16) a. /cqan*?-min-t -wa -s/ cqána?mntus '3sg hear 3sg'
hear -rel-trans-obv-3sg

b. /yr -min-stu -wa -s/ yərmístus '3sg cause push 3sg'
push-rel-caus-obv-3sg

One possible solution to the problem posed by (16) is to postulate that Columbian has two strata, each associated with different morphemes, and phonological rules. Under this analysis, the CSR would be assigned to both strata, the suffix, -min- would be assigned to stratum I, and suffixes such as -stu- 'causative' or -wa- 'obviative' would be assigned to stratum II. (17) illustrates the stratum-ordering of the suffixes presented above:

(17)

	Morphology	Phonology	
I	-tuɬ*- 'redir' -min- 'rel' -ɬ- 'redir' -n- 'control' -t- 'trans'	CSR	"derivation"

II	-stu-	'caus'	CSR	
	-wa-	'obv obj'		
	-si-	'2sg obj'		"inflection"
	-s	'3sg subj'		
	-n	'1sg subj'		

Given the model in (17), the assignment of stress to -min- in (16b) becomes completely regular. As the rightmost suffix at Stratum I, -min- receives stress by the CSR at Stratum I. At Stratum II, the CSR again assigns stress to the vowel of -min- because at that point -min- contains the rightmost accented vowel:

(18) / yr + min]$_{I}$ stu + wa + s]$_{II}$/

I	CSR	yr+min
II	CSR	yrmin]stu+wa+s
other rules		yərmistus

What is of particular interest about the ordering presented in (17) is that the distinction between strata I and II corresponds to the morphological distinction of derivation and inflection, respectively.[7]

2.2 Seri

Another language in which the distinction between inflection and derivation seems to be reflected in the behaviour of the phonological rules is Seri.[8] Three rules in particular are significant here: Vowel Deletion, o-Epenthesis, and i-Deletion. The morphological template of Seri verb forms is given in (19); examples of the application of the rules are given in (20):

(19) oblique-directional-object-{subject-mood / imperative / infinitive}-neg-ROOT

(20) Vowel Deletion: V --> Ø/___V

a. po -i:m --> pi:m 'sleep'-irrealis mood-root

i-Deletion: i --> Ø/C__C

b. si -meke --> smeke 'lukewarm'-irrealis
mood-root

o-Epenthesis: Ø --> o/___m' (C__mC)

c. mi -msisi:n --> m-msisi:n --> momsisi:n 'he is pitiable'
mood-root

All three of these rules are cyclic. However, the domains over which they apply are morphologically constrained. All three are triggered by the mood and negative prefixes (as seen in (20)), and vowel deletion is triggered by the oblique and the directional morphemes:

(21) a. mo -i -y oit --> m-i-y-oit --> imyoit 'it's descending'
dir-poss-nom-root (i-Deletion,i-Epenthesis)

None of the rules is triggered by affixation of the object or subject morphemes, the two morphemes which are clearly inflectional.

(22) a. ma -i?a-st 'to tattoo you' (no V-Deletion)
obj-inf-root
b. masi-k -noptotka?a 'we are hitting you' (no i-Deletion)
obj -nom-root
c. ?im-mi -kasni --> ?imimkasni[9] 'it bit me' (no o-Epenthesis)
obj-mood-root

Whatever the explanation of the morphological constraints on the application of these rules (see Cole 1987), the fact remains that the inflectional morphemes behave differently from those which are non-inflectional.

Clearly, more work needs to be done regarding the distinction between inflection and derivation. If such a distinction does exist, however, then phonological restrictions which are sensitive to it, such as those found in Polish, Columbian, and Seri, are precisely the kinds of facts we would expect to find.

3 Lexical Phonology and Morphology

In the discussion of Polish, I argued that the cyclic rules of Polish fall into two distinct blocks. To conclude the paper, I would like to consider an issue that I raised in the introduction: that is, whether phonological rules constitute a single rule system of the sort argued for in Mohanan and Mohanan (1984) and Kiparsky (1986), or whether the rules belong to the domains in which they apply.

In a single-rule-system model, the phonology is considered to be a single system of rules stated once in the grammar as a block, with orderings and domains of application assigned to the rules. On this view, the same phonological process can apply in more than one domain, only its mode and scope of application are constrained by the domain in which it applies. Among other predictions, such a model makes the following two: first, that a rule which applies in more than one domain should be functionally and formally identical in each domain; and, second, that if rules are ordered in a single block, then relative ordering of the rules should be the same in each domain. The rules of Polish provide counter-examples to both the predictions.

Recall that Fronting has the same function in both derivation and inflection. However, it is formally distinct in each domain. Fronting, then, provides a small counter-example to the first prediction. As far as the second prediction is concerned, Strident Palatalization and First Velar Palatalization show that it is simply not the case in Polish that the relative ordering of two rules is the same in each domain in which those rules apply. To account for the ordering paradox exemplified by these rules, a single-rule-system model would need to be considerably weakened. In a model in which rules belong to domains, however, differences such as the differences in ordering, and in the form of Fronting, would be predicted, and thus accounted for with no additional stipulations.

One of the motivations for the single-rule-system model was the attempt to account for overlap and duplication in rule application. But First Velar Palatalization and other palatalization rules of Polish which I have not discussed, have to belong to both of the postulated domains. It may be the case, then, that a model of the interaction of phonology and morphology may not be able to do away entirely with such redundancies as

duplication.

A model in which rules belong to domains is a weaker model of Lexical Phonology than that in which rules constitute a single system. To argue conclusively that a model needs to be weakened we need very strong evidence, and clearly, while the Polish facts do provide evidence against a single-rule-system model, the evidence they provide is not very strong. I suggest that what is significant about the two blocks of rules of Polish is that they constitute domains within the larger domain of cyclic rules. In addition to these two domains of cyclic lexical rules, Polish also has at least two other domains, one of non-cyclic lexical rules, and another of post-lexical rules (see Booij and Rubach 1987). Unlike the cyclic domain, these other two domains seem to be constrained by the principles proposed by proponents of the single-rule-system model (for example, Booij and Rubach (1987) argue that there is no duplication of rules in the different domains). It may be the case then, that only the larger domains of rules conform to the single-rule-system model, and that smaller domains within domains are constrained by different principles. Certainly, if this were true, it would allow us to keep the strongest hypotheses from a single-rule-system model, and also account for the sorts of facts I have presented in this paper.

NOTES

1. I am grateful to Jennifer Cole, Morris Halle, and Donca Steriade for discussions relating to this paper.

2. Polish vowels are /i,e,y,u,o,ǫ,ę,I,Y/, where y=[ɨ], ǫ,ę are nasal vowels, I,Y are abstract lax high vowels or yers. I cite Polish forms in broad phonetic transcription.

3. Since Polish has a complex phonology, and I am only examining four of its rules, I include here a simplified list of the other rules and their orderings, which I believe should be postulated. My analysis of Iotation and Coronal Palatalization differs slightly from that of Rubach (1984):

Cyclic Rules
j-Insertion: Ø → j / __V+V
SP (derivation)
Iotation: /t,d,s,z/ → [k',g',x',ɣ'] / __+j
Coronal Palatalization: /t,d,s,z,n,l,r/ → [t',d',s',z',n',l',r']/__+i,e
SVP (inflection)
FVP (inflection/derivation)
SP (inflection)
FR (inflection/derivation)
Labio-velar Palatalization: [lab, vel] → [-back]/ __+i,e
Non-cyclic Rules
CP Redundancy Rules: [t',d',s',z',n',l',r'] → [ć,dź,ś,ź,ń,l,ž]
j-Deletion: j → Ø/coronals__
Surface Palatalization: C → [-back]/ __i
Retraction: /i/ → [y]/C
[+back]

4. Two rules apply after the palatalizations and Fronting to yield the surface forms: 1) Retraction (non-cyclic) changes underlying /i/ to [y] after all coronals except the pre-palatals. Thus [pšekročyć] is derived in (at least) two steps: /pše+krok+i+ć/ --FVP--> [pše+kroc+i+ć] --RETR--> [pšekrocyć]. 2) Spirantization (cyclic, ordered after FVP) changes [dž] to [ž] when preceded by a sonorant. Thus the derivation of (1b) proceeds as follows: /noso-rog+ec/ --FVP--> [noso-rodž+ec] --SPIR--> [nosorožec].

5. This rule also applies in other phonological environments which

do not vary with the morphology (see Rubach 1984). For ease of exposition the other environments will be ignored here.

6. Many processes, such as vowel reduction or deletion, apply after the CSR (they are sensitive to stress-assignment) to yield the surface forms given in (15) and (16). All the Columbian data used here have been provided to me by M. Dale Kinkade (see also Kinkade (1982)).

7. Inflectional morphemes are the causative -stu- and the subject and object suffixes which are positioned word-finally and are obviously relevant to the syntax (Anderson 1982). The fact that the causative patterns with inflection is not surprising since, according to Baker (1985), causatives arise as a result of incorporation, and incorporation is situated between derivation and inflection, and therefore could in principle pattern with either. (If Baker's model of grammar is correct, it provides syntactic evidence for the distinctness of inflection and derivation). The stratum-ordering suggested here for Columbian has been independently discussed and motivated in my earlier work on the language (see Czaykowska-Higgins 1985). Columbian actually has three, and not two, strata; the third stratum is ordered before the derivational stratum called stratum I here, and includes all morphology and phonology related to the root.

8. The discussion in this section is based on Cole (1987). The interpretation of the Seri facts is mine, but Cole (p.c.) does not disagree with it.

9. Addition of ?im- 'obj' creates the correct environment for o-Epenthesis, but it does not apply. Instead, a later rule of i-Epenthesis applies to yield the correct surface form.

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