

The Disambiguating Effects of Phonological Exceptions in Grammar

Katherine Hout

University of California San Diego

1 Introduction

In this paper, I demonstrate that constraint indexation theories of exceptionality explicitly predicts that morphophonological exceptions are constrained by the grammar. Furthermore, I demonstrate that exceptions can themselves serve as a constraint on the grammar by forcing the determination of rankings between otherwise unordered constraints. Constraint indexation predicts that the existence of one exceptional pattern will predict (or rule out) the existence of another in the same domain; furthermore, the existence of one exceptional pattern can also rule out (or predict) regular patterns in that domain as well.

I examine these predictions in light of two case studies of exceptions to the expected outputs of regular hiatus resolution processes in Mushunguli (Somali Chizigula; ISO [xma]), an understudied, endangered Bantu language spoken by an ethnic minority within the Somali diaspora. These include a set of high vowel-initial stems that fail to undergo coalescence (Hout, 2015, 2017) as well as a set of lexical items that exceptionally undergo postlexical palatalization as an alternative to postlexical glide deletion, a rarely attested subtype of exceptional blocking which I refer to here as *walljumping*. I show that despite belonging to different lexical categories and phonological contexts, these exceptional patterns are interrelated, suggesting that exceptions are connected within the grammar. This supports and greatly strengthens earlier observations made by Ito & Mester (1995) regarding the ability for loanwords belonging to different lexical strata to determine rankings between otherwise unranked markedness constraints by transitivity.

2 Grammaticality of exceptions

Idiosyncratic lexical items (hereafter referred to as “exceptions”) have historically been problematic for many generative theories of linguistics, as existence of multiple competing patterns for structurally similar forms challenges the assumption that the grammar is fundamentally systematic. This is especially true for parallel frameworks like Optimality Theory and its descendants. This is because critical assumptions that (unmodified) OT frameworks rely on—in particular fixed rankings between constraints, surface orientedness, and lack of derivational stages—are incompatible with the contradictory information introduced by exceptional forms.¹

There have been a great many proposed solutions to this problem, and each new theoretical device introduced to handle exceptions brings with it an inherent set of assumptions regarding the degree to which exceptions can affect the grammar. These assumptions range from the extreme view that exceptions are simply memorized lexical items with no required relationship to the grammar whatsoever (more commonly found in syntax and morphology), to the perhaps over-privileging of exceptions, as seen in some forms of representational solutions to exceptionality (see Hout & Baković (resubmitted) for some discussion on this point). Most phonological theories typically take an intermediate stance: exceptions are constrained by the

* I would like to thank Eric Baković, Sharon Rose, Dave Odden, Michal Temkin Martinez, the members of UCSD PhonCo and LFWG, and audiences at LSA 2018 and AMP 2018 for their feedback on earlier iterations of this work. I would also like to thank Anna Mai and Matt Zaslansky for TeX support. Finally, I would like to thank my language consultant, Mohamed Ramedhan, without whose assistance and patience none of this would be possible. Any errors are mine and mine alone.

¹ This issue is spiritually similar to the problem of opacity, and indeed, Baković (2011) describes “rule exceptions” (which are specifically non-undergoing exceptions) as examples of non-surface-true opacity. However, while exceptions are generally opaque, it is not the case that all attested cases of opacity in the world’s languages are also cases of exceptionality.

grammar, but cannot substantively affect it in any *meaningful* way.

However, as I demonstrate in the following sections, a fact which has been mostly overlooked (or at least not seriously considered) within one class of non-representational solutions to exceptionality is that exceptions are predicted to both be constrained *by* and to serve as a constraint *on* the grammar. These frameworks, which include lexical stratification (Ito & Mester, 1995, 2001) and constraint indexation (Fukazawa, 1999; Pater, 2000, 2010; Finley, 2010; *inter alia*), share the following characteristics: they assume the existence of constraints that encode lexical as well as phonological information, and they assume that said constraints exist as part of a single unified grammar (as opposed to multiple cogrammars, c.f. Orgun (1996); Anttila (2002); Inkelas & Zoll (2005)). These assumptions lead to two broad classes of predictions. First, they predict the existence of more complicated exceptional patterns than the commonly-assumed four-way typology of (non-)undergoers and (non-)triggers (Kisseberth, 1970; Pater, 2010; Finley, 2010). Second, they predict that under the right circumstances, exceptions themselves can determine rankings. This latter ability was first noted by Ito & Mester (1995), who in their stratified model of loanword adaptation in Japanese observed that the interleaving of stratum-sensitive faithfulness constraints among otherwise unranked markedness constraints resulted in the determination of those rankings. In this case, these rankings were determined via transitivity; moreover, the markedness constraints in the Japanese case generally do not make conflicting demands on the set of candidate outputs, making them loosely related at best. This makes it difficult to investigate the consequences of the determined rankings, and so it is unclear whether the “disambiguating” effect is truly informative or simply an inert byproduct of the model. As will be discussed in the following sections, the Mushunguli case at hand will provide more compelling evidence for the ability of exceptions to require specific rankings between general constraints that would otherwise go unspecified. In particular, it will demonstrate that this is a beneficial prediction which allows for an analysis of the language that unifies exceptional patterns with regular ones.

3 Compositional exceptions

The theory being adopted in this paper is the locality-restricted lexical indexation model in Optimality Theory proposed in Pater (2010). In this model, (exceptional) morphemes are indexed to a clone of an existing constraint in the grammar, which is typically ranked somewhere above its counterpart. Indexed constraints are subject to a locality condition, which requires that indexed constraints can only be violated if said violation contains a portion of the indexed morpheme. Exceptions are subject to both the indexed and unindexed versions of the constraint (forming an entailment relationship), while regular lexical items are only visible to the regular constraint.

One goal of Pater’s proposal is to minimally capture the descriptive typology laid out in Kisseberth (1970:57): exceptions are lexical items which are marked as “either undergoing a rule or not, and either serving as the context for a rule or not.” This typology was reframed as exceptional (non-)undergoing and (non-)triggering in Finley (2010), and I adopt this terminology here.

While the four-way typology is descriptively adequate for the discussion of most commonly-attested patterns in the exceptionality literature, it is an oversimplification both in terms of attested cross-linguistic patterns of exceptionality and the full extent of predictions made by indexation theories. One major area of interest that has received little attention are the predicted patterns of exceptions in conspiracies; more specifically, situations where a complex markedness constraint is satisfied by multiple licit repairs. Under these circumstances, multiply-exceptional forms (exceptions to more than one applicable repair) and *compositional* exceptions (exceptions that combine the descriptive categories, e.g. non-undergoers/triggers) are predicted to exist, even when only a single constraint is indexed.²

This can be illustrated using a hypothetical case of hiatus resolution. Imagine a language that productively deletes the first vowel in a sequence of two adjacent heterosyllabic vowels at morpheme boundaries. The general schema for this is $M \gg F$, which in this case involves a hiatus resolution-driving markedness constraint

² Pater’s discussion of Yine includes a multiply exceptional form (a suffix that unexpectedly fails to undergo *and* trigger syncope), which he handles by indexing multiple constraints to both exceptional and non-exceptional morphemes. There is a similar set of exceptions in Mushunguli which exceptionally fail to participate in hiatus resolution whatsoever; these can be analyzed without appealing to multiple indices or indexing non-exceptional morphemes. This is discussed in more detail in Hout & Baković (resubmitted) and Hout (in prep).

(referred to here as just *V.V) and a deletion-penalizing faithfulness constraint, MAX-V.³ Let us assume that this language also has at least one prefix that exceptionally fails to undergo deletion. This exception can be captured under lexical indexation by cloning MAX-V and ranking the clone (MAX-V^L) over *V.V, which generates deletion in regular cases and unrepaired hiatus in exceptional cases.

(1) Regular deletion

	V ₁ +V ₂	MAX-V ^L	*V.V	MAX-V
a.	V ₁ .V ₂		*!	
b.	∅ ₁ V ₂			*

(2) Exceptional blocking of deletion

	V ₁ ^L +V ₂	MAX-V ^L	*V.V	MAX-V
a.	V ₁ ^L .V ₂		*	
b.	∅ ₁ ^L V ₂	*!		*

It is well-established that many languages instantiate more than one hiatus repair in different morphophonological contexts (Casali, 1997, 2011; Rosenthal, 1997); that is, hiatus resolution is often properly viewed as a conspiracy. It is also the case that there are no languages that exhibit *every* attested hiatus resolution pattern, which means that these candidates must be ruled out. For our hypothetical scenario, we will only consider one such alternative solution: consonant epenthesis, which violates DEP-C. We will assume that in our current example language, epenthesis never occurs, and thus the minimal ranking to successfully generate the regular deletion pattern is {*V.V, DEP-C} » MAX-V (schematically: {M,C} » F).

If there are no examples of productive epenthesis anywhere in the language, then provided that *V.V (M) and DEP-C (C) both dominate MAX-V (F), the indeterminate ranking between them is unproblematic and is in fact assumed to be required. However, it turns out that an indeterminate ranking cannot persist if exceptions exist in the language. This is because the cloning and promotion of the lower-ranked faithfulness constraint requires one of the higher-ranked constraints be promoted above the other; otherwise, in exceptional cases, no winner can be chosen. This is illustrated below in (3).

(3) No winner

	V ₁ ^L +V ₂	MAX-V ^L	*V.V	DEP-C	MAX-V
a.	V ₁ ^L .V ₂		*		
b.	∅ ₁ ^L V ₂	*!			*
c.	V ₁ ^L CV ₂			*	

For our current hypothetical scenario, promotion of either M or C to undominated status results in two possible languages. If we promote C, the result will be unrepaired hiatus, the same as (2). This scenario, which we will refer to as *simple blocking*, is illustrated in (4).

(4) Simple blocking

	V ₁ ^L +V ₂	MAX-V ^L	DEP-C	*V.V	MAX-V
a.	V ₁ ^L .V ₂			*	
b.	∅ ₁ ^L V ₂	*!			*
c.	V ₁ ^L CV ₂		*!		

³ For simplicity, we assume that V₁ is deleted by default, as invoking positional constraints (e.g. Casali, 1997) is an unnecessary complication that will not have a significant effect on the outcome.

The promotion of M, however, results in an exceptional pattern that falls outside of the four-way typology. An undominated M must be satisfied by any means necessary, and if C is not undominated, a means exists. In this case, when deletion is blocked, epenthesis occurs as an *alternative*. This scenario, which will we refer to as *walljumping*, is illustrated in (5).⁴

(5) Walljumping

	$V_1^L+V_2$	$MAX-V^L$	*V.V	DEP-C	MAX-V
a.	$V_1^L.V_2$		*		
b.	$\emptyset_1^L.V_2$	*!			*
c.	$V_1^L.CV_2$			*	

The existence of these two types of blocking belies a general truth about constraint indexation: although indexed constraints are only violable by indexed morphemes, the fact that they require a fully-determined ranking to function means that the mere presence of an exception can have an impact on the entire grammar. This forced determination has two consequences: first, the presence of one type of exception will necessarily predict the possibility or impossibility of others. For example, if we have a simple blocking exception that requires the regular ranking $C \gg M \gg F$, we predict that we will *never* see a walljumping exception in the same context.

Second, while regular lexical items are not subject to any indexed constraints, they *are* subject to rankings determined by the introduction of indexed constraints to the grammar. This means that the existence of an exception can determine the possibility or impossibility of other *regular* patterns. For example, in the simple blocking scenario discussed above, the existence of a prefix that failed to resolve hiatus required DEP-C to be undominated. As such, for this language, an epenthesis candidate will *never* be able to win.

In practice, this second prediction is largely unremarkable for cases where no alternative repair was ever reasonably expected to occur; however, in the Mushunguli case study discussed over the next two sections, where alternative repairs *are* expected, this consequence becomes much more interesting.

4 Hiatus resolution in Mushunguli

Mushunguli (Somali Chizigula; Narrow Bantu G.31) is an endangered language spoken by an ethnic minority within the Somali diaspora. The language is highly agglutinating and hiatus frequently occurs at morpheme boundaries. At morpheme boundaries, there are several context-sensitive hiatus repairs that can occur; these repairs are productive, but are not exceptionless. These repairs can be subdivided into two broad categories: coalescence (Section 4.1) and glide formation (Section 4.2).

4.1 Coalescence Mushunguli exhibits three types of coalescence: high coalescence, which changes sequences of low+high vowels to a single lengthened mid vowel; mid coalescence, which changes sequences of low+mid vowels into a single lengthened mid vowel; and identity coalescence, which merges sequences of identical vowels into a single short vowel. Examples of each are given below in (6); these examples can be considered representative of the general patterns of the language. All coalescence processes are categorical and productive at morpheme boundaries, but do not occur across words (generally true for hiatus in Mushunguli).

(6) Examples of coalescence

- | | | | | | |
|----|--------------|---|----------|-----------------------------|----------|
| a. | /ka+iv+is-a/ | → | ke:vi:sa | ‘(s)he heard a lot’ | High |
| b. | /wa+e+jag-a/ | → | we:ja:ga | ‘they scratched themselves’ | Mid |
| c. | /wa+ambiz-a/ | → | wambi:za | ‘they helped’ | Identity |

In the cases of mid and identity coalescence, there are no material changes to the stem vowel. This makes it tempting to treat these cases as deletion rather than coalescence, and it is certainly the case that many descriptive and typologically-focused works do exactly this (see e.g. Casali (2011) for some discussion). However under the analysis adopted in Section 5.2, it will prove more parsimonious to treat these patterns as coalescence.

⁴ “Walljumping” is used here to evoke the sense that when the typical pathway to satisfaction is metaphorically “walled off,” the grammar finds an alternative and perhaps unexpected path past said wall.

4.2 Glide formation Prevocalic high vowels (/i/ or /u/) glide, provided that the following vowel is non-identical (in which case identity coalescence applies). Like high and mid coalescence, glide formation results in compensatory lengthening.

(7) Examples of glide formation

- | | | | | |
|----|--------------|---|------------|---------------------|
| a. | /u+edi/ | → | w̥e:di | ‘good (cl 3)’ |
| b. | /u+a+hem+a/ | → | w̥a:he:ma | ‘you are breathing’ |
| c. | /i+uz+a/ | → | ju:za | ‘it asked (cl 9)’ |
| d. | /i+ereker+a/ | → | je:reke:ra | ‘it (cl 9) floated’ |

Prevocalic high vowels in a /CV+V/ environment exhibit a slightly different pattern, which will be discussed in more detail in Section 5.3.

5 Exceptions to hiatus resolution

In this section, I describe and analyze two types of phonological exceptions in Mushunguli: stems which exceptionally block high coalescence, and a smaller set of lexical items that exceptionally undergo palatalization (an exception to glide formation). These are not the only exceptions to hiatus resolution in Mushunguli, but they are the two sets which have the most interesting implicational relationship, as under our current theoretical assumptions, analysis of the coalescence exceptions has a direct effect on the analysis of the palatalization exceptions, suggesting that both represent parts of a larger unified system.

This is interesting because there are no other obvious links between these two exceptional patterns. Glide formation and coalescence apply in different contexts, and in these two cases the exceptional behavior is local to V₁ and V₂, respectively. There is also no identifiable historical link between the two exceptional patterns: the coalescence exceptions most likely stem from historical sound change affecting root-initial consonants (Hout & Baković, resubmitted); this same historical pathway is unlikely to be the source of the palatalization exceptions, which have unclear origins.

5.1 What is an exception? It is important at this point to briefly clarify what constitutes a “phonological exception,” as the term “exception” on its own has a variety of meanings throughout the literature. Here, (phonological) exception refers to a lexical item (or items) that displays idiosyncratic and unexpected phonological behavior given its morphophonological context and phonological characteristics. Phonological exceptions are a subset of lexical class-conditioned phonological phenomena, but differ from similar phenomena (e.g. morphosyntactic classes (Smith, 2016); ideophones (Dingemanse, 2012; Shih & Inkelas, 2016), *inter alia*) in terms of *arbitrariness*. Exceptions are only distinguishable from non-exceptions by virtue of their idiosyncratic behavior, as opposed to membership in a lexical class that is distinguishable on other grounds (e.g. inflectional prefixes, nouns, proper names). While a set of phonological exceptions *can* be comprised of members of a single lexical class, their behavior will not be representative of that class as a whole. For example, if a language places lexical tone on nouns and grammatical tone on verbs, each category of tone assignment (and any relevant sandhi) may be considered class-conditioned, but is not *exceptional*. However, if a verb exhibits idiosyncratic tone sandhi *relative to other verbs*, that verb may be considered an exception.⁵

For the two exceptional patterns of current interest, in both cases, members of the exceptional sets have shared phonological characteristics, but do not form a morphologically- or syntactically-unified set.

5.2 Exceptions to high coalescence A full analysis of coalescence is outside the scope of this paper; for our current purposes, however, we only need to focus on the constraints that distinguish high coalescence from other repairs in the language.⁶ It turns out in this case that there is only one distinguishing constraint: IDENT(high), which penalizes the change of the second vowel from [+high] to [−high]. For high coalescence to occur, then, the necessary ranking is *V.V » IDENT(high).

⁵ The significance of this distinction is explored more fully in Hout (in prep); very briefly, the key difference is that there can be no exceptions to exceptions, but there can be exceptions to other forms of lexical class-conditioned phonological phenomena.

⁶ A more complete analysis is available in Hout (2015); Hout & Baković (resubmitted). The skeletal analysis presented here is adapted from the former, due to space considerations.

We avoid the application of glide formation in the high coalescence context (low+high) by assuming the existence of high-ranked constraints penalizing the formation of non-high glides from the initial low vowel, or gliding of the second, high vowel. We can also assume that deletion of the initial stem vowel (which is always V_2 in the examples under consideration) is not a possible solution, for two reasons: first, in all cases of superficial deletion, the stem vowel is preserved (e.g. /wa+edi/ → [we:di], *[wa:di] ‘good (cl 2)’). Moreover, deletion of V_2 is rarely attested outside of cases where V_2 is *not* a stem vowel (e.g. at root-suffix boundaries) (Casali, 1996, 1997).

However, there is one other possible hiatus repair that we must find a way to exclude: deletion of V_1 , which is a repair that does occur regularly in other languages in exactly this context (Casali, 1996, 1997; Rosenthal, 1997). Because we know that wholesale vowel deletion does not apply in the high coalescence context, we must minimally rank a generalized constraint penalizing deletion, $MAX-V$, somewhere above $IDENT(\text{high})$.⁷

(8) Skeletal analysis of high coalescence

	ka_1+i_2va	*V.V	$MAX-V$	$IDENT(\text{hi})$
a.	$ka_1.i_2va$	*!		
b.	$k\emptyset_1i_2va$		*!	
c.	$ke_{1,2}va$			*

The ranking in (8) is an instance of the $\{M,C\} \gg F$ schema, and indeed, we have no direct evidence from the regular grammar for the ranking of $MAX-V$ with respect to *V.V. Instead, the only evidence from the language that *requires* the determination of the ranking between *V.V and $MAX-V$ comes from a set of exceptions. There is a set of stems, all of which begin with high vowels, that fail to resolve hiatus *only* in high coalescence contexts, but otherwise behave normally. The examples in (9) illustrates the behavior of the near-minimal pair *-iv* ‘hear’ and *-it* ‘go,’ the latter of which is exceptional.

(9) /it/ vs. /iv/ (adapted from Hout (2015))

	Regular (<i>-iva</i> ‘hear’)	Exceptional (<i>-ita</i> ‘go’)
Glide Formation (/ku-/)	$k^wi:va$ ‘to hear’	$k^wi:ta$ ‘to go’
Identity Coalescence (/si-/)	$sivi:sa$ ‘I heard a lot’	$siti:sa$ ‘I went a lot’
High Coalescence (/ka-/)	$ke:va$ ‘(s)he heard’	$kai:ta$ ‘(s)he went’

Hout (2017) proposes a link between the height of the initial vowels and the failure to undergo only coalescence, and Hout (2015) proposes that this fact can be captured by linking the exceptional stems to a copy of $IDENT(\text{high})$ and ranking this constraint above *V.V. This is illustrated below in (10).

(10) Exceptional blocking of coalescence

	$ka_1+i_2t^L_a$	$IDENT(\text{hi})^L$	*V.V	$IDENT(\text{hi})$
a.	$ka_1.i_2ta$		*	
b.	$ke_{1,2}ta$	*!		*

Much like the toy example from (3), the existence of these exceptions means that the ambiguous ranking between *V.V and $MAX-V$ cannot persist. Otherwise, there will be no way to choose between leaving hiatus unresolved or deletion when coalescence is blocked:

⁷ Recall from earlier that we are assuming that stem vowel deletion is penalized by a high-ranked position-sensitive faithfulness constraint.

(11) Blocking or deletion?

$ka_1+i_2t^L a$	IDENT(hi) ^L	MAX-V	*V.V	IDENT(hi)
a. $ka_1.i_2ta$			*	
b. $ke_{1,2}ta$	*!			*
c. $k\emptyset_1i_2ta$		*		

Instead, the exceptions *require* MAX-V to be promoted:

(12) Correct analysis of exceptions to coalescence

$ka_1+i_2t^L a$	IDENT(hi) ^L	MAX-V	*V.V	IDENT(hi)
a. $ka_1.i_2ta$			*	
b. $ke_{1,2}ta$	*!			*
c. $k\emptyset_1i_2ta$		*!		

This forced undominated status of MAX-V has a significant consequence for any further analysis of the language: for any illicit sequence that occurs within the same morphophonological domain (i.e. at prefix-stem boundaries), we now predict vowel deletion to be an *impossible* repair. This means that any apparent cases of deletion must necessarily be analyzed by other means.

This is in fact the correct analysis for all three forms of coalescence, despite the superficial appearance of deletion in the mid and identity coalescence contexts. This is because there exists an implicational “hierarchy of costliness” among the three forms of coalescence; that is, the constraints violated by identity coalescence are a proper subset of the constraints violated by mid coalescence, which are themselves a larger proper subset of the constraints violated by high coalescence (Hout, 2015; Hout & Baković, resubmitted). This is illustrated below in (13).

(13) Hierarchy of costliness (adapted from Hout (2015))

	IDENT(high)	IDENT(low)	UNIFORMITY
High ($a_1+i_2 \rightarrow e_{1,2}$)	*	*	*
Mid ($a_1+e_2 \rightarrow e_{1,2}$)		*	*
Identity ($a_1+a_2 \rightarrow a_{1,2}$)			*

Because MAX-V must dominate IDENT(high) to allow regular high coalescence to occur at all, then by transitivity it must also dominate all other constraints involved in coalescence. This means that the mere existence of high coalescence excludes the possibility of a deletion analysis for any other coalescence context.⁸ However, it is critical to note that these facts are insufficient to determine the ranking between *V.V and MAX-V; that is, the fact that deletion is an impossible solution in coalescence contexts does not entail that it is impossible in *every* hiatus context. That evidence *only* comes from the non-coalescing exceptions, and the forced promotion of MAX-V that they require has far more interesting implications for the analysis of glide formation.

5.3 Exceptional palatalization As previously discussed in 4.2, glide formation applies to prevocalic high vowels in non-identical contexts. In situations where no consonant precedes the initial high vowel, the surface result is always a full glide, as was seen in (7). However, as mentioned in Section 4.2, /CV+V/ contexts are different.

We start simply, with /Cu+V/ contexts; here, provided the following vowel is not /u/ (which would result in identity coalescence) or /o/, glide formation occurs, but the resulting glide surfaces as a secondary articulation on the preceding consonant. This is typically labialization, though velarization occurs if the preceding consonant is itself labial (usually /m/). Examples are given in (14):

⁸ An interesting consequence of this analysis is that high coalescence and deletion are now predicted to be mutually exclusive repairs; this is outside the scope of this paper but is a point of future study.

(14) Examples of /Cu+V/ hiatus resolution

- a. /ku+itang+a/ → k^wi:ta:nga ‘to call’
 b. /mu+ana ju+edi/ → m^ya:na j^we:di ‘good (cl 1) child’

However, this pattern is not fully general. For cases of /Cu+o/, no glide ever surfaces, e.g. /ku+oger+a/ ‘to swim’ surfaces as ko:ge:ra, not *k^wo:ge:ra (c.f. /u+ombok+a/ → wo:mbo:ka ‘it (cl 3) swam’). In the interest of space, I will not be elaborating on this pattern further; of greater relevance are the cases of /Ci+V/.

For /Ci+V/, we might reasonably expect that an analogous secondary articulation (e.g. palatalization) should occur. However, this is not the case: in these contexts no glide or portion of a glide ever surfaces. This applies regularly to all prefix+root boundaries regardless of lexical class, as illustrated in (15):

(15) Distribution of /Ci+V/

- a. /tʃi+asa/ → tʃa:sa ‘we divorced’ Subject Prefix
 b. /si+di+aza/ → sida:za ‘I lost it (cl5)’ Object Prefix
 c. /mi+ezi/ → mezi ‘months’ Noun Class Prefix
 d. /zi+etu/ → zetu ‘our (cl10)’ Demonstrative Prefix

Much like the mid and identity coalescence examples, it is tempting to analyze these cases as deletion. However, we know already from the analysis of the exceptions to coalescence that this direct solution is unavailable: vowel deletion is blocked in exactly this morphophonological context. To proceed, we must carefully weigh two possible options: either we alter the analysis of the exceptions to allow a deletion candidate to win for /Ci+V/ contexts (i.e. by preventing the forced promotion of MAX-V), or we consider an alternative solution for /Ci+V/ contexts in favor of the evidence introduced by the non-coalescing exceptions.

If we do not want to allow the non-coalescing stems to force the promotion of MAX-V, the only available alternative is to index additional constraints to the non-coalescing stems so as to prevent deletion from applying. Because hiatus resolution *does* apply to the non-coalescing stems in other contexts (e.g. glide formation: /ku+it+a/ → k^wi:ta ‘to go’), the additional indexed constraint will need to be specific to deletion.⁹ The only reasonable candidate then is MAX-V.

There is no formal mechanism in Pater’s theory that restricts the number of constraints that can be applied to an exception; however, there are other formal mechanisms in the theory that make this solution untenable. Recall the discussion of the locality condition from Section 3. This condition restricts the application of indexed constraints by requiring any violation incurred by an indexed constraint to apply to some portion of the indexed morpheme; in this case, the stem. However, we are not trying to prevent the deletion of the stem vowel; rather, what we are trying to prevent is deletion of the *prefix* vowel. But, because deletion of the prefix vowel does not affect any portion of the stem, indexing MAX-V to the stem cannot actually prevent it from occurring, as seen in (16) (prefix and stem denoted by subscript *P* and *S*, respectively).

(16) MAX-V and locality

	ka _P +i _S t ^{L1,2} a	IDENT(hi) ^{L1}	MAX-V ^{L2}	*V.V	MAX-V	IDENT(hi)
a.	ka _P .i _S ta			*!		
b.	ke _P _S ta	*!				*
c.	☞ kØ _P i _S ta				*	

If we were truly dead-set on the multiple indices solution, we could abandon locality. This would be unwise, given that the locality condition is a well-motivated formal restriction that reduces the overgeneration problem inherent to diacritic theories like indexation and cophology (see e.g. Inkelas et al. (1997) for some discussion of the latter point). However, even if we were truly prepared to throw all caution to the wind, indexing MAX-V is a fundamentally *inelegant* solution.

The indexation of IDENT(high) (or a substantively similar constraint) is appealing in the case of the non-coalescing stems because doing so captures generalizations about their shared phonological characteristics

⁹ As opposed to a constraint that can wholesale exclude hiatus resolution, such as ANCHOR(Stem,σ,L) (McCarthy & Prince, 1995) or CRISPEGE (Ito & Mester, 1999).

and directly links those characteristics with the failed application of coalescence.¹⁰ That is, the linking of an otherwise content-less diacritic to a constraint carrying phonological information allows for a principled analysis and provides some explanatory benefit.

This would not be true for the indexation of MAX-V. As discussed previously in Section 5.2, even without considering exceptions, there is no reason to assume that deletion could ever apply in a coalescence context. The only cases in which vowel deletion could reasonably be argued to apply are the context-specific alternatives to glide formation. Indexing MAX-V would thus be entirely *ad hoc*: it does no work besides preventing the wrong outcome from surfacing in a context in which there is no reason to ever assume that it should.

To summarize: indexing MAX-V requires us to adopt a more complicated and less well-motivated set of assumptions, and ultimately results in bizarre (or no) predictions. Contrast this with the original analysis, which makes sensible and interesting predictions regarding exceptional patterns of coalescence, and in which the failure of deletion to apply in the exceptional context is *reinforced* by the forced promotion of MAX-V. The better path, then, is to find an alternative that does not require us to assume the possibility of deletion.

The alternative we will consider here is the following: glide formation is the general repair for prevocalic high vowels (provided the following vowel is non-identical), while coalescence is the general repair for all other cases. However, CG onsets are disallowed, and so post-lexical repairs apply in order to eliminate them. This ultimately unifies the results of glide formation in post-consonantal contexts: secondary articulation applies where applicable, while glide deletion applies elsewhere.

We can assume, generally, that there is a markedness constraint that is violated by surface CG sequences, which we will refer to here as *CG. While there is undoubtedly a general low-ranked constraint penalizing secondary articulations, for our current purposes, we are explicitly focusing on the tendency of /Ci+V/ cases to surface without a reflex of the vowel, whether a glide or (secondary) palatalization. As such, we only need to consider the constraints that mediate between deletion of glides and palatalization.

We will assume that the constraint penalizing glide deletion is MAX-C, and that the constraint penalizing palatalization is simply *C^j; the specificity of the latter is motivated by the fact that palatal secondary articulations seem to be wholesale excluded from the regular grammar, while labialization and velarization are sometimes allowed.

The ranking *CG » MAX-C is sufficient to generate the deletion repair, and the ranking *C^j » MAX-C is sufficient to prevent palatalization from occurring in its place. However, much like the coalescence case, we have no specific information to tell us the relationship between *CG and *C^j, once again giving us an ambiguous ranking of the schematic {M,C} » F form. This is illustrated below in (17); note that the input here is an intermediate |zjetu|, from /zi+etu/ ‘our (cl 10)’.

(17) Glide deletion

	zjetu	*CG	*C ^j	MAX-C
a.	zje.tu	*!		
b.	z ^h øe.tu			*
c.	z ^j e.tu		*!	

This time, the ranking is truly indeterminate. Because no glide or (secondary) palatalization ever surfaces, there is no information to tell us whether palatalization is worse than CG onsets; all we know is that deletion is better than both. We cannot even easily speculate as to the preference of one over another. On the side of palatalization, while there are no palatal secondary articulations, there are many other secondary articulations in the language. Moreover, there does not seem to be a general avoidance of palatal articulations, as there are several palatal consonants that surface in other contexts ([ʃ], [ɲ], [j], and [tʃ]). On the side of avoiding CG onsets entirely, it might be reasonable to assume that because the language generally exhibits a CVCV structure, CG onsets are necessarily worse than palatalization. However, the existence of occasional nasal codas, syllabic nasals, and the occasional tolerance of hiatus suggests a degree of greater nuance. What would

¹⁰ Briefly: because high coalescence is the only hiatus repair that materially affects stem vowels, it makes sense that exceptions that block *only* coalescence are those beginning with high vowels. See Hout (2015); Hout & Baković (resubmitted); Hout (in prep) for deeper discussion of this point.

be ideal is incontrovertible evidence of either a tolerance or intolerance of a palatalization repair. Once again, this information comes from a set of phonological exceptions.

Noun class 5 has a uniform set of agreement prefixes, most of which are /di-/.¹¹ Class 5 agreement prefixes surface faithfully before consonants, as illustrated in (18):

(18) Class 5 agreement prefixes

- a. /di+puluk+a/ dipulu:ka ‘it (cl5) flew’ Subject
 b. /si+di+pik+a/ sidipi:ka ‘I cooked it (cl5)’ Object
 c. /ʒula # di+no/ ʒula di:no ‘this (cl5) frog’ Demonstrative

However, despite their structural similarities, examination of prevocalic contexts reveals that one of these prefixes is not like the others:

(19) Exceptional demonstrative prefix

- a. /di+asam+a/ da:sa:ma ‘it (cl5) gaped’ Subject
 b. /si+di+az+a/ sida:za ‘I lost it (cl5)’ Object
 c. /ʒula # di+angu/ ʒula ʒa:ngu ‘my (cl5) frog’ Demonstrative

While the subject and object prefixes surface without a glide as expected, the demonstrative prefix instead appears to have undergone a form of palatalization. Importantly, this behavior is not representative of the morphological class of demonstrative prefixes; others of the shape /Ci-/ undergo glide deletion, e.g. *tʃangu* ‘my (cl 7)’ (from /tʃi+angu/), *vetu* ‘our (cl 8)’ (from /vi+etu/).

This is also, interestingly, not an exclusive property of the class 5 prefix; the verb ‘eat’ usually surfaces as [ja], but in contexts where an *i*-initial derivational suffix intervenes between the verb root and the final vowel, the root portion of the word instead surfaces with a [d]:

(20) Palatalization in ‘eat’

- a. si:ja ‘I ate’
 b. sidi:sa ‘I ate a lot’
 c. nani:je ‘I will eat’
 d. nanidi:se ‘I will eat a lot’

These exceptions are blocking exceptions, in that they do not exhibit the regular glide deletion pattern. This means that they should be indexed to a copy of MAX-C, which must be ranked over *CG. As with the non-coalescing stems, the indeterminate ranking between *CG and *Cⁱ cannot exist once an indexed constraint is introduced. However, unlike the coalescence exceptions, this is not a case of simple blocking, but rather an instance of the *walljumping* schema described in (5) (M » C » F). The promotion of *CG suggests that the language would prefer to repair CG onsets by any means necessary, even if it means allowing an otherwise unattested alternation.¹² This is illustrated below in (21).

(21) Walljumping palatalization

	djetu	MAX-C ^L	*CG	*C ⁱ	MAX-C
a.	dje.tu		*!		
b.	dØe.tu	*!			*
c.	^{ɪ̥} je.tu			*	

¹¹ Adjectival concord and noun class are not marked for class 5 (or the prefix is Ø-). In the latter case, the noun class prefix resurfaces when the definite pre-prefix is attached, e.g. *idiboko* ‘the banana,’ c.f. *boko* ‘(a) banana’.

¹² Note that while the *alternation* is otherwise unattested, the surface result is an attested sound in the inventory of Mushunguli, and is indistinguishable from regularly-occurring palatal stops. My assumption is that this is an inventory restriction; that is, the language has no d^l, but it does have a palatal stop, so that is what surfaces in this marked context. I am treating this as equivalent to a secondary palatal articulation for now, but in a larger analysis it would likely be necessary to invoke additional constraints penalizing d^l. The main points of this particular paper are not affected by this shortcut.

6 Discussion and concluding remarks

This paper has explored two broad classes of predictions made by lexical indexation: what types of exceptional patterns are predicted (and attested), and how the introduction of lexically-indexed constraints can affect the grammar. The existence of both simple blocking and walljumping exceptions in Mushunguli suggests that the four-way typology of exceptions needs to be reevaluated, especially given the requirements that these patterns impose upon the grammar. Because of this, I suggest that more careful formal and descriptive typological research on exceptions should be carried out.¹³

As was discussed in the introduction, there are some parallels between the patterns exhibited in Mushunguli and the case of Japanese etymological strata first discussed in Ito & Mester (1995). In Japanese, there are several distinct sets of loanwords, roughly correlating to instances of historical contact with other languages, that are idiosyncratic with respect to native forms in the language, but share phonological characteristics within their own set. Ito & Mester observed that these sets formed a hierarchical set of strata: native forms form a core stratum that defines the general set of well-formedness restrictions in the language; each subsequent peripheral stratum is subject to a subset of the restrictions of the stratum before it.

For example, Ito & Mester analyze the Sino-Japanese loan *han* ‘group’ and the French loan *pan* ‘bread’ as having the same underlying form: /pan/. The difference in surface forms stems from the fact that the French loan belongs to a more recent and less restricted stratum that allows singleton *p*, while the Sino-Japanese loan belongs to an earlier, more assimilated stratum. This is captured in OT by the interleaving of stratally-specific (=indexed) faithfulness constraints between markedness constraints representing well-formedness restrictions in the language. In the above example, the stratally-specific faithfulness constraints that apply to Sino-Japanese loans are ranked below a markedness constraint penalizing singleton *p* (No-P), while the faithfulness constraints linked to unassimilated foreign loans is ranked above it.

Ito & Mester observed that this interleaving of stratal faithfulness constraints results in the forced determination of rankings between the markedness constraints by transitivity, but did not elaborate on this point further. This is likely because the markedness constraints in question generally drive repairs that are only related in a very broad sense.

The Mushunguli case supports this observation and arguably makes a more compelling case for the influence of exceptions on the regular grammar than the Japanese case does on its own. Here, all of the relevant repairs are related to one another by virtue of the fact that they are part of the larger hiatus resolution conspiracy, and occur in roughly the same morphophonological contexts. The fact that the analysis of the exceptions reinforces rather than undermines the general patterns exhibited by the system is an important result because it suggests that exceptions can reduce ambiguity within the system by clarifying or reifying broader generalizations about the grammar.

We can see this effect taken a step further in a final example from Mushunguli. The noun class prefix for classes 9 and 10 can be analyzed as /N-/. Because most nouns are C-initial, this would result in a CC onset; however, this cluster never surfaces. Before sonorants and continuants, the prefix is deleted, e.g. /N-simba/ → [simba] ‘lion,’ *[nsimba]. However, before non-nasal stops, the prefix is realized as prenasalization, e.g. /N-guluwe/ → [ʔguluwe] ‘pig’ (Hout, 2012; Temkin Martinez & Rosenbaum, 2017).

Here, we see that the repair strategies for NC onsets, much like CG onsets, are deletion or secondary articulation. Despite this, because the NC contexts are not entirely parallel to the CG contexts, these patterns would have been insufficient to determine the ranking between *Cⁱ and *CG. However, the introduction of the exceptions does not only disambiguate the ranking between these two constraints, it makes it possible to draw parallels between these two unrelated contexts. These factors support a view of exceptions as reinforcing agents within the grammar rather than inert, memorized forms living outside of the system. Put more simply: the apparent breakdown of the system introduced by exceptions is in actuality a reflection of that system.

References

Anttila, Arto (2002). Morphologically conditioned phonological alternations. *Natural Language and Linguistic Theory* 20:1, 1–42.

¹³ In the interest of this, readers are invited submit exceptions they are aware of to the Phonological Exceptions Database currently under development. A submission form is available at <https://goo.gl/forms/JGKpsC0hBzzB2yZe2>.

- Baković, Eric (2011). Opacity and ordering. Goldsmith, John, Jason Riggle & Alan Yu (eds.), *The Handbook of Phonological Theory*, Blackwell, 40–67.
- Casali, Roderic F. (1996). *Resolving Hiatus*. Ph.D. thesis, UCLA, Los Angeles, CA.
- Casali, Roderic F. (1997). Vowel elision in hiatus contexts: Which vowel goes? *Language* 73, 493–533.
- Casali, Roderic F. (2011). Hiatus resolution. van Oostendorp, Marc, Colin J. Ewen, Elizabeth Hume & Keren Rice (eds.), *The Blackwell Companion to Phonology*, Wiley-Blackwell, Malden, MA, vol. 3, 1434–1460.
- Dingemanse, Mark (2012). Advances in the cross-linguistic study of ideophones. *Language and Linguistics Compass* 6, 654–672.
- Finley, Sara (2010). Exceptions in vowel harmony are local. *Lingua* 120, 1549–1566.
- Fukazawa, H. (1999). *Theoretical Implications of OCP Effects on Features in Optimality Theory*. Ph.D. thesis, University of Maryland, College Park. [ROA-307].
- Hout, Katherine (2012). The vocalic phonology of Mushunguli. B.A. Thesis, The Ohio State University. Retrieval at <http://kb.osu.edu/dspace/handle/1811/53373>.
- Hout, Katherine (2015). A lexical indexation account of exceptions to hiatus resolution in Mushunguli. *San Diego Linguistics Papers* 5, 30–70.
- Hout, Katherine (2017). Exceptions to hiatus resolution in Mushunguli (Somali Chizigula). Kandybowicz, Jason & Harold Torrence (eds.), *Africa's Endangered Languages: Documentary and Theoretical Approaches*, Oxford University Press, New York, 411–426.
- Hout, Katherine & Eric Baković (resubmitted). Exceptional behavior is predictable. Resubmitted to *Phonology*.
- Hout, Katherine (in prep). *Redefining Phonological Exceptionality*. Ph.D. thesis, UC San Diego, La Jolla, CA.
- Inkelas, Sharon & Cheryl Zoll (2005). *Reduplication: Doubling in Morphology*. Cambridge University Press, Cambridge.
- Inkelas, Sharon, Orhan Orgun & Cheryl Zoll (1997). The implications of lexical exceptions for the nature of grammar. Roca, I. (ed.), *Derivations and Constraints in Phonology*, Oxford University Press, New York, 393–418.
- Ito, Junko & Armin Mester (1995). The core-periphery structure in the lexicon and constraints on re-ranking. Beckman, Jill N., Laura Walsh Dickey & Suzanne Urbanczyk (eds.), *Papers in Optimality Theory*, GLSA, University of Massachusetts, Amherst, 181–210.
- Ito, Junko & Armin Mester (1999). The phonological lexicon. Tsujimura, Natsuko (ed.), *A Handbook of Japanese Linguistics*, Blackwell, Oxford, 62–100.
- Ito, Junko & Armin Mester (2001). Covert generalizations in optimality theory: the role of stratal faithfulness constraints. *Studies in Phonetics, Phonology, and Morphology* 7, 273–299.
- Kisseberth, Charles (1970). The treatment of exceptions. *Papers in Linguistics* 2, 44–58.
- McCarthy, John H. & Alan Prince (1995). Faithfulness and reduplicative identity. Beckman, Jill N., Laura Walsh Dickey & Suzanne Urbanczyk (eds.), *Papers in Optimality Theory*, University of Massachusetts, Amherst, 249–384.
- Orgun, Cemil Orhan (1996). *Sign-based morphology and phonology: with special attention to Optimality Theory*. Ph.D. thesis, University of California, Berkeley.
- Pater, Joe (2000). Non-uniformity in English secondary stress: the role of ranked and lexically specific constraints. *Phonology* 17, 237–274.
- Pater, Joe (2010). Morpheme-specific phonology: Constraint indexation and inconsistency resolution. Parker, Steve (ed.), *Phonological Argumentation: Essays on Evidence and Motivation*, London: Equinox, 123–154.
- Rosenthal, Samuel (1997). The distribution of prevocalic vowels. *Natural Language & Linguistic Theory* 15:1, 139–180.
- Shih, Stephanie & Sharon Inkelas (2016). Morphologically-conditioned tonotactics in multilevel Maximum Entropy grammar. *Proceedings of the 2015 Annual Meeting on Phonology*, Linguistic Society of America, Washington, D.C.
- Smith, Jennifer L. (2016). Segmental noun/verb phonotactic differences are productive too. Farrell, Patrick (ed.), *Proceedings of the Linguistic Society of America*, Linguistic Society of America.
- Temkin Martinez, Michal & Vanessa Rosenbaum (2017). Acoustic and aerodynamic data for Somali Chizigula stops. Kandybowicz, Jason & Harold Torrence (eds.), *Africa's Endangered Languages: Documentary and Theoretical Approaches*, Oxford University Press, New York, 427–447.