# Dominant Domains in Vowel Harmony

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**Abstract**

In this paper, we make two main claims: (i) we claim that a proposed prefix-suffix asymmetry (the absence of dominant prefixes in bi-directional dominant-recessive vowel harmony systems) is in fact a special case of a broader generalization that should be stated in hierarchical terms (domains), not linear order (prefixes), (ii) we contend moreover that the relevant domains are best defined in morphosyntactic terms (the juncture between Aspect and Tense, cf. "phases") rather than in morphophonological terms (the "stem" of Stratal OT and other work). We offer an account under a slight modification of an existing constraint-based cyclic approach to Vowel Harmony (Kiparsky 2023) and compare this to a rule-based (feature-filling) implementation of the cyclic Spell-Out of morphosyntactic structure.

**Keywords:** dominant-recessive vowel harmony, phases, domains, syntax-phonology interface, Cyclic Spell-Out

## 1 Introduction: NoDomPref

A Dominant-Recessive Vowel Harmony pattern is one in which vowels in a given language are divided into two classes, dominant and recessive, where a morpheme with

an underlyingly dominant vowel causes all underlyingly recessive vowels in the word to shift to their dominant counterpart. Bidirectional Dominant-Recessive (BiDR) systems are neither directional nor exclusively root-controlled. The dominant feature may be introduced by a root or by an affix, and may spread from right-to-left or left-to-right. It has been claimed that dominant prefixes in BiDR harmony systems are cross-linguistically unattested (Hall et al. 1974; Baković 2000; Moskal 2015). Existing accounts of this No Dominant Prefix Generalization (NoDomPref) couch the observation as a prefix-suffix asymmetry, but ultimately resort to a stipulation in one way or another, in the sense that the theoretical machinery used to characterize the generalization could just as easily have described the reverse: a hypothetical but unattested No Dominant Suffix generalization.

In this paper, we propose that the empirical generalization should better be stated in terms of structure, rather than in terms of linear order: No Dominant High affixes (NoDomHigh):

(1) **No Dominant High Affix Hypothesis**:
Syntactically high affixes may not be dominant
i.e., w.r.t. syntactically low elements (root and low affixes).

We contend that the NoDomHigh generalization is empirically superior to NoDomPref: to the extent that NoDomPref is observationally adequate, it is a special case of NoDomHigh. There is a noted cross-linguistic tendency for prefixes to be more peripheral than suffixes, and to often (but not always) be identified with syntactically higher affixes (Julien 2002), accounting for why the generalization seems to be about prefixes, but we show here that there is just as robust a trend regarding suffixes, once the syntactic high-low distinction is recognized. High suffixes are also exclusively recessive, a generalization about which NoDomPref is silent. Additionally, our account predicts the existence of a class of exceptions to NoDomPref, for which we identify plausible candidates.

We propose further that the generalization NoDomHigh can be succinctly characterized in a cyclic approach to morpho-phonology which recognizes privileged domains (levels, strata) in the construction of a complex word. Key to our account will be the assumption that certain aspects of the phonological representation are malleable on the first cycle (the first domain), but then fixed, such that subsequent operations are limited in the types of phonological change they may impose on the output of prior cycles. This may be implemented derivationally via feature-filling rules or as a faithfulness constraint which takes the input of cycle $n$ to be the output of a previous cycle $n-1$, as in the Ident-Stem constraint, invoked by Kiparsky (2023) in a Stratal OT account of other cyclic effects in vowel harmony (which we discuss below). We contend that a cyclic account of NoDomHigh is more explanatory than available accounts of NoDomPref in that it avoids the reversibility problem: the assumptions that characterize NoDomHigh as an effect of cyclic phonology cannot be co-opted to derive the inverse—a putative *NoDomLow is excluded on principled, rather than stipulated, grounds.

We propose further that the first phonological domain is identified in syntactic, rather than strictly morphological terms–specifically, we argue (with Marvin 2003; Newell 2008; Crippen 2019; Fenger 2020; Guekguezian 2021, a.o.) that the cyclic

domain whose effects we see in NoDomHigh reflects a syntactic domain boundary (the "phase"). This contrasts with an otherwise similar approach to (other) cyclic effects in vowel harmony (Kiparsky 2023), in which the relevant cyclic domain is the "stem", a morpho-phonological, rather than a syntactically defined domain. Since there is no consensus on diagnostics for either phases or stems, it is tricky to tease these apart, but we show that the relevant domains for the harmony systems we look at are more similar to what a syntactic-based theory would lead one to expect than they are to the domains identified by Kiparsky's criteria, and that consideration of noun-verb asymmetries in some languages lends itself better to a phase-based, rather than a stem-based, account, on plausible assumptions.

## 2 Background: BiDR Harmony and NoDomX

Empirically, our focus is on BiDR vowel harmony systems, as described above.[1] Kipsigis (sgc, Kalenjin, Southern Nilotic) illustrates such a system. Vowels may be + or − [ATR] (Advanced Tongue Root) (see 2). In the general case, all vowels in a word must share their [ATR] value. Thus, a [+ATR] vowel in a word causes all other vowels to become [+ATR] (a.o. Hall et al. 1974; Halle and Vergnaud 1981; Baković 2000; Casali 2003).[2] Examples are given in (3-6). Here and below we use colour to distinguish dominant (red) from recessive (blue) vowels—this is intended as a visual aid for the reader and provides only redundant information. When a word consists of morphemes that only have [−ATR] vowels, the surface form is identical to the underlying form (3). However, when a morpheme, like the root, has a dominant vowel, it causes suffixes (4) and prefixes (5) to become [+ATR] as well. Finally, (6) shows a dominant suffix that alters the vowel quality of the root and the prefix.[3]

(2) Kipsigis Vowels, ± Advanced Tongue Root (ATR)
[+ATR]: /i,e,ɑ,o,u/ [−ATR]: /ɪ,ɛ,a,ɔ,ʊ/

[1] This definition does not include (rare) harmony systems where either value (+/−) of a feature may be dominant depending on the morpheme. Such a system is attested in Turkana (Eastern Nilotic; Kenya), for example (e.g., Dimmendaal 1983; Noske 2000). We will exclude such systems from our investigation, but see Section 6.2 for a preliminary discussion on Eastern Nilotic languages.

[2] Nevins (2010: 44-53) presents an alternative characterization of Kalenjin, claiming, in effect, that rather than being a bidirectional system, individual recessive morphemes (or classes of morphemes) may be specified for the direction from which they take a dominant value.

[3] We use the following abbreviations (see also the list in the Leipzig Glossing Conventions): ABS = absolutive, ALL = allative, AP = antipassive, APPL = applicative, APPROX = approximative, ASP = aspect, ASS = associative, ASS.MOT = associated motion, AUG = augmentative, CAUS = causative, CL2 = (conjugation) class 2, COLL = collective, COM = comitative, COMPL = completive, COND = conditional, DAT = dative, DEM = demonstrative, DESID = desiderative, DERIV = derivational, DIM = diminutive, DIR = directional, DUR = durative, EMPH = emphatic, E = epenthetic (vowel), EQU = equative (case), FREQ = frequentative, FUT = future, HAB = habitual, INCH = inchoative, INCOMP = incomplete, INCP = inceptive, INESS = inessive, INFL = inflectional, INS = instrumental, IPFV = imperfective, ITER = iterative, IT = itive, LK = linking vowel, MID = middle, MOT = motion, NEG = negation, NMLZ = nominalizer, NOM = nominative, NTNS = intensifier, PASS = passive, PNCT = punctual, PTCP = participle, PPRT = passive participle, PRIV = privative, PROG = progressive, PRS = present, PST = past, PURP = purposive, RECP = reciprocal, REC.PST = recent past, REFL = reflexive, RSLT = resultative, RVRS = reversative, STAT = stative, SUB = subordinate, TH = theme, VB = verbalizer, VENT = ventive. Unless otherwise indicated, Kipsigis examples are from the second author's field notes. Tone is not indicated in the Kipsigis examples.

(3) /ka-ɔ-tʃam/ → kaɔtʃam
PST-2PL-love

(4) /ŋoːk-ɪ/ → ŋoːgi
dog-DEM

(5) /ka-kɪ-pet / → kɑgibet
PST-1PL-get.lost

(6) /a-tʃam-e/ → ɑtʃɑme
1SG-love-IPFV

The example in (7) shows a minimal pair (with two types of applicative suffixes, one recessive, one dominant). Both root and prefix are underlyingly [−ATR] but harmonize to the [+ATR] vowel in the suffix in (7b).

(7) a. Kà-∅-tɛ́m-ɛ́ːn Kíbêːt ímbàr mógóːmbéːt.
PST-3-plow-INS Kibeet.NOM farm hoe
'Kibeet plowed the farm with a hoe.'

b. Kù-∅-tém-tʃí Kíbêːt Tʃèːbêːt ímbàr.
PST-3-plow-APPL Kibeet.NOM Cheebeet farm
'Kibeet plowed the farm for Cheebeet.'

Thus, a system like Kipsigis has bi-directional vowel harmony, since specific vowel qualities can spread to the left, like in examples (5), (6) and (7b), and to the right, as shown in example (4). Nevertheless, Hall et al. (1974) reported that in languages like Kipsigis only suffixes and roots have vowels with a dominant quality. It is now a widely reported claim that dominant prefixes in BiDR systems seem to be cross-linguistically unattested (Hall et al. 1974; Baković 2000; Moskal 2015: among others), which Moskal calls the NoDomPref generalization. This is abstractly represented in (8), where a root can have a dominant vowel, and the quality spreads to the suffix and the prefix; suffixes can change the quality on the root or the prefix, (8b), but (8c) is claimed to be unattested.

(8) a. ✓ prɛf- root -sʊff → prefrootsuff
b. ✓ prɛf- rɔɔt -suff → prefrootsuff
c. ✗ pref- rɔɔt -sʊff → prefrootsuff

Several proposals have been put forward as accounts for NoDomPref.[4] Some of these proposals are supposed to cover prefix-suffix asymmetries more generally, but for the purposes of this paper we only focus on what the claims are with regard to vowel harmony.

One type of account deals with the differences between prefixes and suffixes through constraint rankings. Baković (2000: 227-238) proposes a class of faithfulness constraints that compare the stem vowel in an affixed form to the same stem vowel without the affix. He divides these further into faithfulness constraints for stem vowels in suffixed versus prefixed forms, and proposes that the absence of dominant prefixes can be captured if the faithfulness constraints for stem vowels in prefixed forms are ranked

[4] We leave aside the possibility that the observation is just an accidental gap—the gap is statistically significant in our three-language sample (see the end of Sec. 4). We also put aside proposals such as Fábregas and Krämer (2020) which seem to claim that prefixes do not participate in vowel harmony at all. This is transparently not the case for the languages under investigation. While some do have opaque prefixes, in all of these languages prefixes quite generally undergo harmony: they are obligatory targets of harmony, just not triggers.

universally higher than the faithfulness constraints for stem vowels in suffixed forms. If the harmony-inducing constraint is ranked between the two types of faithfulness constraints, then the ATR value of a vowel in the stem may be overridden by that of a suffix, but not by that of a prefix. As Baković (2000: 236-7) notes: "[a] lack of dominant prefix vowels has been successfully analyzed here as a possible state of affairs, but not as a universal. A simple re-ranking of the proposed constraints would ... predict an unattested language with dominant prefixes and no dominant suffixes!" The constraint-ranking proposal is thus not explanatory in the important sense that it is fundamentally reversible—the same theoretical device could just as easily have been invoked to derive the unattested mirror-image of the actual state of affairs, e.g. *NoDomSuff.[5]

Another type of account argues that the juncture between prefixes and the (lexical) root/stem has a different status from that between stem and suffixes (Nespor and Vogel 1986; Moskal 2015; Bogomolets 2020). When prosodic words are built, a suffix will be part of the relevant prosodic unit with the root, whereas the prefixes will not be. This means that the stem and the suffix can prosodically interact with each other, but once this unit is built and prefixes are attached, a prefix cannot alter the prosodic content anymore. As with the constraint-ranking approach, it is not immediately clear why the status of prefixes should be different from the status of suffixes: One could imagine that the juncture in prosodic theories is more special for suffixes than for prefixes. Like the previous account, the machinery in these prosodic accounts is reversible, and could just as easily have characterized the opposite asymmetry, a hypothetical NoDomSuff generalization.[6]

Existing accounts thus face two challenges: First, they are reversible, and therefore do not explain why the apparent prefix-suffix asymmetry goes the way it does, rather than the opposite. Second, they are silent about the properties of suffixes. Since only prefixes are blocked from being dominant, suffixes may be either dominant or recessive. While this is descriptively true, we argue below that it misses a generalization, namely that syntactically high suffixes are just as robustly consistently recessive as the prefixes. A complete theory should unify these generalizations, which is not possible if the fundamental pieces of the explanation are tied to linear order. We argue that a cyclic theory has the potential to resolve both of these issues. To the extent that the location of an affix in the lower or higher domain can be established on independent (syntactic/semantic) grounds, this family of approaches is not reversible. It is possible to derive NoDomHigh (as we show below), but a putative mirror-image *NoDomLow is unstatable. In this sense, the cyclic view is more explanatory than the

[5]These few sentences of course do little justice to other aspects of the account in Baković (2000). We note that his proposal, unlike a simple claim of an accidental gap (see previous note), does allow underlyingly dominant vowels in prefixes, as long as they are opaque and thus outside the harmony system, a situation that arises in Maasai. Note that Baković does suggest that the prefix-suffix asymmetry may ultimately be a consequence of affixal height/peripherality, as we will indeed argue, but to make this work, he relies on the assumption that prefixes are always more peripheral than suffixes (p.238), a trend but not an absolute. Any account treating the generalization as a prefix-suffix asymmetry, whatever its merits, also says nothing about the lack of high dominant suffixes, a key point in our discussion below.

[6]Bogomolets, looking at the phenomenon of lexical accent, also considers a (partial) syntactic motivation for the prefix-suffix asymmetry but ultimately, like Moskal, settles only on a correlation: the special prosodic boundary lines up with a morphosyntactic distinction, though nothing ensures that it must. Bogomolets also considers some prefixes in the languages that she looks at to be 'low' and thus the boundary cannot follow from the morpho-syntax only.

order-based accounts. We argue that NoDomHigh is also empirically superior, on the evidence currently available.

# 3 Domains not Order

We argue here that the restriction identified by Hall et al. (1974) and others is best understood as a cyclic, that is hierarchical, rather than a linear effect. A morphologically complex word may contain more than one cyclic domain (or "phase" in syntacticians' parlance), as schematized in (9).[7]

(9)

$$\underbrace{[\text{ Hi-Pref-}}_{\text{Outer}}\underbrace{[\text{ Low-Pref-}[\text{ ROOT }]\text{-Low-Suff }]}_{\text{Inner Domain}}\underbrace{\text{-Hi-Suff }]}_{\text{Outer}}$$

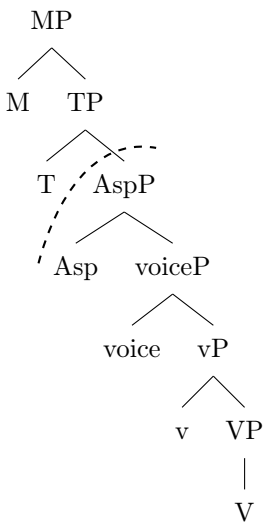
We suggest moreover that the domain boundary is derived from the syntax, in the manner of Cyclic Spell-Out proposals (see e.g., Marvin 2003; Newell 2008; Fenger 2020; Guekguezian 2021, with notable antecedents at least as early as Bresnan 1971). For verbs, we follow Wurmbrand (2014); Harwood (2015); Fenger (2020); Guekguezian (2021) and many references therein, who hold not only that there is a fixed functional sequence in the clausal domain, but that this sequence is divided into two domains ("phases") in the syntax — with the relevant domain boundary lying, to a first approximation, between Tense and Viewpoint Aspect, as shown in (10).[8] In the construction of a complex word, for example, via head-movement or equivalent operations, the first cycle stops at this boundary, thus the inner domain contains heads from the verbal root up to and including Aspect. Morphemes corresponding to heads representing Tense and above are mapped to the outer domain, and are expected to be peripheral to lower affixes in the verb word.[9]

[7] There is a bit of an ambiguity in the literature regarding the term "cyclic". Beyond simply meaning serial derivation, we specifically mean that certain key points in the iterative derivation are special and demarcate a constituent to which a set of rules/constraints/operations apply, which do not apply at every step in the derivation. That is, we mean the sense of "cyclic" as in Stratal OT, Lexical Phonology, and the earliest sense of "cyclic nodes" (later bounding nodes, now "phases") in the syntax, for example, as in Chomsky (1973: 275).

[8] We follow the literature in distinguishing between lexical and viewpoint aspect (Comrie 1976: a.o.). Lexical aspect, also called Aktionsart, is generally more associated with argument structure, and structurally lower, whereas viewpoint (grammatical) aspect has to with the boundedness of the event (especially the contrast between perfective and imperfective), and is structurally higher (Cinque 1999; Travis 2010). We hold (see Fenger 2020) that it is the boundary between viewpoint Aspect and Tense that corresponds to the phase boundary in syntax and thus, by hypothesis, the domain boundary in morphophonology, although both types of Aspect are thus in the Inner Domain.

[9] For present purposes, we may abstract away from the specific inventory of heads and affixes as well as the question of whether all heads are at least abstractly present in all languages. What is important for us is the claim that the relative order among attested heads is consistent across languages and permits a syntactically-determined bifurcation into a high and a low domain (Bybee 1985; Dahl 1985; Bybee and Dahl 1989; Bybee et al. 1994; Cinque 1999).

(10)




Bi-directional dominant-recessive harmony may apply in the inner domain, in which any vowel may be underlyingly dominant or recessive, but, we suggest, once vowel harmony has applied on the inner domain, the relevant quality of vowels in that domain is fixed. Therefore, affixes in the outer domain will essentially only ever be recessive (with some qualifications to which we return): a dominant vowel in the outer domain could lead to a disharmonic word, which is disallowed. We hasten to clarify that we do not take all phonological properties to be cyclically established and subsequently immutable in this way. We limit our discussion to the type of vowel harmony that characterizes BiDR systems.

There are two aspects to our account that we keep separate. In the first place is the argument that hierarchical structure (cyclic domains) provides a better account than left-right order of the observed asymmetries. More specifically, we will argue that the Kalenjin languages, for which NoDomPref was first proposed, are misleading, in that almost all prefixes are high, and almost all suffixes low, conforming to a widely suspected cross-linguistic trend (Julien 2002). This means that in these languages, NoDomPref and NoDomHigh are effectively indistinguishable empirically. Arguments to distinguish these will have to come from languages with richer inventories of prefixes and suffixes.

The second part of our account concerns the criteria for distinguishing low and high, the Inner and Outer domains. We share the cyclic hypothesis, at least in broad strokes, with Kiparsky (2023), but part ways with that approach in terms of the identification of the inner domain: for us it is syntactic: the phase, for Kiparsky (2023) it is morphophonological: the stem.

Section 4 makes the empirical case for structure over order, and we turn to the question of stem versus phase in Section 5. Nevertheless, we presuppose in the descriptive presentation the domain boundary identified in (10)—that is, we take inflection versus derivation as a rough proxy for syntactic height, but with the proviso that

among inflectional morphemes, we take aspect morphology to be low, following Fenger (2020).

Table 1 represents schematically the different predictions made by the structural (NoDomHigh) and the linear (NoDomPref) approaches as regards the possibilities of classes of affixes having dominant vowels.

| | high INFL | low DERIV | ROOT | low DERIV,ASP | high INFL |
|---|---|---|---|---|---|
| low-high | ✗ | ✓ | | ✓ | ✗ |
| prefix-suffix | ✗ | ✗ | | ✓ | ✓ |

**Table 1** Patterns for generalizations: dominant vowels

# 4 Argument I - Structure, not Order: Case Studies

We consider now the verbal morphology of three languages from different families that have figured in the discussion of BiDR vowel harmony. For each language, we classified all the verbal affixes in the available descriptive sources as either low or high (to the extent possible using the criteria identified above) and as dominant or recessive, where this can be determined in the grammars. The following tables reflect the outcome of this exercise. In addition to the numbers of attested prefixes and suffixes in each category, we have also given abbreviations of the features represented by the affixes in each cell so the reader may see what categories we have taken to be high and low. Numbers given with a plus in parentheses count affixes that were not in the primary source consulted but have been added on the basis of a wider literature search and/or field notes, with a question mark indicating uncertainty in classification.

We begin with Kipsigis, a Kalenjin (Niolitc) language, chosen since this is the language group for which the original generalization in terms of a prefix-suffix asymmetry was made in Hall et al. (1974: 247). Examples of BiDR harmony in Kipsigis were given in (7) above, and repeated here as (11). This pair shows the same verb occurring with two derivational (syntactically low) suffixes, the INS which is recessive, and the APPL, which is dominant. As shown, the dominant [+ATR] suffix *-tʃí* causes both the root and prefix vowels to harmonize to their [+ATR] counterparts.

(11) a. Kà-∅-tɛ́m-ɛ́ːn Kíbêːt ímbàr mógóːmbéːt.
PST-3-plow-INS Kibeet.NOM farm hoe
'Kibeet plowed the farm with a hoe.'

b. Kù-∅-tém-tʃí Kíbêːt Tʃèːbêːt ímbàr.
PST-3-plow-APPL Kibeet.NOM Cheebeet farm
'Kibeet plowed the farm for Cheebeet.'

The table in (12) presents the distribution of dominant and recessive affixes in Kipsigis, based on Toweett (1979) and verified by the second author's field notes.

(12) The Kipsigis (Kalenjin) verb

| | INFL | DERIV | ROOT | DERIV | INFL | |
|---|---|---|---|---|---|---|
| | | | | | ASP | AGR |
| DOM | Ø | Ø | | n = 5<br>APPL, AP<br>VENT, PL(2) | n = 1 | Ø |
| REC | n = 9<br>PST(3)<br>NEG(1)<br>AGR(5) | Ø(+1?) | | n = 7<br>ASS.MOT(2), IT<br>INS, MID<br>PTCP, CAUS | Ø | n = 1<br>AGR |

We have identified twenty-three verbal affixes in Kipsigis from the literature, plus one additional possible prefix,[10] and classified each along three dimensions: linear order (prefix versus suffix), phonological behaviour (dominant or recessive), and syntactic type.[11] As discussed above, we take inflection versus derivation to be a convenient proxy in verbs for high versus low syntactic position, with the exception that, following Wurmbrand (2014); Harwood (2015); Fenger (2020), we take aspect to be "low", that is, within the first syntactic phase, despite being arguably inflectional.

Of the twenty-three affixes in the table, only 6 are dominant. All are suffixes, and all are low. It is easy to see why Kipsigis would be seen in terms of a prefix-suffix asymmetry: there are no dominant prefixes, while there are dominant suffixes. However, it is also the case that Kipsigis shows a fairly strong correlation between syntactic height and linear position: all prefixes in the original source express high inflectional categories, and most suffixes are derivational. There are only two inflectional suffixes, of which moreover the only dominant one is the low category, aspect. Thus Kipsigis is actually consistent with both NoDomPref and NoDomHigh and so indeterminate between the two approaches.

A slightly more complex picture is presented by Diola-Fogny (dyo, Niger-Congo), for which morpheme counts from Sapir (1965) and Casali (2018) are given in (13):[12]

[10] We use the term 'possible' because this prefix (which is a causative prefix) is moraic in nature, making it slightly different from traditional morphemes. This mora is usually realized in the form of vowel length (i.e., it causes lengthening of adjacent vowels), but in some cases the moraic prefix is realized as the epenthetic vowel [i] (Kouneli 2022). This vowel is recessive, indicating that the moraic prefix does not come with a dominant [ATR] feature.

[11] In all of the languages under investigation, certain affixes display a number of allomorphs. A note is, thus, in order regarding how different allomorphs are counted in the tables presented in this section. For example, the imperfective suffix in Kipsigis has (at least) the allomorphs -∅, -*i* or -*e*, with their distribution being determined by phonological factors (Kouneli 2022). For allomorphs of this type, which have a similar phonological shape and whose distribution is phonologically-conditioned, we count all allomorphs as one morpheme. For allomorphs that are clearly suppletive, on the other hand, we count each allomorph as a separate morpheme. For example, Kipsigis has a verbal number suffix that has the form -*ja* in the perfective and the form -*to:s* in the imperfective; these are counted as two morphemes in Table 12.

[12] The emphatic marker is listed as a high morpheme in Diola-Fogny, as it is classified in Sapir (1965) as mood marker also expressing subjunctive/desire. Moreover, there are 5 derivational, non-dominant affixes that are not listed in the table. They are, according to Sapir (1965) highly infrequent, and stilted, which is why we decided not to list them.

(13) The Diola-Fogny verb

| | INFL | DERIV | ROOT | DERIV | INFL | |
|---|---|---|---|---|---|---|
| | | | | | ASP | AGR |
| DOM | Ø | Ø | | n = 4(+2)<br>DIR, NEG<br>VENT, ASP? | Ø | |
| REC | n = 10<br>FUT(2)<br>EMPH(1)<br>AGR(7) | Ø | | n = 5(+5)<br>REFL, INS<br>RECP, INCH<br>CAUS | n = 4<br>HAB<br>INCOMP<br>ITER, STAT | n = 13<br>AGR(8)<br>PST(3)<br>SUB, NEG |

While the situation with the prefixes is similar to Kipsigis (and likewise indeterminate between the two competing approaches), Diola-Fogny has a richer inventory of suffixes. While all 10 high prefixes are recessive, so too are the even more numerous (*n=13*) high inflectional suffixes. Only the NoDomHigh approach accounts for the recessivity of inflectional prefixes and suffixes as a single generalization. Put differently, NoDomHigh accounts for the recessive nature of all 23 high inflectional affixes, where NoDomPref provides an account only of the prefixes, slightly less than half of the inflectional affixes.

The same point can be made from Chukchi (ckt, Chukotko-Kamchatkan). Most of the Chukotko-Kamchatkan languages, including Chukchi, have a BiDR harmony system with two sets of vowels, recessive {i, u, $e_1$} and corresponding dominant {$e_2$, o, a}. There is some debate about the phonetic nature of dominant versus recessive /e/,[13] but phonologically, the patterning is clear: a dominant vowel anywhere in the word causes all underlyingly recessive vowels to shift to their dominant counterpart.

The examples in (14) show the alternation in affix vowels, controlled by the root. Affixes with a recessive vowel surface as such with recessive roots, but the dominant alternants are used with roots containing dominant vowels (Krause 1979: 4, Skorik 1961: 37).

(14) Root controls affix (prefix and suffix)

| | | | |
|---|---|---|---|
| -(n)u EQUATIVE | recessive: | /milute/ ‘rabbit’ | milute-nu |
| | | /tutlik/ ‘snipe’ | tutlik-u |
| | dominant: | /wopqa/ ‘moose’ | wopqa-no |
| | | /orw/ ‘sled’ | orw-o |
| (ɣ(e))-...-(t)e INS | recessive: | /milute/ ‘rabbit’ | ɣe-milute-te |
| | | /kupre/ ‘net’ | ɣe-kupre-te |
| | dominant: | /wala/ ‘knife’ | wala-ta |
| | | /rərka/ ‘knife’ | ɣa-rərka-ta |

[13] Bogoras (1922), Skorik (1961: 22ff), and Asinovsky and Volodin (1987) report that the two /e/ vowels are distinct, while Mel’nikov (1948: 209), Fortescue (1998: 128), Dunn (1999), and Weinstein (2023: 43) dispute this.

The inverse pattern is shown in (15). Here, the roots alternate, surfacing with dominant vowels when the affix contains a dominant vowel, and with recessive vowels otherwise.[14]

(15) Affix controls root

| ROOT | ABS | COMITATIVE /ɣ(a)-...-ma/ |
|---|---|---|
| /milute/ 'rabbit' | milute-t | ɣa-melota-ma |
| /titi/ 'needle' | titi-ŋə | ɣa-tete-ma |
| /rʔew/ 'whale' | rʔew | ɣa-rʔaw-ma |
| /ləle/ 'eye' | ləle-t | ɣa-ləla-ma |

It should also be noted that morphemes (both affixes and roots) with no full vowels may be diacritically marked as being dominant or not (Krause 1979: 13-14; Muravyova 1979: 138-141). For example, the affixes in (16) have only schwa or no vowel at all, but trigger harmony alternations in the roots they attach to:

(16)

| | AFFIX | ROOT | SUFFIXED FORM |
|---|---|---|---|
| a. | -ɣtə | /milute/ | melota-ɣtə 'to the rabbit' |
| b. | -jpə | /titi/ | tete-jpə 'from the needle' |
| c. | -tk- | /utt/ | ott-ə-tk-ən 'crown of a tree' |
| d. | -lɣən | /milute/ | melota-lɣən 'rabbit (singulative)' |

With these descriptive points in mind, the table in (17) presents the distribution of dominant and recessive affixes, with base morpheme counts from Dunn (1999), supplemented (in parentheses) with examples from Bogoras (1922); Skorik (1977) and Weinstein (nd).[15]

(17) The Chukchi verb

| | INFL | DERIV | ROOT | DERIV | INFL | |
|---|---|---|---|---|---|---|
| | | | | | ASP | AGR |
| DOM | Ø | Ø(+2?) | | n=4(+6?)<br>INCH(2), AUG<br>RSLT | Ø | |
| REC | n=12<br>FUT, COND<br>STAT(2)<br>AGR(8) | n = 7<br>CAUS/APPL<br>RECP, DESID<br>NTNS(2), AP<br>APPROX | | n = 13<br>DESID, ITER<br>COLL(2), AP<br>TH(2), COMPL<br>RVRS, PURP<br>DUR, PNCT<br>DIM | n=2<br>PROG<br>TH | n = 18<br>ACTIVE(11)<br>STAT(7) |

[14] The comitative in (15) is presented as a circumfix in descriptive grammars and appears to contain a dominant vowel in the prefixal portion. The prefixal portion can instead be analyzed as the same (recessive) element as in the instrumental *ɣ(e)-...-(t)e* in (14) (Dunn 1999: 248) The trigger for harmony is the dominant vowel in the suffix, *-ma*.

[15] As above, there is some degree of analytical uncertainty in classifying Chukchi affixes. In addition to the derivational prefixes listed here are others that occur only in non-finite forms termed "verbal bases" by Dunn (which are obligatorily subordinate to an auxiliary or light verb). The six he lists (p.241), including the two negative-marking circumfixes, are all recessive. Many of the derivational suffixes (and some of the prefixes) are clearly cognate with free roots, and for at least some, it is not clear whether these are affixes or compounds. See Dunn (1999: 252-262) for discussion. The element marked TH in the Aspect column is included there since it is in complementary distribution with the progressive marker.

Like Diola-Fogny and unlike Kipsigis, Chukchi has a rich inventory of inflectional suffixes, and has more suffixes than it has prefixes. Notably, all inflectional affixes are recessive. For the high inflectional affixes (those higher than aspect), the NoDom-Pref generalization is accurate, but weakly so: it accounts for only 40% of the affixes (12/30) covered correctly by the NoDomHigh proposal. Accounts that invoke or derive NoDomPref leave the recessive nature of the other 60% of the affixes (all the high inflectional suffixes) as a mere accident. On the strength of this, NoDomHigh is a stronger proposal, with broader empirical coverage and consistent with the verbal inflection of Chukchi, as well as that of Diola-Fogny and Kipsigis. All else being equal, NoDomHigh should thus be preferred on these grounds alone.

But Chukchi might add an additional point, not seen in Diola-Fogny, regarding the prefixes. Dunn's description lists no dominant verbal prefixes of any sort, but other descriptions contain morphemes identified as dominant prefixes, apparently in violation of the putative NoDomPref generalization. Two of these occur as prefixes to verbs (a third appears to be more regularly attached to nouns). One such apparent dominant prefix identified in Skorik (1977) is the intensifier *kət-*, given in (18a). Example (18b) establishes that the root *ɣənt(ev)* 'run (away)' is underlyingly recessive.

(18) a. /kət-ɣənt-et-rkən-i-tək/ → kət-ɣənt-at-rkən-e-tək
NTNS-run-DERIV-ASP-E-2PL
'Run!' (Skorik 1977: 77)

b. /ɣəntev-ɣʔi/ → ɣəntek-vʔi
run-2SG
'You ran (away).' (Skorik 1977: 21)

Weinstein (2023: 45) gives the prefix *ʔaqa-* 'impossible to V' as dominant.[16] He gives examples including: *ʔaqa-ɣənneŋŋəttəsqewək* 'he could not go hunting [any more]', which is evidently built on a recessive verb *ɣənniŋŋəttək* 'to hunt', and a recessive suffix *-sqiw-* 'to go V', both identified elsewhere in Weinstein's works.

Importantly, although there may be some uncertainty surrounding the proper identification of these prefixes, both are derivational rather than inflectional, compatible with the NoDomHigh proposal but problematic for the NoDomPref generalization.[17]

As far as the verbal systems of these three languages are concerned, we see that the prefix-suffix asymmetry seen in Kipsigis can be better cast as a special case of a

[16] Weinstein (2023: 43-45) notes that there is inter- and intra-speaker variation in the pronunciation of morphemes as dominant or recessive, and we have found some amount of variability in and across sources. For example. Weinstein (2023: 45,313) notes a recessive variant of the prefix just mentioned as *ʔeqe-* which he says had been previously undocumented. Similarly, Weinstein (2023: 128) also describes a prefix *taŋ-* 'able to' as if it were dominant, but elsewhere the prefix behaves as recessive *teŋ-*. In the Chukchi variety described by Dunn (1999), both of these prefixes are recessive, as expected on etymological grounds for the latter.

[17] It should be noted that both of these morphemes, like many other derivational affixes in Chukchi, are at least historically related to independent roots, and thus an analysis in terms of compounding might also be possible. This is not always clear, though, since some affixes show phonological differences to their cognate roots (see discussion in Dunn 1999: §14). Note in this regards that as a property root, *-kət-*∼*-ɣtə-* 'heavy' is given as recessive in Volodin and Skorik (1997: 26), though dominant in Skorik (1977: 231). We thank Alex Vaxman for research assistance on these points in the context of a different project.

The issue of distinguishing affixes from compounds arises in the analysis of Nez Perce as well. In defending the generalization that there are no dominant prefixes in BIDR harmony systems, Hall and Hall (1980: 227-228) acknowledge that Aoki (1966) claims that Nez Perce has a few dominant prefixes, but they argue that apparent examples of dominant prefixes in Nez Perce are "clearly compounds", a position for which they give supporting evidence.

broader generalization, stated in terms of high versus low affixes: NoDomHigh. This generalization encompasses all of the inflectional prefixes considered, but extends as well to the even larger class of high inflectional suffixes. The near absence of dominant prefixes is in part an accident of the cross-linguistic tendency for prefixes to be high, rather than a special property of prefixes as such. Potential evidence in favour of that view comes from the handful of apparent derivational prefixes in Chukchi, some of which are indeed dominant.

Before moving on to the question of stems versus pahses, we note that the absence of dominant prefixes, or of dominant high affixes, is unlikely to be merely a function of the small overall number of dominant affixes, even though dominant affixes are relatively infrequent even where all theories admit them: across all three languages considered here, only 14/45 low suffixes are dominant (excluding the uncertain cases). But this 14/45 is to be compared with zero (for the clear cases) in all other combinations of low-high and prefix-suffix. Summing the data across all three tables, which include a total of 115 affixes (not counting the questionable cases) Fisher's Exact tests show significance for prefix-suffix $\times$ dominant-recessive (0/38 prefixes are dominant, as opposed to 14/77 suffixes, p=.0044), and for high-low $\times$ dominant-recessive (0/63 high affixes are dominant as opposed to 14/52 low affixes, p<.0001). In other words, both NoDomPref and NoDomHigh represent statistically significant generalizations over the data here, but NoDomHigh has a lower conditional entropy: NoDomHigh covers a larger proportion of the data (leaving a smaller proportion to accident) than NoDomPref does.

Note that the absence of low, dominant prefixes (if we were to disregard the two Chukchi prefixes not in Dunn) is possibly an accident, since the overall number of low prefixes is low. There is a significant correlation, conforming to a frequently-mentioned trend, between affix height and prefix-suffix: suffixes are split between high and low—32/77 are high; but prefixes are overwhelmingly high—31/38 prefixes are high ($\chi^2$= 14.875, p=0.0001). These numbers are consistent with our contention that the original NoDomPref observation is correct (and statistically significant), but it is an artifact of the rarity of low prefixes, distracting from the real generalization, NoDomHigh.

# 5 Argument 2 - Phases, not Stems. Theoretical analysis

We turn now to two different ways in which NoDomHigh could be explained theoretically. In addition to richer empirical coverage, as we have just documented, we suggest that NoDomHigh is more readily amenable to a theoretical explanation than NoDomPref, which, as we have seen, was reversible – other than by stipulation, there is no reason why NoDomPref should hold as opposed to NoDomSuff with reversal of the constraints (Baković) or a prosodic boundary on the other side (Moskal).[18]

Ultimately, we will argue that NoDomHigh follows from a cyclic approach to Spell-Out which incorporates (at least) two significant domains. We will suggest that the

[18]It is of course conceivable that grammar-external considerations are implicated in prefix-suffix asymmetries (see, for example, Wynne et al. 2021), but we have argued above that the patterning of syntactically high suffixes together with (high) prefixes militates against seeing the distribution of dominance as a linear effect in the first place.

(morpho)syntactic representation is translated into the (morpho)phonological one in chunks of a particular size (phases), starting with the lowest chunk. To a first approximation (although we will ultimately propose something slightly different) one may think of this in terms of underspecification: vowels may be specified as [+ATR] or may be underlyingly unspecified, with [+ATR] spreading on the first phonological cycle. A default, feature-filling rule at the end of the first phonological cycle supplies [−ATR] for any vowels that remain unspecified (i.e., when there is no instance of [+ATR] in the first phase), preventing subsequent feature-filling rules from affecting vowels in the first cycle. Coupled with a ban on surface disharmony, NoDomHigh is derived. Importantly, a putative *NoDomLow is impossible to characterize in these terms.

But we will build this account in pieces, in part in the interests of clearer engagement with existing approaches and to highlight shared assumptions versus points of difference. We start by co-opting the account of a different type of cyclic effect in vowel harmony put forward in Kiparsky (2023) in the Stratal OT framework. Our aim in this section is to show how the cyclic asymmetry in terms of structure, rather than linear order, can be captured with an "off-the-shelf" proposal. Even though our actual proposal will depart from Kiparsky's, this serves as a useful point of departure, since the two approaches converge on the way they enforce cyclicity effects, and are largely (though not entirely) inter-translatable. After we show how NoDomHigh can be derived in a cyclic approach, we turn to the differences between Kiparsky's Stratal OT model and the model we will ultimately converge on. Our approach will differ notably from Kiparsky's in the way the inner domain is identified, and the kinds of predictions they therefore make. These predictions are the subject of section 5.2.

## 5.1 Stratal OT

Kiparsky (2023) presents an account of cyclic effects in vowel harmony, distinct from those we discuss, but which provides a convenient (more or less) off-the-shelf formalism in which to cash out the intuitive discussion we have presented above. In this section, we present the key components of his model and consider how it derives (something tantamount to) NoDomHigh. We leave a comparison between the models–and in particular why we think there is a syntactic component (phases) rather than a purely morphophonological definition (stems) for the identification of the inner domain–for the next subsection.

One of the leading ideas of Stratal OT (Kiparsky 2015; Bermúdez-Otero 2022) is that phonology is cyclic, namely "that certain constituents in the morphosyntactic structure of a linguistic expression define domains for phonological computation. Phonology applies iteratively over these domains, starting with the smallest, least inclusive cyclic domains, and moving progressively outwards to larger, more inclusive cyclic domains" (Bermúdez-Otero 2022). Kiparsky (2023) proposes that the two relevant cyclic domains are the stem (possibly iterative) and word. Kiparksy considers three cases of apparent directionality-reversals in harmony processes, which he describes as sharing the property that "roots combine with their first affix in dominant-recessive fashion, outputting a derived stem which then cyclically passes the harmonic feature outward to subsequently added affixes by stem faithfulness." Here, we illustrate with his presentation of rounding harmony in Warlpiri, and show how the theory

he proposes can easily be extended to derive NoDomHigh. After doing so, we argue that our facts require, however, that the relevant inner domain is the syntactic phase (or something close to it) rather than the stem, as in his account.

In Warlpiri (wbp, Pama-Nyungan), as Kiparsky presents things, the core generalization is that the sequence $*i \ldots u$ may not occur in consecutive syllables (though the reverse is allowed). If this sequence would arise in morphological concatenation, it is resolved by an iterative harmony process. In verbs, if the first suffix is [+RND], harmony will be regressive, spreading from suffix to root (as in (19)). But for all suffixes beyond the first (and for nouns), harmony is progressive, rather than regressive, and spreads [−RND] (rather than [+RND] from stem to suffix, as in (20)).[19]

(19)

| | | | *-rnu* (Past) | *rni* (NonPast) | *-ka* (Impf) |
|---|---|---|---|---|---|
| a. | /kiji/ | 'throw' | kuju-rnu | kiji-rni | kiji-ka |
| b. | /nyunji/ | 'kiss' | nyunju-rnu | nyunji-rni | nyunji-ka |
| c. | /yirra/ | 'place' | yirra-rnu | yirra-rni | yirra-ka |
| d. | /yurrpa/ | 'grind' | yurrpa-rnu | yurrpa-rni | yurrpa-ka |

(20)

| | | | | |
|---|---|---|---|---|
| a. | /wanti-mi-juku/ | → | wanti-mi-jiki | 'fall-still' |
| b. | /wanti-ja-juku/ | → | wanti-ma-juku | 'fell-still' |
| c. | /ya-nu-juku/ | → | ya-nu-juku | 'fall-still' |

Kiparsky argues that this is a cyclic effect. The first relevant cycle is the Stem, which for Warlpiri verbs, Kiparsky treats as the root plus the first suffix. On the stem cycle, the constraints relevant for harmony are those in (21).

(21) a. $*\begin{bmatrix} -\text{Round} \\ +\text{High} \end{bmatrix} \begin{bmatrix} +\text{Round} \\ +\text{High} \end{bmatrix}$

b. MAX[+RND]

Both constraints are ranked above the simple IO faithfulness constraint MAX[RND]. Constraint (21a) enforces harmony, while constraint (21b) ensures that harmony resolves to the marked value, namely [+RND], if the suffix is [+RND]. The tableau in (22) illustrates for the simple root-plus-suffix combinations in (19). Example (19b) shows that (21a) is directional: *i* may follow *u*, but *u* may not follow *i*. Example (19c) shows that (21a) constrains vowels that are adjacent on the vocalic tier—intervening *a* blocks further spreading.

(22)

| /kiji-rnu/ | $*\begin{bmatrix} -\text{RND} \\ +\text{HI} \end{bmatrix} \begin{bmatrix} +\text{RND} \\ +\text{HI} \end{bmatrix}$ | MAX[+RND] | MAX[RND] |
|---|---|---|---|
| a. kiji-rnu | *! | | |
| b. kiji-rni | | *! | * |
| ☞ c. kuju-rnu | | | ** |

Now, since constraint evaluation is cyclic, it is the output of the stem cycle, not (always) the underlying lexical representation, that functions as the input to the

[19] Data and glosses are from Kiparsky (2023). We abstract away here from numerous additional complexities, interesting their own right, but not directly relevant to the point we wish to make here. We return to some issues in an appendix.

next cycle. This model thus admits a further class of faithfulness constraints: IDENT-STEM[F] (compare S[TEM]-A[FFIXED FORM]-IDENT[F] in Baković 2000: 23). Such constraints are vacuous (or undefined) on the first (stem) cycle—since all elements on the first cycle are by definition part of the stem the constraint IDENT-STEM[F] has no effect distinct from plain faithfulness constraints. On subsequent cycles, we understand IDENT-STEM[F] to be violated by an occurrence of [$\alpha$F] in the output of a post-stem cycle that corresponds to[$-\alpha$F] in the output of the stem cycle (regardless of that feature's value in the original underlying representation). Ranked high, IDENT-STEM[F] on this interpretation expresses the same intuition that we have characterized as fixing of feature values at the end of the first cycle: values set on the first cycle are not overridden on later cycles.[20] This is shown in the tableau for (20):

(23)

| /[wanti-mi]$_{\text{Stem}}$-juku/ | $*\begin{bmatrix}-\text{RD}\\+\text{HI}\end{bmatrix}\begin{bmatrix}+\text{RD}\\+\text{HI}\end{bmatrix}$ | ID-STEM[RD] | MX[+RD] | MX[RD] |
|---|---|---|---|---|
| a. wanti-mi-juku | *! | | | |
| ☞ b. wanti-mi-jiki | | | ** | ** |
| c. wantu-mu-juku | | *!* | | ** |

On the stem cycle, all vowels are [−RND], so the optimal candidate matches the input. On the second cycle, IDENT-STEM[F] enforces preservation of the stem vowel value [−round], forcing a MAX[+RND] violation in the suffix which would have been fatal on the first cycle (as it is in (22b)).

Although Kiparsky's focus is a class of harmony effects where there is a directionality reversal after the first affix, and not BIDR systems as such, the mechanisms are readily adapted to the cyclic effects in BIDR harmony that we are interested in. We show this here with reference to Kipsigis. We replace Kiparsky's STEM with I.D. (Inner Domain, first cycle) in what follows, so that we can return later to the identification of that domain and the question of whether it is a stem or phase.

For Warlpiri, the harmony constraint is directional, blocking the specific combination *[−RND][+RND] (i.e., *i . . . u)*. The corresponding syntagmatic markedness constraint in Kipsigis is *[$\alpha$ATR][$-\alpha$ATR] blocking any combination of (consecutive) vowels that do not share a value for [ATR]. The relativized faithfulness constraint prefers harmonization to the marked [ATR] value: MAX[+ATR]. Kipsigis harmony, unlike Warlpiri, is thus bidirectional: whenever there is at least one [+ATR] segment, switching all [−ATR] vowels to [+ATR] is preferred. Putting aside domains for a moment, the basic workings are shown in (24) for the example in (7b).[21]

[20] Our implementation of IDENT-STEM[F] is thus similar to Baković's SA-IDENT[F]. The implementation in Kiparsky (2023) does not invoke serial constraint evaluation, but instead treats IDENT-STEM[F] as a type of positional faithfulness (Beckman 1997) that selectively privileges Input-Output faithfulness for features in the stem. As far as we can see, the two implementations are equivalent for the cases below, but we present the evaluations serially for maximal explicitness. Although it is not relevant for the examples considered here, we count each vowel separately in computing IDENT-STEM[F] violations. We return to some more narrowly technical issues in Appendix A.

[21] For reasons of spacing and readability, tones and the zero third person prefix are omitted, and "F" in the tableaux beyond the first is to be read as "ATR".

(24)

| /ka-tɛm-tʃi/ | *[αATR][−αATR] | Max[+ATR] | Max[ATR] |
|---|---|---|---|
| a. ka-tɛm-tʃi | *! | | |
| b. ka-tɛm-tʃɪ | | *! | * |
| ☞ c. kɑ-tem-tʃi | | | ** |

For this example, adding the cyclic constraint Id-ID[ATR] into the mix changes nothing. For maximum explicitness, we break the tableau into two, representing the first cycle (stem+suffix) in (25), and the second cycle in (26).[22] As above, the root harmonizes to [+ATR] from the suffix on Cycle 1, and this spreads to the prefix on Cycle 2.

(25)

| C1: /tɛm-tʃi/ | *[αF][−αF] | Id-ID[F] | Max[+F] | Max[F] |
|---|---|---|---|---|
| a. tɛm-tʃi | *! | | | |
| b. tɛm-tʃɪ | | (*) | *! | * |
| ☞ c. tem-tʃi | | (*) | | ** |

(26)

| C2: /tɛm-tʃi/ /ka/-[tem-tʃi] | *[αF][−αF] | Id-ID[F] | Max[+F] | Max[F] |
|---|---|---|---|---|
| a. ka-tɛm-tʃi | *! | * | | |
| b. ka-tɛm-tʃɪ | | *!* | * | * |
| ☞ c. kɑ-tem-tʃi | | | | ** |
| d. ka-tem-tʃi | *! | | | * |

But now consider what happens if a high affix, such as the tense prefix, were (hypothetically) to have an underlyingly [+ATR] vowel. The relevant case is the combination with an inner domain that has only [−ATR vowels], for example when the root is combined first with the Ins suffix instead of the Appl. The result is shown here (only the second cycle is considered, as the first cycle is trivial):

(27)

| C2: /tɛm-ɛːn/ /kɑ/-[tɛm-ɛːn] | *[αF][−αF] | Id-ID[F] | Max[+F] | Max[F] |
|---|---|---|---|---|
| ☞ a. ka-tɛm-ɛːn | | | * | * |
| b. kɑ-tem-eːn | | *!* | | ** |
| c. kɑ-tɛm-ɛːn | *! | | | |

The highly ranked Id-ID[ATR], not applicable on the first cycle, ensures that the [ATR] value established on the first cycle wins out over any higher values, even at the cost of forcing otherwise illicit violations of Max[+ATR] in the affix introduced on cycle 2, here the prefix.

This effectively derives NoDomHigh. Since the vowel quality on the first cycle cannot be overridden on a later cycle, but harmony still applies, all affixes beyond the first cycle (that is, all high affixes in our terms) will harmonize with the ATR value of the stem, regardless of whether that value is [+] or [−]. As a matter of observation,

[22] Recall from note 20 that we take Ident-ID[ATR] to be undefined on the first cycle (thus we have shaded it. In Kiparsky's presentation, it applies, but is in complementarity with the higher ranked harmony constraint and thus cannot be decisive on the first cycle.

the underlying value of the high affixes is thus irrelevant; high affixes always behave as if they had (underlyingly) recessive vowels.

Note that unlike the accounts of NoDomPref in Baković (2000); Moskal (2015), the Stratal OT account is not reversible. While there is an independent question of which affixes are part of the inner domain and which are not (to which we return), there is no way to limit dominant vowels to higher affixes and prohibit them from the lower domain. High ranked IDENT-ID[ATR] makes the underlying value of outer affixes irrelevant (rendering them recessive as shown above), but a low ranked IDENT-ID[ATR] would be irrelevant - dominant and recessive vowels would be free to occur anywhere in the word. That is, the mechanisms on offer to derive NoDomPref could just as well have been formulated so as to derive *NoDomSuff. But the cyclic account of harmony asymmetries in terms of structure, rather than as a prefix-suffix asymmetry, is not reversible: we derive NoDomHigh or nothing, but cannot derive a putative *NoDomLow. We take this, of course, to be an advantage of ours and Kiparsky's approaches.

As we have just shown, Kiparsky's cyclic account of directionality reversals in vowel harmony (as illustrated by Warlpiri) extends without substantive modification to provide an account of the ban on dominant high affixes quite similar to our syntactic account: harmony will be bi-directional in the inner domain; properties set in the first cycle will propagate outwards, and higher affixes can not be dominant but will instead behave as recessive targets of vowel harmony controlled by the stem. Both accounts rely on cyclic application of harmony to establish an inner domain, which then controls harmony in higher domains. Where the accounts differ is in the identification of this domain. We turn next to what we take to be suggestive evidence in favour of our syntactic approach over Kiparsky's.

## 5.2 Stems vs. Phases

In this section, we present two arguments in favour of seeing the inner domain as a syntactic domain, like phases, as opposed to Kiparsky's morphophonological unit, the stem. These arguments are not fully conclusive, since, as far as we can tell, there is no consensus in the relevant literature on how to identify either stems or phases. Despite this concern, we think the two points below suggest that the available evidence is more likely to support an eventual syntactic, phase-based account.

### 5.2.1 Multiple affixes

In the patterns that Kiparsky describes for Warlpiri, Nen (Tunen), and Telugu, the relevant differences distinguish the behaviour of the first affix from all subsequent affixes (at least in verbs, see below). Thus Kiparsky says (p.3): "The pattern is that roots combine with their first affix in dominant-recessive fashion, outputting a derived stem which then cyclically passes the harmonic feature outward to subsequently added affixes by stem faithfulness." Kiparsky holds that this is because the (verbal) root alone does not constitute a stem, but the root plus the first affix does.[23] If this criterion

[23]Stratal OT allows for iterative formation of stems, such that a stem plus an affix may also be a stem. For the properties under discussion, ID-STEM as we have interpreted it privileges the features established on the first stem cycle. This is consistent with Kiparsky's characterization: (p.6) "Because affixation turns a

generalizes, such that the first stem cycle can consist of maximally the root and one affix, any affix beyond the first must be (or behave as if it is) recessive. This prediction is not borne out.

For example, in Kipsigis both the recessive causative suffix and the dominant applicative suffix can be the first affix attaching to the root, illustrated in (28a) and (28b) respectively. As shown in (28c), when the two suffixes co-occur, the applicative remains dominant despite being the second affix to be added.

(28) a. *Root + Recessive causative in Kipsigis*
/ka-∅-ɪ-twaːl-sɪ/ → kaɪtwaːlsɪ
PST-3-CL2-jump-CAUS

b. *Root + Dominant applicative in Kipsigis*
/ka-∅-ɪ-twaːl-tʃi/ → kɑitwɑːltʃi
PST-3-CL2-jump-APPL

c. *Root + Recessive causative + Dominant applicative in Kipsigis*
/ka-∅-ɪ-twaːl-sɪ-tʃi/ → kɑitwɑːlsiːtʃi
PST-3-CL2-jump-CAUS-APPL

In Chukchi likewise the prediction of Kiparsky's approach that only stem-forming affixes can be dominant is not borne out. The examples in (29) show that a dominant suffix may attach outside a recessive one, affecting the vowels of all morphemes, including the root:[24]

(29) a. *Aspect (Aktionsart) stacking in Chukchi*
/ɣe-tiw-tku-ŋŋo-te/ → ɣa-tew-ə-tko-ŋŋo-ta
COM-beat.snow-ITER-INCP-INS
'beginning to beat off snow' (Dunn 1999: 258)

b. *Case stacking in Chukchi*
/umk-čəku-ɣtə/ → omk-ə-čəko-ɣtə
bush-INESS-ALL
'into the bushes' (Dunn 1999:283)

c. *Case outside derivation in Chukchi*
/umk-ɣleŋ-etə/ → omk-ə-ɣlaŋ-etə
bush-PRIV-ALL
'to the bush-less (place)' (Weinstein 2023: 37)

Whatever definition of stem from this literature is chosen (root + first affix, base of inflection, etc.), the dominant affix in each of these examples is not part of the (first) stem.

As another illustration of this point, consider the suffix *-ew∼-aw*, which is a plausible candidate for a verbal stem formative ("little *v*"). This suffix serves to make verbs from roots of other categories, and also transitivizes intransitive verbs (as well as simply being lexically required by some verb roots). It frequently co-occurs with

root into a stem, regressive harmony happens only in the innermost, noncyclic root layer of verb morphology, where it is obligatory." If iterative stem formation is allowed, our implementation of IDENT-STEM[F] and Kiparsky's (see n. 20) could in principle make distinct types of predictions.

[24] Occurrences of schwa between hyphens in surface representations in Chukchi examples indicate epenthesis to break up consonant clusters. Morphemic glosses correspond to the underlying representation.

the causative prefix *n(ə)-∼r(ə)-*. The suffix is underlyingly recessive, but suffixes that follow it may be dominant, changing both the suffix and the root to their dominant counterparts. Dominant suffixes that follow the verbalizer include participial *-jo* in (30a) and aspectual (aktionsart) suffixes such as inceptive *-mɣo* in (31a) (also dialectal variant *-ŋŋo*). The (b) examples provide corresponding forms with no dominant affixes, affirming the underlying recessive status of the root and verbalizer:[25]

(30) a. *Root-stem-dominant.suffix (Chukchi)*
/rə-mejŋ-ew-jo/ → rə-majŋ-aw-jo
CAUS-big-CAUS-PPRT
'(one who) was brought up' (Dunn 1999: 140)

b. *Root-stem-recessive.suffix (Chukchi)*
rə-mejŋ-ew-nin
CAUS-big-CAUS-3>3
'she brought him up' (Dunn 1999: 198)

(31) a. *Root-stem-dominant.suffix (Chukchi)*
/n-ine-n-req-ew-mɣo-qin/ → n-ena-n-raq-aw-ə-mɣo-qen
HAB-AP-CAUS-do.sth-VB-INCP-3SG
'(whenever) he started to do something to him' (Dunn 1999: 89)

b. *Root-stem-recessive.suffix (Chukchi)*
/ine-n-req-ew-ɣʔi/ → ine-n-req-ek-wʔi
AP-CAUS-do.sth-VB-TH
'What are you doing to me?' (Dunn 1999: 89)

In agreement with Kiparksy, we maintain that the effects we see are cyclic and distinguish between affixes in an inner versus an outer domain. But for Kipsigis and Chukchi it is clear that we cannot take the first affix (or first suffix) to delineate the relevant inner domain for the purposes of the IDENTID constraint. To the extent that the stem is defined (as Kiparsky does) by the first suffix that attaches outside the root, the Inner Domain in BIDR is not the stem.

### 5.2.2 Affixes with variable behavior

We saw in (28b)–(28c) above that the applicative suffix is dominant in Kipsigis irrespective of whether it is the first or second affix following the root. We already pointed out that this is problematic for the stem-based account, which would predict variable behavior for this affix: it should be dominant when it is the first affix, but recessive when it is the second affix. The question that we focus on in this section is whether such affixes with variable behaviour are ever attested. We show that they are, and that they too help distinguish between the predictions made by the stem-based and phase-based definitions of the first domain.

A minimal pair to (28b)–(28c) can be seen in (32) below: unlike the applicative suffix, which is always dominant, the ventive suffix *-u* is dominant when attaching directly to the root (32a), but recessive when attaching to the root + causative complex

[25] A similar point can be made on the basis of the Kipsigis data presented in (39b) below, where a recessive participle-forming suffix (i.e., an affix that turns a verb into an adjective) can be followed by a dominant plural suffix.

(32b).[26] In (32), the ventive suffix is used to introduce the first person benefactive argument.[27]

(32) a. *Root + Dominant ventive in Kipsigis*
/ka-∅-ɪ-twaːl-u-an/ → kɑitwɑːlwɑn
PST-3-CL2-jump-VENT-1SG
'He/she jumped for me.'

b. *Root + Recessive causative + Recessive ventive in Kipsigis*
/ka-∅-ɪ-twaːl-sɪ-ʊ-an/ → kaɪtwaːlsɪwan
PST-3-CL2-jump-CAUS-VENT-1SG
'He/she made someone jump for me.'

The variable behavior of the ventive, and in particular the fact that it is recessive when following the causative suffix *-sɪ*, indicates that the latter should be treated as a stem-forming affix in Kiparsky's account. This means that any affix attaching after the causative will be attaching at the stem level, and should thus be recessive in the language. This, however, is not borne out: as already shown in (28c) above, repeated here as (33), the applicative is dominant when it follows the causative.

(33) *Root + Recessive causative + Dominant applicative in Kipsigis*
/ka-∅-ɪ-twaːl-sɪ-tʃi/ → kɑitwɑːlsiːtʃi
PST-3-CL2-jump-CAUS-APPL

Not only the applicative, but also the imperfective affix is dominant when following the causative or even the causative + ventive combination. Examples of the relevant forms are given in (34).

(34) a. /ka-∅-ɪ-twaːl-sɪ-∅/ → kɑitwɑːlsi
PST-3-CL2-jump-CAUS-IPFV
'He/she was making someone jump.'

b. /ka-∅-ɪ-twaːl-sɪ-ʊ-∅-an/ → kɑitwɑːlsiwɑn
PST-3-CL2-jump-CAUS-VENT-IPFV-1SG
'He/she was making someone jump for me.'

The imperfective suffix has a null allomorph in these examples, and thus determining its linear position is more challenging. Nevertheless, there is indirect evidence that it follows the causative and the ventive. Toweett (1979) notes that the causative does "not behave like the other formatives [...] For all practical purposes they (=verbs with the causative suffix) behave as if they were basic verbals" (Toweett 1979: 137). This description is consistent with the idea that the causative is stem-forming, and it indicates that it is always the suffix closest to the root. Thus, the the imperfective suffix would have to follow the causative in (34a). As for its position relative to the ventive, we know that the null allomorph of the imperfective follows the applicative: as shown

[26] To our knowledge, the variable behaviour of the ventive has not been documented in previous descriptions of Kipsigis.

[27] This is part of a more general rule, where the applicative suffix, seen in (28b) above, is used for third person applied arguments and the ventive suffix - otherwise used to indicate direction towards the deictic center - is used for local person applied arguments.

in (35), the applicative suffix has the form *tʃiːn* in the imperfective, which is the allomorph of *-tʃi* when in non-final position.[28] Since the ventive has a similar function to the applicative in these examples (they both introduce applied arguments), the most natural assumption is that the imperfective is merged after the ventive as well.

(35) Kɑ-∅-i-twɑːl-tʃiːn-∅ Kibeːt laːkwɛːt.
PST-3-CL2-jump-APPL-IPFV Kibeet child.NOM
'The child jumped for/on behalf of Kibeet.'

To sum up, Kiparsky's account correctly predicts the existence of affixes with variable behaviour, but the case of the Kipsigis ventive shows that attributing such behaviour to the existence of stem-based domains makes incorrect predictions about the behaviour of other affixes in the language. More specifically, in order to account for the variable behavior of the ventive, one has to postulate a very small inner domain for the Kipsigis verb, incorrectly predicting recessive behaviour for applicative and imperfective affixes in the language. If, on the other hand, the inner domain is defined in terms of phases, as proposed in this paper, any morpheme below the phase-delineating head (which we argue in Section 3 is the Aspect head) should always have the ability to be dominant. Thus, we correctly predict that the applicative and imperfective suffixes in Kipsigis will remain dominant irrespective of the presence of other morphemes lower (or higher) in the structure.

At this point, one might argue that while the stem-based account undergenerates with respect to the morphemes that are dominant in Kipsigis, a phase-based account overgenerates: since the ventive is lower than the Asp head, it is not clear why it loses its dominance when following the causative.[29] While we do not have a full explanation yet, we note that overgeneration is a less severe problem than undergeneration, since

[28] Bossi (2023) analyzes the form *-tʃi(ː)n* as the allomorph of *-tʃi* in the context of imperfective (and not as the allomorph of the suffix when in non-final position). Nevertheless, there are clear counterexamples to this claim. For example, in (1a)–(1b), the (linearly first) applicative suffix has the *-tʃin* form, even though the verb is inflected in the perfective. What these forms have in common, however, is that the applicative is followed by another suffix in both cases - the instrumental in (1a) and another instance of the applicative in (1b). Comparing (1b) to (1c), we see that the first applicative suffix has the form *-tʃin* irrespective of aspect, while the second applicative suffix has the form *-tʃin* only in the imperfective. These data support the view that *-tʃin* is used when another morpheme follows the applicative, and can be used as evidence that imperfective forms involve a null aspect suffix that is attached after the applicative.

(1) a. Kɑ-∅-i-goː-[tʃin]-eːn Tʃeːbeːt laːkwɛːt lɔgɔjaːt saːnɪːt.
PST-3-CL2-give-APPL-LK-INS Cheebeet.NOM child plate
'Cheebeet gave a fruit to the child on a plate.'

b. Kɑ-∅-i-goː-[tʃin]-eː-[tʃi] Kɪplaŋgat Kibeːt Tʃeːbeːt kɪtabʊːt.
PST-3-CL2-give-APPL-LK-APPL Kiplangat Kibeet.NOM Cheebeet book
'Kibeet gave a book to Cheebeet on behalf of Kiplangat.'

c. Kɑ-∅-i-goː-[tʃin]-eː-[tʃin]-∅ Kɪplaŋgat Kibeːt Tʃeːbeːt kɪtabʊːt.
PST-3-CL2-give-APPL-LK-APPL-IPFV Kiplangat Kibeet.NOM Cheebeet book
'Kibeet was giving a book to Cheebeet on behalf of Kiplangat.'

It should also be noted that the *-tʃiːn* allomorph sometimes appears with a short vowel (as in the examples above). Such vowel shortening is quite common in Kipsigis morphophonology, and while the factors that determine it are not well-understood, they are phonological (Kouneli 2019: Chapter 2).

[29] As a reminder, the phase-based account also predicts that there will be morphemes with variable behaviour just in case they can attach both below and above the Asp head.

the recessive behaviour of the ventive when following the causative could be due to factors other than phasehood. For example, it is possible that the ventive is merged differently in causative vs. non-causative structures, affecting the way in which the morpheme is phonologically integrated with the rest of the verb, or alternatively, that the ventive simply has two allomorphs, one with a dominant vowel and the other with a recessive one, the latter appearing after the causative.[30] We leave the analysis of the ventive as a topic for further research.

### 5.2.3 Category differences in phonology

Phase-based and stem-based approaches might also be distinguishable in terms of what expectations they lead to regarding cross-categorial asymmetries. Our case studies in section 4 were all drawn from the verbal systems of the languages we investigated. When we look beyond verbs, a different picture emerges.

The structure that we proposed, where Aspect is the relevant phase head, makes no claims about phases/domains beyond verbs. In other words, according to our theory, no affix can be dominant if it spells out a head higher than the head introducing a phase boundary, but positing that the intermediate phase in verbs lies between Aspect and Tense does not automatically lead to any predictions about where, or whether, one will find such an intermediate phasal boundary in the nominal and adjectival domains. Although there is no consensus on where phases are in the syntactic literature, our sense of the state of the literature is that to the extent there is evidence for an intermediate phase (around AspP) in the extended verbal/clausal spine, there is far less, if any, evidence for a corresponding intermediate phase in the extended nominal domain. A claim along these lines has been made on independent grounds, albeit tentatively, in Bobaljik (2008: fn.7). More specifically, Bobaljik (2008) discusses a noun-verb asymmetry in epenthesis in Itelmen (Chukotko-Kamchatkan), which he accounts for by arguing that epenthesis applies cyclically in verbs, but not in nouns; he then speculates that the lack of cyclicity in nouns may be due to the lack of a phase boundary in the nominal domain, situating this in a broader cross-linguistic tendency for nouns to show more phonological distinctions (and thus less 'regularity') than verbs (Smith 2011). If these speculations are on the right track, then a phase-based approach might lead one to expect cyclic (inner domain) effects in verbs, but not in nouns or adjectives.

By contrast, the stem-based approach would seem to lead to the opposite expectation, namely that the inner domain (first cycle) in nouns will be, if anything, smaller than that in verbs. Just as there is no consensus on what constitutes a phase, there are also varying diagnostics regarding the identification of stems. Regarding the verb-noun asymmetry in Warlpiri, Kiparsky adopts the proposal of Nash (1979), suggesting that unlike verb roots, which are bound, "Nouns, being free forms, are inherently stems." (p.5). Thus, nouns trigger progressive spreading of [−RND] even to the first affix as in (36a) (example (36b) shows that the suffix vowels are underlyingly /u/, as they surface faithfully as such after stem-final /a/, where no harmony violation is at issue).

[30] All of our examples are from causatives of unergative verbs, and interestingly there are proposals according to which the sole argument of an unergative verb is introduced differently in causative vs. non-causative environments (e.g., Legate 2014; Nie 2020). It is thus possible that this would affect an argument-introducing morpheme like the ventive.

(36) a. /maliki-kurlu/ → maliki-kirli ‘dog-PROP’
b. /minija-kurlu/ → minija-kurlu ‘cat-PROP’

In sum, taking syntactic phases as the relevant domain might lead to the expectation that only verbs, but not nouns, have a word-internal cyclic domain boundary: all affixes in a complex noun would be part of the first domain and NoDomHigh would appear to hold only in verbs. Taking stems to be the relevant domain might lead to the contrasting expectation that in nouns, but not verbs, since the root corresponds to the first cyclic domain boundary, all affixes in nouns would count as high for the purposes of NoDomHigh.

For Chukchi the facts support, if anything, the phase-based expectation. There is (unsurprisingly) less morphological complexity in nouns than in verbs, but the most peripheral suffixes include dominant ones, such as the allative (dative), and associative case markers. Note that the allative case, across Chukotko-Kamchatkan, can be built on top of the (stative) locative case—the forms are morphologically complex, reflecting a common cross-linguistic decompostion (Radkevich 2010), and it is the higher (more peripheral) of the two cases that is underlyingly dominant.[31]

(37) a. *Associative circumfix in Chukchi*
/ɣe-kʔeli-ma/ → ɣakʔalema
ASS-hat-ASS
‘with a hat’ (Dunn 1999:332)
b. *Case stacking in Chukchi*
/umk-čəku-ɣtə/ → omk-ə-čəko-ɣtə
bush-INESS-ALL
‘into the bushes’ (Dunn 1999:283)
c. *Case stacking in Chukchi*
/plek-səku-ɣtə/ → plaɣ-səko-ɣtə
boot-INESS-ALL
‘into the boot’ (Weinstein 2023: 16)

Skorik (1961: 325) also identifies one dominant prefix in the Chukchi nominal system, *əm-* ‘all, whole’, corresponding to the root *əm-* ‘all, whole’, illustrated here:

(38) a. *Dominant nominal prefix in Chukchi*
/əm-lʲeleŋit/ → əm-lʲalaŋet
all-winter
‘the whole winter’ (Skorik 1961: 325)
b. /əm-pelvəl/ → əm-palvəl
all-herd
‘the whole herd’ (Skorik 1961: 325)

While one could debate whether these examples constitute compounds or prefixation, either way, if the nominal root is a stem on its own (à la Kiparsky), the dominant element would be external to that stem, but if there is no internal phase in the nominal domain (our view), then the dominant element is in the same phase as the root.

[31] The comitative and associative cases combine a prefix and suffix. It is arguably the suffix that contains the dominant vowel. See fn. 14.

A parallel argument can be made for Kipsigis adjectives (and participles). Adjectives are morphologically simpler than verbs, and adjectives (and participles), unlike verbs, have a dominant, plural agreement suffix, presumably high within the morphological structure but evidently still within the inner domain. This is consistent with assuming that the inner domain effect is tied to phases, which occur word-internally only in verbs, but not with the assumption that stems identify a morphological constituent that across categories excludes inflectional suffixes.

(39) a. *Kipsigis adjective*
/mʊgʊl-[eː]n/ → mugulɛːn
round-PL

b. *Kipsigis participle*
/jaːt-aːt-[iː]n/ → jɑːtɑːtiːn
open-PTCP-PL

In the case of Kipsigis, there is independent evidence from suppletion which also points towards the adjectival plural marker *-eːn* being in the same domain as the root. The adjective *oː* 'big' is suppletive in the presence of the plural marker: *eːtʃ-eːn* 'big(pl)'. There are competing views on the locality domain for suppletion, but at least some proposals (e.g. Bobaljik 2012) make reference to the idea that the trigger and target must be in the same cyclic domain.

The Chukchi noun and Kipsigis adjective data present, on the face of it, a challenge to the empirical claim that there are no dominant high affixes. The apparent challenge is resolved under the hypothesis we have maintained throughout, namely that "high" in the relevant sense is defined relative to a designated domain boundary—the phase. Assuming that there is no intermediate phase head similar to Aspect in the nominal and adjectival domain would explain the Kipsigis and Chukchi data above, and has precedents in the literature on noun-verb asymmetries in the phonology (e.g. Bobaljik 2008; Smith 2011; Hyman 2019). More broadly, it allows us to be consistent with an approach that treats observed phonological asymmetries among categories in terms of a prior difference in cyclic structure, and without direct reference to syntactic categories in phonological rules, preserving a type of modularity (d'Alessandro and Scheer 2015; Newell and Sailor pear). At the same time, the examples considered appear to present a challenge to a program to understand the observed differences in terms of stems, as in the specific Stratal OT proposal put forward by Kiparsky.

Going further, the hypothesis that there is a phase boundary in verbs but not in nouns raises an interesting question about cross-categorial derivations such as deverbal nominalizations (possibly including the participles discussed above). Since our theory does not refer to categories directly, we predict that nominalizations that embed only the lower, phase-internal verbal projections should be noun-like, that is, consisting of a single domain in which even the outermost affixes may be dominant. This is borne out by the available data. In Chukchi, deverbal nominalizations may embed Aktionsart suffixes (i.e., "lexical aspect"—importantly distinct from the viewpoint Aspect that defines the phase), and when they do, they behave as a single domain for vowel harmony. Nominalizing affixes, outside of these Aktinosart suffixes, may be dominant and will change the vowels of the root and internal affixes. Example (40) illustrates

this point with nominalizer -ɣərɣ in combination with the iterative suffix (40a) and the verbal collectivizer (40b).[32]

(40) a. /wʔi-tku-ɣərɣ-n/ → wʔe-tko-ɣərɣ-ə-n
die-ITER-NMLZ-ABS
'death' (Dunn 1999: 145)

b. /wič-rʔu-ɣərɣ-jŋ-n/ → weč-ə-rʔo-ɣərɣ-ə-jŋ-ə-n
worry-COLL-NMLZ-AUG-ABS
'one who worries' (Dunn 1999: 364)

The following example makes the same point with the stem-formative *-ew-* followed by the (passive) participial suffix *-jo-*. If the participle is treated as nominal, and the verbalizer as little $v$ (see above), then this reinforces the conclusion above that the stem-forming categorizer $v$ is not in and of itself a phase-domain defining head: dominant suffixes may occur outside it.

(41) a. /rə-ɣnu-w-jo/ → rə-ɣno-w-jo
CAUS-remain-VB-PPRT
'(the) remaining (one)' (the one left behind)' (Dunn 1999: 310)

b. rə-ɣnu-w-ninet
CAUS-remain-VB-3SG>3PL
'(he) left (them)' (Dunn 1999: 375)

Like the examples considered in section 5.2.1, these show that the inner domain is not closed off by the first suffix. The examples also indicate that the domain (phase) is not simply the highest verbal (extended) projection in the derivation (see discussion in Bobaljik and Wurmbrand 2013). Under such an approach, one might consider that the iterative lexical Aktionsart head in (40a) might introduce a phase in nominalizations (even though it does not in verbs), since it is the highest head of the verbal part of the projection. But the facts do not bear this out and are instead consistent with the approach that heads that do not introduce phases as part of the verbal extended projection also do not do so when the extended projection is truncated, as when it is embedded under the nominalizer.

In principle, we would predict that syntactically larger nominalizations that contain a (verbal) phase boundary, if such are possible, should be verb-like: phase-external affixes should not be dominant. Here, Chukchi is uninformative. While verbs with Aktionsart (lexical aspect) suffixes can be nominalized, grammatical/viewpoints aspect affixes and inflectional affixes do not appear in nominalizations in the sources we have consulted.

## 5.3 Interim Summary

This completes our main arguments: we hope to have shown in the first place that a cyclic (domain-based) account provides a more comprehensive account of the limitations on the distribution of dominant affixes in BiDR harmony systems than a

[32] Dunn does not give the root for 'worry' on its own, but it is assumed to be underlyingly recessive and opccurs as such (*vič-*) in Tal'pygyrgina and Pupynina (2017)

prefix-suffix asymmetry does. On this point, our results converge with Kiparsky (2023) from a different empirical domain. But we diverge from Kiparsky in how the inner domain is defined: we argue (albeit somewhat tentatively) that the evidence leans in favour of a syntactic identification of the inner domain–the phase, particularly as identified in Fenger (2020)–the border, in verbs, between (lexical) aspect and tense, and not, as in Kiparsky's approach, the stem. Kiparsky provides two ways of identifying stems: addition of the first affix to the root (in verbs) and the ability of a root to stand free (for noun-verb asymmetries). Both of these make the wrong predictions in the languages we have investigated, whereas positing a domain boundary between aspect and tense in verbs, and no boundary in nouns, consistent with independent proposals in the syntactic literature, makes the right cut.

# 6 Dominant high affixes after all?

At this point we turn to various claims in the literature for dominant prefixes and/or dominant high-affixes. Note that thus far, describing a morpheme (or vowel) as dominant has meant two things: on the one hand a particular, marked value of a binary contrast (such as [+ATR]) and on the other, a particular behaviour: effecting a change on neighbouring vowels. In the examples to be considered below, these properties diverge. In section 6.1, we look at examples that have been offered of (high) prefixes with a dominant value (i.e., [+ATR]) but which fail to show consistent dominant behaviour. In section 6.2, we look at examples of apparent high suffixes which show dominant behaviour but which exceptionally have the ATR value which is not the normally dominant one in the systems in which they occur (these are cases of "dominance reversal" in Baković 2000). We have found no clear examples in BiDR harmony systems of affixes that are high by our syntactic criteria and which are dominant both in terms of feature value and behaviour.

High affixes that are underlyingly [+ATR] in a system where that is the dominant value are partciularly interesting since they bear on a subtle distinction between two implementations of cyclicity: one relying on Ident-ID (or Ident-Stem) to ensure that values fixed on the first cycle cannot be subsequently overwritten, and an older derivational approach appealing to underspecification (i.e., of recessive vowels), under which a default feature-filling rule at the end of the first cycle (and a ban on feature-changing) will have essentially the same effect. We discuss these in section 6.1, noting that the predicted differences are clear, but that there are conflicting empirical claims.

Regarding dominance reversals, principally in Eastern Nilotic, we present a brief summary of the facts, but note in addition that the systems are independently not straightforward BiDR harmony systems, and so, while accounting for them is clearly within the remit of a typology of vowel harmony, they fall outside the narrow scope of the focus of this paper.

## 6.1 Dominant value, recessive behaviour

We have presented our model of Cyclic (domain-based) Spell-Out using a version of Stratal OT, but argued that the inner domain should be the first (syntactic) phase, rather than the (morpho-phonological) stem. An alternative, derivational approach,

could assume that BiDR systems arise via underspecification: dominant vowels are underlyingly specified as [+ATR], while recessive vowels are underlyingly unspecified [_ATR]. On the first cycle, if there is at least one instance of [+ATR], it spreads (in both directions) and fills in underspecified representations. There are many proposals to understand vowel harmony as a feature-filling operation in these terms (for Kalenjin see Lodge 1995, and for differing implementations which nevertheless share the intuition of a representational asymmetry in which recessive vowels lack a value that dominant vowels can provide, see Halle and Vergnaud 1981; Nevins 2010). To account for the cyclicity effect, one could assume that there is a default feature-filling rule at the end of the first cycle, whereby all remaining instances of [_ATR] are specified as [−ATR]: if there is no instance of [+ATR] in a given word on the first cycle, all vowels will be [−ATR] by default. If harmony in BiDR systems is feature-filling, but not feature-changing, this will have the same effects for the BiDR systems we have considered as the Stratal OT approach: internal to the first cycle, underlyingly unspecificed vowels will harmonize, but at the end of the first cycle, ATR-values will be set as either + or − and will not be subsequently changed. For the effects discussed so far IDENT-ID (or IDENT-STEM) is effectively the constraint-based analogue of a ban on feature-changing (IDENT) applying after a default feature-filling operation fixes values on the first cycle.

But the two approaches might differ in the predictions they make about the fate of underlyingly dominant affixes in the higher cycle. In the cyclic OT approach, as we have seen, if a vowel in the higher domain had an underlyingly dominant *value* (for example [+ATR]), it would nevertheless show recessive *behaviour*: all else being equal, the ranking of IDENT-ID over MAX[+ATR] will ensure that the underlying ATR value of affixes in the outer domain will harmonize to the value of the stem. As a matter of observation, high affixes will thus appear to always be recessive: NoDomHigh. In the underspecification+default-filling approach the predictions are less straightforward. If nothing further is said, then high affixes could have underlyingly dominant values such as [+ATR], but they would not show dominant behaviour (relative to inner vowels) because vowels on the inner domain would already have had their values set. When the inner domain has exclusively [−ATR] vowels, this would yield surface disharmonic forms. Deriving NoDomHigh requires an additional constraint against surface disharmony: high affixes with underlyingly dominant values would run afoul of this constraint. A key test case would be an affix with an underlyingly dominant vowel that could occur in either the inner or outer domain. The OT approach would predict that it shows dominant behaviour in the inner domain and recessive behaviour in the outer domain. The underspecification approach might predict that it shows dominant behaviour on the inner domain, but yields surface disharmony in the outer domain.

Interestingly, the literature as far as we can tell presents an ambivalent picture, in some cases presenting conflicting descriptions of the same language. We cannot resolve the conflict here, but present two cases to illustrate the nature of the predictions.

### 6.1.1 (Tu)Nen

Nen or Tunen (tvu, a Mbam language, Bantu, Cameroon) has been previously discussed in the context of dominant-recessive harmony, as one of a handful of apparent

examples of dominant prefixes in ATR harmony (Mous 1986; Moskal 2015; McCollum and Essegbey 2020).[33] Kiparsky (2023) presents Nen specifically as an illustration of the OT prediction of variable behaviour.

The basic pattern in Nen, as in other languages discussed above, is that [+ATR] vowels (/i,ə,o,u/) are dominant and [−ATR] vowels (/ɛ,a,ɔ,o/) are recessive.[34] In (42) the root *bil* 'oil palms' with a dominant vowel triggers harmony on the class 6 prefix, whose underlying [−ATR] form surfaces as such with the recessive root *bat* 'clothes':

(42) a. ma-bat → mabat [Class 6: /ma-/]
b. ma-bil → m$^{w}$əbil [Class 6: /ma-/]

But Nen is widely discussed for showing a contradictory pattern alongside (42). The challenge comes from nominal class prefixes which show dominant behaviour, but only when combined with one of a small number of nominal function words. Example (43) shows that the emphatic proximal demonstrative has the [+ATR] form *-tənə* when combined with the class 3 prefix, but [−ATR] vowels *-tana* when combined with the class 2 prefix. This suggests that the class 3 prefix must be underlyingly [+ATR], a dominant prefix.

(43) a. mu-tana → mutənə [Class 3: /mu-/]
b. ba-tana → batana [Class 2: /ba-/]

Both Moskal (2015) and Kiparsky (2023) analyze these facts as indicating that there is normally a domain boundary between class prefixes and lexical noun stems but that there is no such domain boundary between prefixes and function words (for Moskal this is a special instance of a general claim as part of a theory of domains). As Kiparsky presents the data, when the Class 3 prefix /mu-/ (and its plural counterpart /mi-/) combines with lexical nouns, it shows recessive behaviour, as the Stratal OT model predicts. Kiparsky (2023) illustrates with the root *-laŋ* 'story' in (44):

(44) a. [mu-[laŋ]] → molaŋ [Class 3: /mu-/]
b. [mi-[laŋ]] → melaŋ [Class 4: /mi-/]

The pair in (45) (Boyd 2015: 28) shows the contrasting realizations of the Class 3 prefix with a [+ATR] nominal root *-lə́$^{n}$dù* 'tendril' versus a [−ATR] root *-líŋí* 'tail' (from a variety in which the [−ATR] counterpart of [u] is [ʊ]).

(45) a. [mù-[lə́$^{n}$dù]] → mùlə́$^{n}$dù [Class 3: /mù-/]
b. [mù-[líŋí]] → mʊ̀líŋí [Class 3: /mù-/]

If the special case of the function words did not exist, we would never know that the Class 3 (and plural 4) prefixes are underlyingly [+ATR], since the behaviour with open class nouns in (44) is indistinguishable from what would be expected from underlying [−ATR] /mo-/. Yet this variable behaviour depending (by hypothesis) on whether

[33] Other languages with similar patterns include Tuki, KiBudu, and Kinande (Moskal 2015, McCollum and Essegbey 2020: 18). In her discussion of these patterns, Moskal (2015: 224-235) questions whether the exponents of the class prefixes in KiBudu are the same in lexical nouns and function words.

[34] Numerous additional complexities arise, including interaction with rounding harmony, apparent surface neutralizations of underlying contrasts (note that [o] appears both as [+ATR] and [−ATR]), and differences in the vowel inventories across varieties. The most comprehensive treatment we are aware of is Boyd (2015).

the prefix is or is not in the same domain as the element with which it combines, is precisely the behaviour expected on the Stratal OT approach.[35]

### 6.1.2 Eastern Nilotic I: The Maasai opaque prefix

According to the description in Baković (2000: 232-236), citing Levergood (1984), Maasai has one prefix that comes closer to what the underspecification analysis predicts. This is the 3SG prefix /e-/. When the prefix occurs with Class 1 verbs, its ATR value is controlled by the stem, just as the Stratal OT, and Baković's earlier cyclic model, predict. But when the 3SG prefix occurs with Class II verbs, which have a semantically empty class marking prefix before the verb root, the vowel is reported to be opaque. The following examples are relevant:

(46) a. /e-ɪ-tiŋ/ → eitiŋ
3SG-CL2-end 'he/she ends'

b. /e-ɪ-dɪp/ → eɪdɪp
3SG-CL2-finish 'he/she finishes'

c. /nɛ-m-e-ɪ-rrɑg/ → nemeɪrrɑg
FUT-NEG-3SG-CL2-lie.down 'he/she will not lie down'

When the prefix combines with a dominant root (stem), as in (46a), it surfaces as [+ATR] [e-], which is of course uninformative. What is interesting is that it retains its [+ATR] value when it combines with recessive stems as in (46b-c), yielding disharmonic words. Furthermore, this [e-] is not merely opaque to harmony, but it spreads its [+ATR] vaue to more peripheral prefixes, if any, that are underlyingly [−ATR], such as the future /nɛ/ in (46c). This characterization aligns with the predictions of underspecification-based account: the underlyingly dominant value of the prefix cannot show dominant behaviour with respect to elements in the Inner Domain (root and verb class prefix) but in its own higher domain it retains both its dominant value and dominant behaviour.

Although this looks like a potential reason to rehabilitate underspecification-based accounts (or their equivalents) we note that Quinn-Wriedt (2013) devotes a chapter to this prefix and contends on the basis of phonetic evidence that it has been misdescribed. Specifically, Quinn-Wriedt suggests that the proximity to the Class II prefix [ɪ] triggers an anticipatory lowering of the F1 of the [e-] prefix in Class II (as compared

[35] For the record, we note that Moskal (2015: 220-224) makes the opposite claim about Nen, namely that the combination of Class 3 /mu-/ and a [−ATR] lexical noun results in a surface disharmonic form, as would be predicted by the underspecification account. In support of this, Moskal cites the following from Dugast (1971: 69), which shows the opposite behaviour from (45b):

(1) mu-and → muand [Class 3: /mu-/]

While the form is interesting, it is anomalous within Dugast's data. Dugast (1971: 68-69) gives 39 singular:plural pairs with these class 3-4 prefixes, roughly evenly split across [−ATR] and [+ATR] variants. Of 21 stems with [−ATR], only two, both vowel-initial and thus showing hiatus, show the pattern in (1)–all others have the [−ATR] variants of the prefixes (*mo-, me-*). Authors subsequent to Dugast (1971) consistently report that Class 3-4 prefixes behave as recessive with lexical nouns and harmonize to the noun root, both for the variety studied by Dugast, in which the [−ATR] counterpart to /u/ is [o] (Mous 1986) and for the variety in which it is [ʊ] (Boyd 2015: 28), with examples showing the prefix vowel alternating, as in (44) and (45).

to Class I) and suggests that this has been misanalyzed as [+ATR]. This interpretation is further supported by a (marginal) difference in F1 vaues for this prefix before [+ATR] and [−ATR] roots suggesting that it is undergoing ATR harmony after all. Quinn-Wriedt found in addition no statistically significant difference in the F1 values for the negative prefix seen in (46c), preceding the 3SG prefix in Class I and Class II verbs, whereas there should have been a difference if the the prefix was undergoing ATR harmony conditioned by a consistently [+ATR] 3SG prefix in class II (but not Class I) verbs, independent of the root.

In sum, we have seen in this section that in principle, two families of implementations of a cyclic account of NoDomHigh (or NoDomPref) should be distinguishable in terms of what they predict about the fate of a high affix with an underlyingly dominant value. Relevant examples have been discussed in the literature, but in the cases we know of, there is some degree of uncertainty about the facts. On balance, the evidence as we currently understand it, seems to tip in the direction that such vowels might exist, detectable in their variable behaviour in and out of the Inner Domain, and that they appear to show dominant behaviour in the inner domain, but switch to recessive, rather than opaque, behaviour in the outer domain.

## 6.2 Eastern Nilotic II: Dominant behaviour, recessive value

Having discussed cases of high affixes that have a dominant value [+ATR], but recessive behaviour, we now move on to examples of high affixes that exhibit dominant behaviour, but do so in the usually recessive value, i.e., [−ATR]. The clearest examples of such affixes come from the Eastern Nilotic languages Turkana and Karimojong.[36]

In both of these languages, peripheral affixes can be dominant in the sense of being able to determine the [ATR] value of vowels in the rest of the word. For example, in the Turkana example in (47b), the subjunctive marker *rɛ*, which has a [−ATR] vowel, causes the otherwise [+ATR] vowel of the root *rem* 'to spear' to become [−ATR]; example (47a) shows that the root is underlyingly [+ATR], since the prefixes appear as [+ATR]. Subjunctive being a mood marker, we expect this morpheme to realize a high syntactic head, and its dominant behaviour is thus unexpected.[37]

(47) a. a-ki-rem 'to spear'
b. ɛ-rɛm-ɛ-**rɛ** 'why is it speared' (Noske 2000: p.780)[38]

A similar picture emerges in Karimojong, where Lesley-Neuman (2007: p.33) writes that "the TAM marker which is at the right edge of the verb" is often dominant. An example is given in (48) below, where the last (+ATR) suffix is what determines the [ATR] value of the word according to Lesley-Neuman (2007).

(48) ɛ-to-dóŋ-ɑn-ɑkín-**jò**
AGR-CAUS-pinch-FREQ-DAT-**PASS.PRS.AGR** (adapted from Lesley-Neuman 2007: p.16)

[36] Maasai, which belongs to the same family and was discussed in the previous section, does not have such affixes.
[37] Noske (2000) uses this type of Turkana data to argue that FAITHSUFFIX may be ranked higher than FAITHSTEM in some languages.
[38] Noske (2000) does not provide glosses, but explains in footnote 6, p.780 that *rɛ* is a subjunctive marker.

These data from Turkana and Karimojong indicate that syntactically high affixes can indeed trigger harmony in certain cases.[39] What is interesting, however, is that these affixes will spread their [ATR] value irrespective of whether it is [+ATR] or [−ATR], which is quite unusual. While we do not have an explanation for these facts, we believe that they indicate that these harmony systems are fundamentally different from dominant-recessive systems of the Kipsigis or Chukchi type. Indeed, Lesley-Neuman (2012) convincingly shows that affixes in Karimojong belong to three strata: she argues that harmony is root-controlled in the first stratum, while it is dominant-recessive in the second stratum; affixes in the third stratum are outside the harmony domain. Note, however, that in Lesley-Neuman's classification, no dominant (in the second stratum) suffix is ever followed by a harmonizing suffix. This means that we only have evidence that these suffixes cause affixes (including the root) to their left to harmonize, but we cannot know whether they would affect suffixes to their right. It is, thus, impossible to know whether what we see is bidirectional dominant-recessive harmony or just a special type of regressive harmony.

## 6.3 Affixes with variable behaviour II: Nez Perce

Finally, we consider one further case of an apparent dominant high affix that has been mentioned in the literature. Nez Perce (nez, Sahaptian) is one of the first important cases of an apparent BiDR system discussed in the vowel harmony literature (Aoki 1966; Hall and Hall 1980). As mentioned above, it has figured in the discussion of whether there are dominant high affixes. Hall and Hall (1980) argue that despite claims in (Aoki 1966), it lacks true dominant prefixes (apparent prefixes are compound roots). Turning to the suffixes, Crook (1999: 253) states that only one inflectional suffix is dominant, namely the past tense marker which appears as *-qa* (recent past) and *-o'qa* (conditional). Examples (49a) and (49b) show this suffix's dominant behaviour.

(49) a. kuu-see-qa → kosaaqa
go-INC-REC.PST
'I just went' (Crook 1999: 248)

b. 'e-cilúu-o'qa → 'acilóoyo'qa
3-boil-COND.PST
'I could have boiled it' (Crook 1999: 248)

Example (49a) appears problematic for both our approach (Tense is high and should not be dominant) and for Kiparsky's (it is not the first suffix and therefore should be outside of the stem). However, the facts are even more complicated. In presenting these examples, Crook notes that the past tense suffix is dominant when it co-occurs with either the incompletive aspect marker or with the 3SG object marker (49b), but when both of these co-occur, the past tense marker ceases to show dominant behaviour, and the surface form is disharmonic (50):

[39] While this is quite clear for Turkana, the status of the peripheral suffixes is more complicated in Karimojong. As seen in the gloss in (48), those affixes are fusional, expressing (high) TAM and agreement information, but also voice distinctions, which are arguably low in the structure. Whether these affixes will count as "low" or "high" will depend on how fusional morphology should be analyzed. We leave the analysis of such morphemes and the implications for our theory as a topic for further research.

(50) 'e-nméekuni-see-qa → 'enméekuniseeqa
3-see.approach-INC-REC.PST
'I recently saw him approaching' (Crook 1999: 248)

This variable behaviour is not expected on any of the approaches, but Crook (1999) does not provide further examples which delineate when *-qa* does and does not display dominant behaviour. Moreover, Crook (1999: 253) states that "the harmonizing alternations that still obtain [with *-qa*] are just those for the most common words like 'go' and 'boil'. Otherwise, speakers use [disharmonic forms like (50)]". In light of this, we are not in a position to speculate on the proper analysis of Nez Perce past, other than to note that it does not constitute a straightforward counter-example to the NoDomHigh generalization.

# 7 Conclusions

In this paper, we have revisited the NoDomPref generalization of Hall et al. (1974) and much subsequent work and argued that it is better seen as a special case of a structural, not a linear, generalization: NoDomHigh. We offered empirical and distributional arguments that NoDomHigh is a stronger generalization in that it covers the distribution of dominant vowels in suffixes as well as prefixes, and that there may in fact be a small number of dominant prefixes, but they are all low, as predicted by NoDomHigh, but contrary to NoDomPref. In addition to providing better empirical coverage, we have argued that NoDomHigh is to be preferred in that it can in turn be explained as a function of cyclycity, in a way that NoDomPref cannot. Existing accounts of NoDomPref are not explanatory in the sense that they could be reversed and the same theoretical devices could be used to characterize a counter-factual mirror-image generalization (NoDomSuf). A cyclic account explains instead why if there is a constraint, it must be NoDomHigh – the mirror image NoDomLow would be unstatable. In proposing an account in terms of cyclic domains, our account of NoDomHigh converges in many respects with the account of directionality reversals in other vowel harmony systems in Kiparsky (2023). We part ways with Kiparsky however in that we argue that the first cyclic domain is defined in morpho-syntactic (rather than morpho-phonological) terms: the phase, i.e., a constituent that includes the verb root and affixes up to and including viewpoint aspect. In this, our account contributes to ongoing debates about the nature of cyclicity across syntax, morphology and phonology, joining with the growing body of literature that sees a cyclic model of Spell-Out relating key syntactic domains to those implicated in cyclic phonology (see Marvin 2003; Newell 2008; Crippen 2019; Fenger 2020; Guekguezian 2021, among others).

In order to keep this project manageable, we have circumscribed the domain of inquiry to focus primarily on BiDR vowel harmony systems. We do not argue for a general ban on phonological operations targeting material in a low domain when the trigger is introduced in a high domain, nor do we claim that our theory is a general theory of prefix-suffix asymmetries. To be sure, many issues arise as one broadens the scope of inquiry even a little bit to encompass other types of vowel harmony system. We have identified some of those issues in the final sections of this paper. While we have not solved these other issues, we see our contribution here as the first phase of a

larger research program, for which we might claim that the generalization NoDomHigh can be taken as having been established, and hopefully thus not to be revised on subsequent phases.

**Acknowledgments.** For helpful comments, questions, and suggestions, we thank audiences at Universität Leipzig, Harvard University, Masaryk University, WCCFL 40, IMM 20, UConn, and Penn State University, and especially Paul Kiparsky and Heather Newell. We are grateful to our Kipsigis speakers Enock Kirui, Wesley Kirui, Hillary Mosonik, and Donald Mutai for their valuable work as linguistic consultants. Maria Kouneli's work was funded in part by DFG grant 439622645 for project *Layers of morphosyntactic number in Eastern Sudanic*, part of the Research Unit *Cyclic Optimization*.

# Appendix A Kiparsky 2023: Ident-Stem redux

For completeness, we elaborate briefly on how the cyclic interpretation of IDENT-INNERDOMAIN[F] that we have made use of (following Baković 2000) might differ from the version presented in Kiparsky (2023), and why we have chosen the serial implementation.

Kiparsky presents it as an advantage of his model that it avoids the Majority Rules problem (Baković 2000): An underlying disharmonic sequence *[+F][−F] could in principle be resolved either way, changing both values to + or both values to −. If elements with the two values are unequally distributed in a given UR, then resolution should be to whichever value is in the majority, since that candidate will incur fewer IDENT[F] violations. Kiparsky presents MAX$\mu$F (Max marked value of F) as in part a means to avoid this problem: when MAX$\mu$F outranks IDENT[F] (or other faithfulness constraints), counting violations of IDENT[F] is irrelevant—a single dominant (i.e., [$\mu$F]) segment will be sufficient to force all others to harmonize to [$\mu$F]. We saw this in the Warlpiri tableau in (22) in which underling *kiji-rnu* becomes surface *kuju-rnu*: the single round vowel is sufficient to ensure the harmonic form with all round vowels wins. If [Ident[F]] outranked MAX$\mu$F, the majority rules effect would arise.

But the key to the cyclic domain effects (Kiparsky's directionality reversals) is the ranking of IDENT-STEM[F] above MAX$\mu$F. This ensures that dominant vowels that are outside of the stem will be unable to influence the stem vowels—the effects of MAX$\mu$F are neutralized outside of the stem. As far as we can see, though, Kiparsky's implementation of IDENT-STEM[F] in this way has the potential to reintroduce the Majority Rules problem: since IDENT-STEM[F] unlike IDENT[F] *is* ranked above MAX$\mu$F, counting violations of IDENT-STEM[F] will matter. To see this, consider (51) which repeats the tableau from (22) above, but with the interpretation of IDENT-STEM[F] as a type of positional faithfulness (Beckman 1997), rather than ours. Under Kiparsky's interpretation, so far as we can tell, IDENT-STEM[RND] incorrectly selects (💣) the candidate with the fewest IDENT-STEM[RND] violations and prevents the evaluation from considering MAX[+RND] which would have favoured the correct output (☹).[40]

[40]This is Kiparsky's tableau (16), but Kiparsky gives only one ID-Stem[Rnd] violation in the c. line, asserting that as a consequence "MAX[+RND] acts as a tie-breaker." This works only if IDENT is categorical—either the stem is identical to the UR or it isn't and the number of violations is not counted—but this in turn seems to be at odds with the earlier discussion in the paper where it is noted that comparing the

(51)

| [/kiji-rnu/]$_{Stem}$ | * [−Rnd +Hi] [+Rnd +Hi] | ID-Stem[Rnd] | Max[+Rnd] | Max[Rnd] |
|---|---|---|---|---|
| a. kiji-rnu | *! | | | |
| 💣 b. kiji-rni | | * | * | * |
| ☹ c. kuju-rnu | | **! | | ** |

On our interpretation, Ident-Stem[Rnd] is inactive/undefined and thus unviolated on the stem cycle and Max[+Rnd] applies as it is supposed to, outranking other faithfulness constraints and thereby enforcing resolution of harmony for all mixed URs to dominant outputs. On the secnd and subsequent cycles, no Majority Rules problem arises, since Ident-Stem[Rnd] enforces stem-controled harmony, whatever value the stem vowels have. We take it then that our interpretation, which seems to us to most closely implement the fundamental idea that the output of one cycle is the input to the next, is the interpretation that the framework suggests.

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number of Ident violations is what leads to the Majority Rules problem that Max[+Rnd] is intended to circumvent: simply not letting constraints count violations (McCarthy 2003) would also have avoided Majority Rules—the problem is only to be considered in the first place if Ident violations are gradient, as are other constraints in Kiparsky's paper.

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