r-Epenthesis and the bigrade alternation

The role of phonological distance in the regularization of Japanese verbal inflection

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For Japanese verbal suffixes sensitive to the C/V polarity of the stem-final segment, C-stem alternants are underlying, and regular V-stem alternants result from intervocalic epenthesis of r at stem boundary (de Chene 2016). This “Analysis A” entails that any V-stem suffix not consisting of r plus its C-stem counterpart is irregular and subject to replacement. While the r-Epenthesis rule of Analysis A is naturally understood as a generalization of the r-zero alternation of three suffixes that have shown it since the eighth century, however, the innovative r-initial suffixes of other categories do not appear until the eighteenth. This lag is illuminated by the dialects of Kyūshū, where adoption of Analysis A is blocked by the “bigrade” stem alternation, which in most dialects was leveled in the seventeenth century. Building on a discussion of leveling that treats that phenomenon as a subtype of regularization, it is proposed in explanation of this “bigrade blocking” effect that the order in which alternations become subject to regularization is constrained by the phonological distance between alternants. Investigation of the possibility that the bigrade alternation and Analysis A are related by a triggering effect as well as by a blocking effect, finally, leads to a new account of the adoption of Analysis A.

Keywords: leveling, extension, regularization, default, Japanese, verbal inflection, bigrade alternation, r-Epenthesis

1. Introduction

It has been suggested (Kuryłowicz 1945-1949 [1966]: 174) that while linguistic structure lays down the tracks on which “analogical” change runs, whether and to what extent those tracks are used depends on social rather than strictly linguistic factors. Kuryłowicz’s well-known dictum amounts to the claim that the triggering or activating factors for analogical change inevitably lie outside the linguistic system proper. Fertig (2000: 27-28), among others, however, has argued that this is too restrictive a view, and that analogical changes are not infrequently precipitated by identifiable linguistic events. In the present paper, our central data will be provided by a case of this sort from the history of Japanese, one in which change C can be argued to have served as a catalyst for reanalysis R after a long period in which the surface relationships underlying R were satisfied but remained analytically inert.

The paper is organized in the following way. Section 2 introduces the relevant Japanese verbal suffixes and the analysis of their alternations (“Analysis A”) that has recently been argued (de Chene 2016) to be in force. Section 3 notes that there is an unexplained condition on the adoption of Analysis A and the appearance of the regularized vowel-stem forms predicted by it, namely that regularized forms are limited to nonalternating stems and do not appear in the paradigm of stems that retain the inherited “bigrade” alternation of the stem-final vowel (e or i) with ı; the diachronic corollary of this restriction is that regularized forms do not appear historically until the bigrade alternation has been leveled. The section ends by considering and rejecting several conceivable approaches to the problem of explaining this phenomenon of “bigrade blocking”.

Section 4, taking the domain of leveling to be the individual phonological alternation, proposes that leveling is a subtype of regularization, that it applies in the same way in stems and in affixes, and that it has no necessary proportional motivation. Section 5, after noting evidence from several languages that greater phonological distance between alternants increases the resistance of an alternation to leveling, proposes an account of bigrade blocking that relies on the phonological distance differential between the stem and suffix alternations involved. Consideration of the possibility of a triggering effect relating leveling of the bigrade alternation and the adoption of Analysis A then leads to a new understanding of the principles under which Analysis A was chosen. Section 6 is a brief conclusion.

2. Background: Japanese verbal suffix alternations and their analysis

The paradigm of the Japanese verb includes a set of suffixes that alternate depending on the consonant/vowel (C/V)
polarity of the stem-final segment; typical stems are C-stem kak- ‘write’ and V-stem mi- ‘see’. While at least four analyses of these alternations have been proposed in the literature, each analysis makes different claims about which forms are regular and which are irregular and thus generates distinct predictions about what changes should be observed if irregular forms are eliminated in favor of regularized substitutes. de Chene (2016) argues that it is the analysis of (1) (“Analysis A”) that has been adopted by speakers.

(1) a. Underlying representations (URs) coincide with C-stem suffixes.
   b. Regular V-stem suffixes are the result of the rule \( \emptyset \rightarrow r \) / \( V_b \) [ ___V

At the stage when Analysis A is adopted, the only regular V-stem suffixes are those that consist of the corresponding C-stem suffix preceded by \( r \); other V-stem suffixes are irregular and subject to replacement by substitutes that duplicate that pattern. The categorization of suffix alternants under Analysis A is shown in Table 1, which displays for eight inflectional categories C-stem suffixes, V-stem suffixes divided into regular and irregular subgroups, and the predicted replacements for members of the irregular group.

<table>
<thead>
<tr>
<th></th>
<th>1 C-stem=UR</th>
<th>2 Reg V-stem</th>
<th>3 Irreg V-stem</th>
<th>4 Substitute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conclusive</td>
<td>-u</td>
<td>-ru</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provisional</td>
<td>-eba</td>
<td>-reba</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passive</td>
<td>-are-</td>
<td>-rae-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imperative</td>
<td>-e</td>
<td>-ro/-yo/-i</td>
<td>-re</td>
<td></td>
</tr>
<tr>
<td>Hortative</td>
<td>-oo</td>
<td>-yoo/-u</td>
<td>-roo</td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>-an</td>
<td>-n</td>
<td>-ran</td>
<td></td>
</tr>
<tr>
<td>Conjunctive</td>
<td>-i</td>
<td>-Ø</td>
<td>-ri</td>
<td></td>
</tr>
<tr>
<td>Causative</td>
<td>-ase-</td>
<td>-rase-</td>
<td>-rase-</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Regular and irregular suffix alternants under Analysis A

The predictions of Analysis A with regard to the replacement of irregular V-stem suffixes are confirmed by the Japanese dialectological literature and by the Grammar Atlas of Japanese Dialects (GAJ = Kokuritsu Kokugo Kenkyūjo 1989-2006): all five innovative \( r \)-initial V-stem suffix alternants (column 4) are widely attested in Japanese regional varieties, and the same pattern is observed for a number of suffixes that show a more limited geographical distribution (de Chene 2016: 55-56). Evidence for the adoption of Analysis A is displayed by Ryukyuan languages as well (de Chene 2019). Regularization under Analysis A constitutes the most recent of a series of changes that have affected the paradigm of Japanese vowel-stem verbs since the earliest documentation of the language in the eighth century, a period during which consonant-stem inflection, in contrast, has remained essentially constant.

Given the \( r \)-Epenthesis rule of (1b), the appearance of the innovative suffix alternants of column 4 in Table 1 is triggered by the loss of existing suffix alternants, those of column 3. There is one further innovative suffix alternant, Potential \(-re\), whose appearance is triggered instead by relaxation of the earlier restriction that the Potential suffix \(-e\) be added only to C-stems (de Chene 2016: 45, 49). Below, we will use the label “innovative \( r \)-suffix” for any innovative V-stem suffix alternant whose generation involves application of \( r \)-Epenthesis.

In closing this section, let us say something about the status of the epenthesis rule of (1b). First of all, as the formulation of that rule makes clear, Japanese \( r \)-Epenthesis is not conditioned by syllable structure or prosodic factors alone, despite misunderstanding on this point in the literature (de Lacy 2006: 81-82; see also de Chene 2016: 60-61 (note 20)). Rather, that rule is a response to the more specific problem of hiatus at stem boundary in the inflection of a particular lexical category. In §5.3 below, the parallel case of \( \delta \)-Epenthesis in the Modern Greek nominal paradigm will provide us with evidence as to why this should be a natural rule type.
3. Bigrade blocking: A restriction on the adoption of Analysis A

3.1 The phenomenon of bigrade blocking

The relation between the adoption of Analysis A and the appearance of the innovative r-suffixes of Table 1 is a classic example of abductive change (covert reanalysis) followed by the deductive change (generation of innovative forms) that renders the reanalysis “visible” (Andersen 1973). Before reanalysis, the V-stem suffix alternants Conclusive -ru, Provisional -reba, and Passive -rare- of column 2 in Table 1 will have been lexically listed in full, like the irregular alternants of column 3, and there will have been no rule-governed relationship between C-stem and V-stem suffixes. As a result of reanalysis, the r of those three suffix alternants came to be interpreted as epenthetic—that is, as supplied by rule, specifically the rule of (1b) above. It is the postulation of the r-Epenthesis rule that at once rendered irregular those V-stem suffix alternants that could not be derived by it and provided for the generation of innovative r-initial replacements for those now irregular alternants.

There is a residual puzzle, however, concerning the timing of the adoption of Analysis A and the corresponding appearance of the regularized forms that analysis predicts. The r-Epenthesis rule of Analysis A is naturally seen, as just suggested, as a generalization of the r-zero alternation of the first three suffixes of Table 1. In Conclusive -(r)u and Provisional -(r)eba (originally Adnominal -(r)u and Realis -(r)e), this alternation goes back to the earliest literature, the eighth-century texts of Old Japanese. Essentially the same is true of Passive -(r)are-, which in the earliest texts is in the process of replacing an older Passive suffix -(r)aye-. There is no evidence for the innovative r-suffixes of Table 1 (i.e. the column 4 alternants) before the modern period, however, and in fact only scattered examples of attestation before Kokugo Chōsa linkai (1906), the first systematic survey of Japanese dialects. Further, a terminus post quem for those innovations is arguably established by the failure of Rodriguez (1604–1608 [1955]: 607–613) to mention them in the section on nonstandard dialects in his monumental Japanese grammar. In particular, given that he records in some detail the morphological idiosyncrasies of Western Kyūshū Japanese, including Imperative -ro and adjectival Conclusive -ka, it seems more than likely that r-suffixes such as Imperative -re and Negative -ran would also have been mentioned had they been in use at the time.

The eighth-century r-zero alternation of the first three suffixes of Table 1, then, seems to have remained stable, but inert, until at least the seventeenth century, exemplifying Fertig’s (2000: 27) observation that “In many cases, the same analogical proportions have been valid for centuries or millennia before a change actually takes place.” Ideally, we would like to be able to account for this long period of inertness and explain why it ended. Fortunately, it turns out that modern Kyūshū dialects retain evidence suggesting why the reanalysis we have postulated, the adoption of Analysis A, would have been impossible before the seventeenth century.

In contemporary Tokyo Japanese and the majority of other dialects, regular vowel-final verb stems are nonalternating. Over the larger part of the recorded history of the language, however, the stem vowel (/i or e/) of the great majority of vowel-stems alternated with u in the Conclusive and Provisional. This is illustrated in Table 2, which shows partial paradigms of oki- ‘arise’, uke- ‘receive’, se-/si- ‘do’, and ko-/ki- ‘come’ as of the year 1600 (here and below, in citing vowel-final verb stems, I suppress the u-final alternant).

<table>
<thead>
<tr>
<th></th>
<th>‘arise’</th>
<th>‘receive’</th>
<th>‘do’</th>
<th>‘come’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>oki-nu</td>
<td>uke-nu</td>
<td>se-nu</td>
<td>ko-nu</td>
</tr>
<tr>
<td>Conclusive</td>
<td>oki-Ø</td>
<td>uke-Ø</td>
<td>si-Ø</td>
<td>ki-Ø</td>
</tr>
<tr>
<td>Provisional</td>
<td>oku-reba</td>
<td>uku-reba</td>
<td>su-reba</td>
<td>ku-reba</td>
</tr>
</tbody>
</table>

Table 2. Vowel-stem inflection in 1600

Because the /e ~ u alternation has the orthographic consequence that stem alternants are written with syllabary characters from two different rows or “grades” of the standard five-by-ten syllabary table, verbs showing that

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1 Hikosaka (1999) provides a detailed review of the first attestations of Imperative -re, Hortative -noo, and Negative -ran, both in Kokugo Chōsa linkai (1906) and in earlier sources back to the first half of the eighteenth century.
alteration (apart from the irregulars ‘do’ and ‘come’) are characterized in the traditional Japanese analysis of verbal conjugation as following the bigrade (nidan) paradigm, as opposed to the unigrade (ichidan) paradigm of nonalterting verbs. Below, we will adopt this terminology for stems like oki- and uke- and refer to the stem alteration \( i/e \) as the “bigrade alternation”.

The diachronic course of the leveling of the bigrade alternation in favor of the front vowel \( i/e \) has been governed by two main factors, stem length (monosyllabic vs. polysyllabic) and the identity of the stem vowel (\( i \) vs. \( e \)), with the first member of the opposition being relatively favorable to leveling in each case and the second relatively unfavorable. \(^{261}\) Of the dozen or so monosyllabic \( i \)-stems of Old Japanese, first of all, some were already nonalterting, some displayed variation between leveled and unleveled forms, and some, while alternating at that stage, underwent leveling in the course of the following centuries (see Frellesvig 2010: 106 and the entries of Omodaka et al. 1967). By around the year 1200, then, there were no monosyllabic bigrade \( i \)-stems left, a generalization which holds as well of all modern dialects.

For monosyllabic \( e \)-stems, the leveling of the bigrade alternation began by the fourteenth century (Yamaguchi & Akimoto 2001: 336) with the verb he- ‘pass through’, and the remaining handful of monosyllabic \( e \)-stems (\( e \)-‘obtain’, \( de \)-‘emerge’, \( ne \)-‘sleep’, \( ke \)-‘kick’ (\( ker \)-in most modern dialects)) had become nonalterting in the prestige dialects of central Japan by the seventeenth century (Yamaguchi & Akimoto 2001: 892). Today, the bigrade alternation survives in monosyllabic \( e \)-stems only in northwestern Kyūshū and at a handful of isolated points to the south (GAJ map 66).

Leveling of the bigrade alternation in polysyllabic stems had begun in central dialects by the seventeenth century (Yamaguchi & Akimoto 2001: 892), but it began even earlier in eastern dialects (Kokugo Gakkai 1980: 76, 856) and was noted as a characteristic of eastern speech at the turn of the seventeenth century by Rodriguez (1604-1608 [1955]: 29). In contemporary dialects, the bigrade alternation of historical polysyllabic \( i \)-stems survives in eastern Kyūshū and to some extent in the north and west of the island as well and at several locations in Wakayama prefecture in the southern Kii peninsula (GAJ map 61). More than half of the Kyūshū locations that preserve \( oku \)-as the Conclusive of historical \( oki \)-‘arise’, however, have reanalyzed the stem as \( oke \)-under the pressure of the far more numerous \( e \)-stems (see GAJ map 72). For polysyllabic \( e \)-stems, finally, the great majority of Kyūshū dialects (as well as two Wakayama locations) preserve the bigrade alternation, although leveling is underway in some of them.

We have seen that the bigrade alternation that originally characterized virtually all Japanese vowel-stems survives in Kyūshū, in particular for polysyllabic \( e \)-stems. Crucially, the innovative \( r \)-suffixes of Table 1 are also widely attested in Kyūshū, but (almost) exclusively in the unigrade paradigm. The bigrade alternation, that is, appears to block the introduction of innovative \( r \)-suffixes. At the same time, leveling of the bigrade alternation appears to trigger the introduction of innovative \( r \)-suffixes (as noted by Ōnishi 2016: 150), so that those suffixes appear in the paradigms of all and only verbs that have undergone leveling. This complementary distribution between innovative \( r \)-suffixes and the bigrade alternation is illustrated in Table 3 with forms from Takachiho in northwestern Miyazaki Prefecture (Itoi 1961: 261); items displaying innovative suffixes are underlined.

<table>
<thead>
<tr>
<th></th>
<th>‘arise’</th>
<th>‘raise’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conclusive</td>
<td>oki-ru</td>
<td>agu-ru</td>
</tr>
<tr>
<td>Provisional</td>
<td>oki-reba</td>
<td>agu-reba</td>
</tr>
<tr>
<td>Imperative</td>
<td>oki-ge</td>
<td>agii &lt; age-i</td>
</tr>
<tr>
<td>Hortative</td>
<td>oki-roo</td>
<td>agyuu &lt; age-u</td>
</tr>
<tr>
<td>Negative</td>
<td>oki-ruu</td>
<td>age-n</td>
</tr>
</tbody>
</table>

Table 3. Unigrade and bigrade inflection in Takachiho

At a first level of abstraction, the failure of innovative \( r \)-suffixes to appear in the bigrade paradigm of Table 3 suggests an answer to the puzzle of why the \( r \)-zero alteration of the first three suffixes of Table 1 remained analytically inert for at least nine centuries: as long as the bigrade alternation remained unleveled, the reanalysis of suffix-initial \( r \) as epenthetic appears to have been impossible. In the next two subsections, we will examine in more detail this “bigrade blocking hypothesis”, the hypothesis that the bigrade alternation blocks the adoption of Analysis A. First, in §3.2, we will see that suffix-specific reanalysis can mimic the results of regularization under Analysis A, creating forms that look like counterexamples to that hypothesis but that can be explained in ways that are consistent with it. Section 3.3 will
then investigate the degree to which the predictions of the bigrade blocking hypothesis are obeyed in modern Japanese dialects.

3.2 A class of apparent exceptions to the bigrade blocking hypothesis

As we have seen, regularization under Analysis A will take the form of the appearance, in the vowel-stem paradigm, of the innovative r-suffixes of column 4, Table 1. For a stem such as oki- ‘arise’, for example, regularization will result in forms such as Imperative okire, Hortative okiroo, Negative okiran, Conjunctive okiri, and Causative okizaru-; the first three of which were illustrated in Table 3. Suppose, however, that only one innovative r-suffix is observed in a particular dialect for one or more classes of verbs, and that there is an explanation for that suffix that does not involve Analysis A. We would then be justified in hesitating to conclude from the appearance of that suffix alone that Analysis A has been adopted for the class(es) of verbs in question.

Consider in this context the dialect of the Gotō islands of Nagasaki Prefecture, for which the GAJ supplies data from three locations and Hirayama & Ōshima (1969) provide more detailed data from five. Throughout the area, the bigrade alternation has been leveled for i-stems like oki- ‘arise’ and in the Provisional of e-stems like uke- ‘receive’ and the regular sere, so that the Conclusive and Provisional of those three verbs derive from okire/okireba, ukire/ukireba, and suru/sereba, respectively (phonetic forms reflect the further deletion of final high vowels and reduction, typically to glottal stop, of the resulting word-final consonants). The Imperative, Hortative, and Negative of oki- have innovative r-suffixes in all locations and thus coincide with the Takachiho forms of Table 3, although variation with conservative forms is reported in some cases. What is unexpected is that the innovative Imperative suffix -re appears only with i-stems like oki-, but with se/si- ‘do’ and e-stems like uke-, leaving irregular ko-/ki- ‘come’ as the only vowel-stem verb at any of the locations in question without an Imperative in -re.

Because uke- and se/si- retain the bigrade alternation in the Conclusive, their Imperatives in -re, if due to regularization under Analysis A, would represent a violation of the bigrade blocking hypothesis. It is noteworthy, however, that because of the leveling of that alternation in the Provisional of those verbs (ukureba > ukereba; sureba > sereba), the innovative Imperatives in -re coincide in all cases with the corresponding Provisional form minus -ba. Further, they duplicate in this respect a relationship that holds for consonant-stem verbs (kak-e ‘write!’, kak-eba ‘if ... write’), which constitute about two thirds of the verbal lexicon (see de Chene 2016: 66 and sources cited there). This coincidence raises the possibility that innovative e-stem Imperatives in -re (including sere ‘do!’) are backformed from the Provisional on the model of consonant-stem forms, an analysis that could be expressed proportionally as kakeba : kake :: ukereba : (ukere). Semantically, this analysis would have a natural basis in the widespread tendency in Japanese dialects and in Japonic languages more generally (see de Chene Forthcoming, note 9) for the Provisional to be used as a suggestion and thus, by extension, as a weak Imperative, as in Tokyo soo sureba (do o desu ka)? ‘(How about) if (you) did that?’ It should also be noted that the conservative Imperatives replaced by ukere and sere will, judging by the surrounding area, have been ukero and soro, forms with the same stem alternant and a minimally different suffix.

What provides the most decisive evidence for this account of Gotō island e-stem Imperatives in -re, however, is the Provisional of ko-/ki- ‘come’, the only verb whose paradigm we have not yet considered. While the expected Provisional kureba is recorded by Hirayama & Ōshima (1969: 81) for Fukue, the largest population center in the area, the four remaining locations treated in that work plus all three GAJ points (including Fukue) report koiba or phonological developments thereof (koeba, keeba, keba). The form koiba, inexplicable on phonological grounds, can only be accounted for as a replacement for kureba formed from the irregular Imperative koi of ko-/ki- plus -ba. The analysis that treats the Provisional as [Imperative + ba], suggested in the last paragraph, thus appears to be at work here, albeit with a contrary direction of derivation (kake : kakeba :: koi : (koiba)). Tiersma (1978, 1982) has interpreted bidirectional derivational relationships in inflectional morphology as the result of “local markedness”, under which plural forms, for example, will tend to be treated as derivationally basic vis-a-vis singulars for nouns denoting objects that typically occur in pairs. In the present case, both the irregularity and the high token frequency of koi ‘come!’ are naturally seen as motivating its use as a derivational base (on these two factors, see Bybee 1985: 57-58): as we have seen, ko is the only Gotō Imperative with the suffix -i (as is true for many other dialects as well); and in the Balanced Corpus of Contemporary Written Japanese (accessed with the Chûnagon search tool), the ratio of Imperative to Conclusive forms for ‘come’ (14.7%) is more than five times higher than the same ratio over all verbs (2.6%).
If the account of Gotō V-stem Imperatives in -re that we have offered above is correct, that case illustrates that suffix-specific developments can mimic the outcome of regularization under Analysis A, resulting in forms that appear to violate the bigrade blocking hypothesis but in fact can be explained in a manner consistent with it. Let us move now to an assessment of the degree to which various verb classes obey the predictions of the bigrade blocking hypothesis, returning at the end of the next subsection to the question of apparent counterexamples.

3.3 The extent of conformity with the bigrade blocking hypothesis

In evaluating the degree to which modern dialects conform to the bigrade blocking hypothesis, we will use primarily the data of the GAJ, supplemented where appropriate by that of Kyūshū Hōgen Gakkai (1991). We will organize our discussion around the two oppositions that we identified above in presenting the history of bigrade leveling, stem length and identity of the stem vowel. For each verb class or stem type as defined by those oppositions, there is a representative stem whose forms were surveyed by the GAJ. For each of those stems, we will first inventory the set of locations that report only unleveled forms for the stem’s Conclusive or, depending on the availability of data, for either the Conclusive or Provisional (below, the “target set”); these are the locations which we will judge to have preserved the bigrade alternation and to which we will therefore take the bigrade blocking hypothesis to apply. Next we will examine the inflectional categories surveyed in the GAJ that could in principle show innovative r-suffixes and, over the locations of the target set, compute the percentage that, in accordance with the bigrade blocking hypothesis, fail to do so. This percentage will be our measure of conformity with the bigrade blocking hypothesis for the stem type in question.

Let us start with polysyllabic e-stems, which, as we noted above, preserve the bigrade alternation over a wider area than any of the other verb classes. Of the 121 Kyūshū locations surveyed by the GAJ, 85 have exclusively akuru or phonetic developments thereof (notably akut) for the Conclusive of the representative polysyllabic e-stem, ake- ‘open (tr)’ (map 64). These 85 points thus constitute the target set for this verb class. GAJ survey items for ake- include the Imperative, Hortative, Negative, and Causative, all of which could in principle show innovative r-suffixes. There are thus in the data of the GAJ 340 potential violations of the bigrade blocking hypothesis for ake-, the representative polysyllabic e-stem. Let us consider these innovative r-suffixes one by one.

In Kyūshū as a whole, twelve locations report akere as at least one option for the Imperative of ake- (map 87). Four of these are outside the target set, however, and three others are the Gotō island locations for which we have argued above that Imperative -re is the result of a suffix-specific reanalysis. Of the remaining five locations, this latter interpretation seems plausible for at least one, where the Provisional of ko-/ki- ‘come’ is koeba.2 If so, unexplained occurrences of Imperative -re in the target set are limited to the remaining four locations. There is also one unexplained occurrence in the target set of Hortative -reo (map 107) and two unexplained occurrences of Causative -rase (map 118). Out of the 340 potential violations of the bigrade blocking hypothesis for ake-, then, there are only seven actual violations, so that the percentage of compliance with that hypothesis is 333 out of 340, or 97.9%.

Turning now to historical polysyllabic i-stems (reanalyzed as e-stems in a number of locations, as noted above), we find that the GAJ provides data for the stem oki- ‘arise’ on both of the forms that historically show the alternant oku-, the Conclusive and the Provisional. There are 31 GAJ locations that report only okuru or phonetic developments thereof for the Conclusive (map 61), and 27 locations that report (among forms with the suffix -reba) only okureba or phonetic developments thereof for the Provisional (map 126). 23 locations belong to both of these sets, so that there are 35 locations in the target set, the set of locations that display only unleveled forms for one or both of the Conclusive and Provisional. The forms of oki- surveyed in the GAJ that could in principle show innovative r-suffixes are the Imperative, Hortative, and Negative, so that there are 105 potential violations of the bigrade blocking hypothesis for that stem.

The GAJ reports two occurrences of Imperative okire and one occurrence of Negative okiran from target set locations in northwestern Kyūshū. It also records two target set locations in northwestern Miyazaki prefecture that show innovative r-suffixes for all three of the relevant categories. The data of both Kyūshū Hōgen Gakkai (1991: 154) and Ōnishi (2016: 151), on the other hand, place those latter two points within the area that has leveled okaru for the Conclusive; since both report okiru = okireba for the Provisional, this would remove them as counterexamples to the

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2 This is survey point 737096 (Minamikushiyama, Nagasaki Prefecture). While the GAJ reports the corresponding Imperative as koyoo (the Standard Japanese Hortative form), Kyūshū Hōgen Gakkai (1991: 156-157) records koì for a nearby town (Kuchinotsu) and the entire surrounding area.
bigrade blocking hypothesis.\(^3\) On the basis of the GAJ data, then, we would count nine violations of that hypothesis out of a possible 105, for a compliance rate of 91.4\%. If we rely instead on the testimony of Kyūshū Hōgen Gakkai (1991) and Ōnishi (2016) regarding the distribution of \(\text{okaru}\), the target set is reduced from 35 to 33 locations, and there are only three violations out of a possible 99, for a compliance rate of 97.0\%.

For the monosyllabic e-stem \(\text{ne-} \) ‘sleep’, the GAJ data suggest a sharply lower rate of compliance with the bigrade blocking hypothesis. There are 21 locations that report only \(\text{muru}\) or phonetic developments thereof (\(\text{nut}, \text{mu}, \text{mai}\)) for the Conclusive of that stem, and two inflected forms that could in principle show innovative \(r\)-suffixes, the Negative and the Hortative. Of the resulting 42 potential bigrade blocking violations, 16 are in fact realized; both Negative \(\text{neran}\) and Hortative \(\text{nero}\) are relatively common at the locations of the target set. The bigrade blocking compliance rate is therefore 26 out of 42, or 61.9\%.

Finally, we must consider the two irregular stems, \(\text{se/-si-} \) ‘do’ and \(\text{ko/-ki-} \) ‘come’, which retain the bigrade alternation over most of the country in the Conclusive and, to a somewhat lesser extent, in the Provisional as well. That there is a tendency for the bigrade blocking hypothesis to be observed with these two verbs, first of all, can be illustrated with the Negative. For \(\text{se/-si-}\), innovative Negative \(\text{-ran}\) is attested in the GAJ (map 84) only at one point in the Gotô islands and at four points in the Mikawa Bay region of Aichi Prefecture, always in variation with conservative \(\text{sen}\). At the Gotô location, while the Provisional is leveled \(\text{sereba}\), the Conclusive is reported as \(\text{su}\) (\(<\text{sur}<\text{sura}\)), so that Negative \(\text{seran}\) represents a violation of the bigrade blocking hypothesis. In the Mikawa Bay region, however, the stem is nonalternating \(\text{se-}\) over a relatively wide area, showing Conclusive \(\text{seru}\) (GAJ map 70), Provisional \(\text{sereba}\) or reduced \(\text{se(r)ya}\) (map 131), and Conjunctive \(\text{seri}\) (Yoshikawa & Yamaguchi 1972: 152). No bigrade blocking violation thus results. Innovative Negative \(\text{koran}\) ‘doesn’t come’ is even more limited in distribution than \(\text{seran}\), being attested, in variation with conservative \(\text{kon}\), only at three points in the Izumo region of Shimane Prefecture (GAJ map 83). At those three points, while the stem has not become totally nonalternating, the fact that the bigrade alternation in particular is in the process of being leveled is shown by the innovative Provisional forms \(\text{korya(a)/kora}\).

At the same time, however, it is clear that certain innovative \(r\)-suffixes, notably the stem-forming suffixes Causative \(-\text{rase-}\) (\(\sim\) \(-\text{ras-}\)) (map 120) and, to a lesser extent, Potential \(-\text{re-}\) (map 178), show far too wide a distribution with \(\text{ko/-ki-}\) to allow dismissal of the innovative forms as isolated exceptions. One possible factor in this relatively wide distribution of Causative \(\text{ko-\text{rase-}}\) and Potential \(\text{ko-\text{re-}}\) is geographical diffusion of forms that, given the irregularity of \(\text{ko/-ki-}\), are likely to have been lexicalized. Such diffusion has a clear precedent in Imperative \(\text{koi} \) ‘come!’ (map 90), which, uniquely among vowel-stem Imperatives in \(-\text{i}\) (contrast map 87) has, with its phonetic derivatives, a distribution that includes all of Kyūshū (see also Kyūshū Hōgen Gakkai 1991: 156-157) and much of eastern Japan. While geographical diffusion may have played a part in the spread of \(\text{ko-\text{rase-}}\) and \(\text{ko-\text{re-}}\), however, the near universality of unleveld Conclusive \(\text{kuru}\) shows that the origin of those innovative forms cannot be attributed to regularization under Analysis A if the bigrade blocking hypothesis is to be maintained. Rather, it would seem, we must appeal in explaining them to surface analogy with forms that do owe their innovative \(r\)-suffixes to Analysis A. Crucially, given the extremely high rates of compliance with bigrade blocking for polysyllabic stems, this kind of surface analogy would need to be postulated only for the four monosyllabic e-stems and the two irregulars—that is, for precisely the set of monosyllabic alternating vowel-final stems.

In this section, we have evaluated the degree to which modern Japanese dialects conform to the bigrade blocking hypothesis. We have seen that for polysyllabic stems, both e-stems and i-stems, the rate of compliance approaches 100\%, but that it is significantly lower for the small number of monosyllabic stems, both regular e-stems and irregular ‘do’ and ‘come’. While we have suggested that this difference can be accounted for in terms of the sensitivity of monosyllables to surface analogical influences, the issue deserves further investigation. There can be little doubt, however, that the phenomenon of bigrade blocking, as epitomized by dialects that have multiple innovative \(r\)-suffixes, but only for nonalternating stems (Table 3 above), represents a linguistically significant generalization. Our focus now shifts to the question of how to account for that generalization, and as a preliminary step, we take up, in §§3.4 and 3.5, two types of proposals that might appear promising in that regard.

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\(^3\) The GAJ survey points are 737497 (Gokase) and 739405 (Shiba). It is worth noting that Ōnishi (2006: 89), working with the GAJ data, attributes the apparent presence of Negative \(\text{okiran}\) beside Conclusive \(\text{okaru}\) in this area to influence from the adjacent dialect rather than to grammatical reanalysis.
3.4 Representational approaches to bigrade blocking

In the $r$-Epenthesis rule of (1b), the verbal constituent in the rule’s environment $V_{\text{th}}$ is assumed to be a stem. As a result, one straightforward reaction to the phenomenon of bigrade blocking would be to conclude that verbs like ake-‘open (tr.)’ that show the bigrade alternation cannot be analyzed as having stems that end in the alternating vowel. This is because if they did, Analysis A would treat them no differently from stems ending in nonalternating vowels, and we would expect them to come to display the innovative $r$-suffixes that are the hallmark of regularization under that analysis. As an alternative to analyzing the stem of a bigrade verb as ending in the alternating vowel, the stem might be taken to be the string ending in the preceding consonant (cf. de Chene 1985: 180). Under this proposal, the Takachiho Conclusives and Negatives of Table 3, for example, would (omitting brackets around suffixes and showing the results of $r$-Epenthesis) have the structures [(oki)ru], [(oki)ran] and [(ag)aru], [(ag)en].

While the proposal to treat bigrade verbs as consonant-stems might seem to be validated by the fact that the consonant-final sequence in question is precisely what all inflected forms of a bigrade stem have in common, that proposal has immediate negative consequences. One is that if bigrades are C-stems, they will have to carry a lexical mark to distinguish them from regular or unmarked C-stems, which constitute, as we have seen, two thirds of the verbal lexicon; note that for a regular C-stem $*ag\$, the Conclusive and Negative would be $*[ag]u$, $*[ag]an$. This in turn predicts that if and when bigrades regularize, they should become regular C-stems. But this never occurs; bigrades always regularize as nonalternating V-stems. A second problem is that if what we have treated as the alternating vowel $i/e \sim u$ is simply the first segment of a variety of suffixes, there will be no way to express the observed elimination of the bigrade alternation as leveling and, more generally, no way to motivate it.

A somewhat more sophisticated variant of the C-stem approach to bigrades would treat the alternating vowel as a suffix, roughly analogous to the Indo-European thematic vowel. Abbreviating stem and theme as “St” and “Th”, respectively, the structure of the Takachiho Conclusives and Negatives cited above could then be [(oki $s$) ru], [(oki $s$) ran] and [(ag $s$) $\overline{u}$ $\overline{n}$] ru], [(ag $s$) $\overline{v}$ $\overline{n}$] n], with $r$-Epenthesis written so as to apply at stem boundary but not at theme boundary. This treatment of bigrade forms would avoid the negative consequences of the bigrades-as-C-stems proposal that were noted in the last paragraph: bigrade stems would be distinguished from regular C-stems in the lexicon by the presence of the thematic vowel rather than by a diacritic, and, given the treatment of the alternating vowel as a separate morpheme, elimination of the bigrade alternation would be a straightforward example of leveling.

The thematic vowel proposal, however, has a more subtle problem. Observe first that a hypothetical restriction on the $r$-Epenthesis rule of (1b) to the effect that the vowel-final verb stem of that rule must be nonalternating would be a global condition, since verification of nonalternating status would require reference to multiple forms. Note now that the thematic vowel will have to be absorbed into the verb stem when its alternation is leveled, so that newly nonalternating stems become subject to the $r$-Epenthesis rule. This latter point, however, underlines the fact that the thematic vowel proposal—treating what appears to be a stem-final vowel as a separate morpheme when and only when it alternates—is little more than a way to make the existence of the alternation structurally visible, thus allowing reference to it without postulating a frankly global condition on the relevant rule. This line of argument suggests that even if some version of a representational approach to the phenomenon of bigrade blocking can be made to work, it will in all probability remain stipulatory and unsatisfying.

3.5 Approaches to bigrade blocking based on recharacterization of Analysis A

In addition to the representational proposals treated in §3.4, there are a variety of intuitions on which it might at first glance seem possible to base an understanding of bigrade blocking but which in the end do not yield an account that will withstand scrutiny. This is true in particular of certain proposals that would seek to reinterpret or recharacterize Analysis A. For example, one might suggest (with a reviewer) that the import of that analysis is that, epenthetic $r$ aside, V-stem inflection is identical to C-stem inflection. The bigrade alternation creates a violation of this identity condition and so blocks adoption of the analysis. There are, however, both conceptual and empirical reasons for skepticism about such an identity condition. Since Analysis A, as an account of suffix alternations, is properly just a specification of suffixal underlying forms plus a phonological rule, the proposed identity condition would constitute an ad hoc addition to it, and one that, like the hypothetical nonalternation condition referred to in §3.4, is clearly global in nature. More
concretely, the proposed identity condition predicts that the blocking effect would disappear if C-stems (in particular, those with a front vowel in their final syllable) also underwent the bigrade alternation and that, conversely, a blocking effect would obtain if C-stems underwent the alternation and V-stems did not. Neither of these predictions, however, seems particularly plausible.

As another possibility, one might propose that Analysis A involves basing the paradigm of V-stem verbs on the Conjunctive; this could be seen as a natural analytic move because the latter is a semantically basic form with a zero suffix (see Bybee 1985: 52-57 and references cited there). Since innovative Conclusive akeru can be analyzed as containing Conjunctive ake, but conservative Conclusive akuru cannot, Analysis A would be impossible until akuru is replaced by akeru. This proposal, however, in writing a requirement that V-stem forms be based directly on the Conjunctive into the statement of Analysis A, assumes in disguised form the nonalternation requirement on the adoption of that analysis that constitutes our explicandum and thus verges on circularity.

In §3, we have documented the phenomenon of bigrade blocking and discussed several accounts of it that we have deemed ultimately to be unsuccessful. Before returning to the question of explanation in §5, we take up, in §4, the nature of leveling. The understanding of that phenomenon that we gain there will undergird the remainder of the paper.

4. Prolegomenon: On leveling

In §4.1, I sketch an interpretation of leveling on which it constitutes one subtype of regularization. In §4.2, citing a Japanese example that will also play an important role in the discussion of §5, I take up alternative interpretations of leveling that have been proposed in recent literature, in particular with regard to its motivation.

4.1 Leveling and extension as subtypes of regularization

In explicating the concept of leveling, let us start with the concept of alternation, or grammatically (as opposed to sociolinguistically) conditioned variation in morpheme shape. An (instance of) alternation may be conceptualized as affecting a morpheme as a whole, but also as affecting a segment within a morpheme or a feature bundle within a segment. Thus, the alternation that German /rad/ ‘wheel’ undergoes as a result of syllable-final devoicing may be expressed as [rad] ~ [rat], as [d] ~ [t], or as [+voice] ~ [–voice]. As the first element in our understanding of leveling, I will adopt the assumption that the unit to which leveling applies is the individual alternation, expressed in principle in terms of the minimal applicable unit; this will typically be the segment for segment-zero alternations and the feature bundle otherwise. For concreteness, let us assume that an alternation undergoing leveling is formulated either as a minor rule, a rule applying only to morphemes specifically marked to undergo it, or by means of the lexical listing of marked suppletive allomorphs alongside a default form.

Multiple alternations can target a single morpheme, as in the frequently cited Old English example cēos-an/cor-en ‘choose/chosen’, where each of the three stem segments undergoes a distinct alternation (see e.g. Fertig 2016: 440). Under the conception of leveling just sketched, it is unremarkable that in such a case, leveling may apply to one or more of the alternations without affecting the others. This is of course illustrated by the modern English forms, in which the two consonantal alternations have been leveled, but the ablaut alternation of the stem vowel has been retained. Another consequence of our conception of leveling is that, absent compelling evidence to the contrary, we expect the process to proceed in the same way in affixes as it does in stems. Because of this expectation, I will take the common term “paradigm leveling” to invite misunderstanding and avoid it except in citing the work of others. I will, however, return below to the question of the nature of leveling in suffixes.

With the above as background, and following the treatment in de Chene (2016: §1.2), I now propose that both leveling and extension of (nonautomatic) alternations are special cases of regularization, where the latter is understood as simplification of lexical entries by loss of the lexical coding of irregularity.4 The unity of leveling and extension is well illustrated by ongoing changes in Korean nominal inflection (Albright 2008: 167ff., Ito 2010, de Chene 2016: 71-72, among many others), and in order to motivate the proposal in question, I introduce those changes briefly.

4 As Fertig (2016: §2.3) points out, the treatment of leveling as regularization is, at least in general terms, relatively common. I would resist, however, Fertig’s suggestion that adoption of this position represents a decision to remain “agnostic on the mechanisms question” and submit that regularization, as characterized here and below, is itself appropriately viewed as a mechanism of change.
In Korean, as the result of syllable-final (a) reduction of clusters and (b) neutralization of manner and laryngeal contrasts, the inventory of obstruents in syllable codas is limited to \( ptk \). Further, as the result of (unsuffixed) isolation forms of nouns being taken as morphophonologically basic, each of stem-final \( ptk \) in basic forms alternates before a vowel-initial clitic with multiple obstruents and clusters depending on the individual lexical item; typical examples of alternation are \( p/p, pp/p, p/p/s; t/t\text{'}, t/c; t/s; k/k, k/k, k/lk \). At each point of articulation, the alternation with the highest type frequency has been chosen as regular; this is the null alternation for labials and velars, and the \( t/s \) alternation for coronals. There is thus a rule taking \( t \) to \( s \) when it is both final in a noun stem and, as the result of resyllabification before a vowel, syllable-initial, but no rules affecting stem-final \( p \) or \( k \). A stem that undergoes an irregular alternation will have this fact recorded lexically either as a minor rule specification or as an environmentally restricted allomorph.

It is widely understood that, in psychological terms, regularization is the result of failure to retrieve irregular forms from memory (Marcus et al. 1992: vi, 15–18; Albright 2002: 10–12; Garrett 2008: 128); the grammatical correlate is loss of specifications of irregularity from lexical items. In Korean, as lexical entries for nouns are simplified by loss of the environmentally restricted allomorph or the minor rule specification, the result is leveling in favor of the default form for labial-final and velar-final stems. For coronal-final stems, however, simplification of lexical entries results in the \( t \)-final default form undergoing the \( t \)-to-\( s \) rule, so that the \( t/s \) alternation is extended. In contemporary Korean, these changes are all proceeding simultaneously, and thus quite clearly constitute a unified phenomenon. The crucial difference between leveling and extension, then, is the existence of a productive morphophonological rule in the latter case; otherwise, both change-types are the automatic consequence of loss of lexical irregularity.\(^5\)

In order to complete this picture of leveling, we need an account of how lexical irregularity, in the relevant sense, arises in the first place, given that (as was the case for the bigrade alternation in polysyllabic stems) an alternation may persist over long periods of time without being either leveled or extended. I will assume that stability of a nonautomatic alternation is the result of lexical representations that code all alternants in parallel fashion, for example by listing each with the environment in which it occurs (as in Bloch’s (1946) account of the Japanese alternations of Table 1), or by listing all alternants without specification of environment and treating the choice between them as the outcome of constraint rankings (as in Ito & Mester’s (2004) account of the same alternations). Analyses with lexical representations of this type may be called “symmetrical” treatments of the relevant alternations, as opposed to analyses with lexical representations characterized by a distinction between defaults and special or exceptional cases (“default structure”). Given an alternation with a symmetrical analysis, speakers will have no basis for eliminating any alternant in favor of any other, and the alternation will remain stable. Regularization, conversely, in the form of either leveling or extension, will be dependent on adoption of default structure for the lexical representations in question.

The account of leveling just sketched places that phenomenon in the context of a framework that also encompasses the other two logical possibilities for treatment of a nonautomatic alternation, namely maintenance and extension: if lexical representations for alternating morphemes do not include defaults, the alternation is predicted to remain stable, and if they do include defaults but the alternation is taken as rule-governed, it will be extended rather than leveled. These predictions are summarized in the flowchart (2).

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\(^{5}\) The statistical preponderance of leveling over extension (Mariczk 1958, Fertig 2016: 425, 449) is presumably the result of relatively stringent constraints on the postulation of innovative morphophonological rules; on this issue, see §5.3 below.
When we speak of regularization as resulting from loss of the lexical coding of irregularity, then, “irregularity” refers to lexical information, whether in the form of a suppletive allomorph or a rule specification, over and above a default representation. It is this kind of “excess” lexical information that tends to be lost over time from lexical entries when it is “not learned, remembered, or accessed fast enough” (Garrett 2008: 128), thus engendering regularization.

4.2 Additional motivation for leveling?

On the account of §4.1, the fundamental driver of leveling is simply the tendency for information in excess of a default form to be lost from lexical entries. This, however, does not exclude the possibility of other types of motivation in individual cases. In particular, the question of proportional motivation for leveling has been a perennial topic of discussion in historical linguistics since Neogrammarian times (see Fertig 2016: §§1-2). In §4.2, after introducing a Japanese example that will serve as a test case, I consider the question of motivations for leveling that are unrelated to regularization, concentrating on the question of proportionality.

4.2.1 A test case

Consider the sound changes of (3), a set of monophthongizations that occurred (with a degree of dialectal variation) in Japanese prior to the year 1600 and whose results are recorded in the grammatical and lexical materials compiled by Portuguese missionaries in the early 17th century.

(3) a. iu > yuu  c. ou > oo  
  b. eu > yoo  d. au > oo

The changes (3) took place both morpheme-internally (typically in Sino-Japanese morphemes) and in a variety of morphological combinations (see Frellesvig 2010: 319). Crucially, they took place across stem boundary in the paradigm of vowel-stem verbs because of the reduction of the Inferential suffix -mu (-amu after consonant-stems) to -u. Thus, for example, the Inferential of oki- ‘arise’ developed from oki-u to okyu, and the Inferential of ake- ‘open (tr.)’ from ake-u to akyoo. As a result, both the stem and the Inferential suffix came to alternate for V-stem verbs. This is illustrated in Table 4, where the Conjunctive and Negative are used as representative of forms that are based transparently on the vowel-final stem.

| Conjunctive  | oki-Ø | ake-Ø |
| Negative     | oki-n | ake-n |
| Inferential  | ok-yuu| ak-yoo|

Table 4. V-stem Inferentials in 1600

In contemporary standard Japanese and many other dialects, the Inferential forms of Table 4, now expressing a Volitional or Hortative meaning, have been replaced by those of Table 5.

| Conjunctive  | oki-Ø | ake-Ø |
| Negative     | oki-na-| ake-na-|
| Hortative    | oki-yoo| ake-yoo|

Table 5. Contemporary V-stem Hortatives

Both the stem alternation and the suffix alternation seen in Table 4, that is, have been leveled; leveling of the Inferential
stem alteration can be linked to leveling of the bigrade alternation in that the two changes occurred more or less simultaneously, involved generalization of the front-vowel stem allomorph (oki/-ake-), and followed the same path, with i-stems and shorter stems regularizing first (see Sakanashi 1982: 475-477, 496-497). In terms of relative chronology, leveling in suffixes preceded leveling in stems, so that okiu > okuyu will have passed through the stage okyoo before undergoing leveling of the stem alternation and emerging as okiyo (Sakanashi 1982: 496, Fukushima 1969). This chronology is consonant with the relative geographical distribution of the two changes in contemporary dialects, where the locations that have leveled the stem alternation constitute a proper subset of those that have leveled the suffix alternation (GAJ map 106). There are locations in western Japan, that is, that preserve (alongside akyoo < akei) the postulated intermediate stage okyoo, with the suffix alternation leveled and the stem alternation intact, but none that show *okiyu, with the stem alternation leveled and the suffix alternation intact. It appears likely, then, that the latter form has never existed.

Under the interpretation of leveling proposed in §4.1, the changes relating the forms of Table 5 to those of Table 4 result from regularization, the elimination of lexical specifications of irregularity following adoption of a default vs. special case structure for the relevant lexical representations. To make this claim more concrete, we may note that the choice of the default follows from the same principle for both the stem and suffix alternations, namely that the default altemant of an alternating morpheme is the one that occurs with the largest number of eligible cooccurring elements—for stem alternants, morphosyntactic feature complexes or paradigmatic slots; for suffix alternants, lexical stems (for elaboration of this criterion, see de Chene 2016: 74). Specifically, the vowel-final stem alternants oki- and ake- of Table 1 occur in all forms except the Inferential, making them unmarked with respect to the consonant-final alternants ok- and ak-, and the e-final stems with which the alternant -yoo occurs are approximately ten times as common as the i-final stems that take the alternant -yuu (1261 e-stems versus 127 i-stems in the CD version of Nishio et al. 2000), making the former unmarked with respect to the latter. In the following section, we raise the possibility that the changes evident in Table 5 have additional types of motivation as well.

4.2.2 Proportionality and associative interference

Fertig (2016: 424-425) traces the view that “all analogical innovation, including paradigm leveling,” results from the “productive application of grammatical rules” back to Paul (1886) and adopts the term proportional to characterize that view, associating it with a morphological framework in which the word is the minimal unit of analysis. While not using that term, Garrett (2008: 142), in parallel fashion, proposes that “paradigm uniformity is always the imposition of an existing (uniform) pattern on a nonuniform paradigm.” I will state the claim in question, without reference to the concept “paradigm”, as the hypothesis (4).

(4) Proportionality Hypothesis: All leveling is the result of the proportionally mediated extension of patterns of nonalternation.

Let us return to the Japanese example of §4.2.1 in the light of the Proportionality Hypothesis. Consider first the stem alternation. As a result of the changes (3), every Japanese vowel-stem verb will have come to have a consonant-final altemant in the Inferential; this includes se/-si- ‘do’, with Inferential s-yoo < se-u, and ko/-ki- ‘come’, with Inferential k-o < ko. There will thus have been no nonalternating model among vowel-stems for leveling of the alternations oki- and ake-. More concretely, there will have been no vowel-final stem XV- capable of supporting a proportion like XV±e : XV-yoo : ake±e : X (X = ake-yoo), where e is the marker of the Conjunctive, arguably the least marked verbal category. Parallel proportions based on consonant-stem forms will fail for one or more of a number of reasons, notably the fact that C-stem and V-stem suffix alternants are typically distinct, precluding the required point of contact between the first and third terms of the proportion, and the fact that the C-stem Inferential suffix is -oo (0 -a < -a) and will thus provide no account for the y of the V-stem suffix. Leveling of the stem alternation in the Inferential case thus appears to constitute a counterexample to (4).

Moving now to the suffix alternation -yoo/-yuu, there are at least two ways we can envision extending the idea that leveling represents proportionally motivated imposition of an existing pattern to a case of this sort. In line with the idea that leveling in stems results from extension of the nonalternating status of an existing set of stems, first of all, we could
propose that leveling in suffixes is to be explained as extension of the nonalternating status of an existing set of suffixes. Given that inflectional suffixes other than the Inferential are in fact nonalternating over the set of V-stems, those suffixes might appear to provide the required nonalternating model. In fact, it is less than clear that we want to claim that leveling of the /yoo/-/yuu/ alternation is the consequence of the nonalternating status of suffixes like Conjunctive -∅ and Negative -n, underlining the fact that the ability to cite a possible nonalternating model for a given case of leveling is not ipso facto a demonstration that that model was instrumental in bringing about the relevant change. Setting that point aside, however, let us ask what an attempt to express the proposal in question by means of a proportion whose terms are full inflected forms would look like. Such a proportion would diverge from the typical pattern in that its first two terms would be related by sharing a suffix rather than by sharing a stem. Remembering that suffix leveling preceded stem leveling in the case at issue, we might thus essay the proportion (5) in an attempt to account for the form okyoo.

(5) aken : okin :: akyoo : X

Typically, of course, leveling in suffixes is in fact expressed proportionally as extension of a suffix alternant from one context to another, as in the textbook example stone : stones :: cow : X (X = cows) (Hock 1991: 172). On this model, we might propose (6) as an alternative to (5), with the only difference being the interchange of terms two and three.

(6) aken : akyoo :: okin : X

Both (5) and (6), however, appear to be illegitimate, and for the same reason, namely that the required formal point of contact between terms one and three fails to exist. More specifically, we expect the residue in term one resulting from excluding the string that terms one and two have in common—ake in (5) and en in (6)—to appear in term three, but this expectation is not realized. Leveling of the suffix alternation in the example of §4.2.1 thus appears to be as devoid of proportional motivation as was leveling of the stem alternation.

Fertig (2016: 423), arguing, similarly, that not all leveling is proportional, proposes that “something akin to the ‘interference’ mechanisms commonly associated with contamination and folk etymology account well for the nonproportional instances.” Let us ask whether the relevant interference mechanisms can shed light on the development of okyoo and akyoo to okiyoo and akeyoo in Japanese.

Fertig takes the mechanism behind folk etymology, first of all, to be perceptual confusion, either hypocorrective (upmost replacing utmost) or hypercorrective (sandblind replacing (inferred) *samblind). Perceptual confusion, however, would not seem to be a helpful concept in the Japanese case: contrasts between mid and high vowels (/yoo vs. -yuu/) and between /Cyo/ and /Cyo/ sequences (okyoo vs. okiyoo) are robust and stable in Japanese, and if they had been misperceived, the effects would have shown up somewhere in addition to the set of morphemes involved in the relevant levelings. Contamination, on the other hand, is such a general concept that it could be held to apply, when convenient, to virtually any occurrence of leveling at all. It would thus seem prudent to limit appeal to it to cases where its relevance seems patent, such as the innovation of b-initial forms in the Middle High German Imperative and Present Indicative of ‘be’ as a result of influence from 2nd singular bist (Paul 1920: 161, Fertig 2016: 443).

Considering both proportional pressure and associative interference as possible factors in the leveling of the stem and suffix alternations of Table 4, then, we have reached the conclusion that there is no reason to believe that either factor was operative. If so, neither proportional pressure nor associative interference is essential to the nature of leveling, however plausible their operation may be in individual cases; nor does all leveling involve one or the other of the two factors, as proposed by Fertig (2016). Rather, what unites all cases of leveling is simply the concept of regularization, as characterized in §4.1.

5. Toward an explanation of bigrade blocking

As we noted at the outset, the explanation of bigrade blocking to be offered in this section will appeal to the phonological distance between alternants as one factor determining the susceptibility of alternations to leveling. To
motivate this idea, §5.1 will present three brief case studies that illustrate it. Section 5.2 then extends that idea first to the relative chronology of stem and suffix leveling in Japanese Inferential forms and then to the relation between leveling of the bigrade alternation and the adoption of Analysis A. Section 5.3, finally, raises the question of whether it is necessary to recognize a triggering effect relating leveling of the bigrade alternation and the adoption of Analysis A in addition to the blocking effect already documented and answers that question in the negative.

5.1 Phonological distance as a factor in leveling

There is reason to believe that phonological distance between alternants is one of the many factors that determine whether or not leveling takes place in any given case. I will motivate this idea with three brief examples, while noting that the issue deserves fuller treatment than we can give it here. Because two of our examples will require us to evaluate the phonological distance between short diphthongs (contour vowels) and short monophthongs, I will begin by introducing an assumption that bears on that question. Throughout, I will abstract away from the question of the relative contributions of articulatory and perceptual factors to the measure of phonological distance employed.

First, take the unit of phonological distance to be a single phonological feature. Consider now the effect on phonological distance of a secondary articulation like palatalization. The phonological distance between /p/ and /p̩/ is arguably less than the phonological distance between pairs like /p/ and /p̩/ or /p̩/ and /k̩/, whose members differ in two features and thus in two units of phonological distance. If so, a secondary articulation should count as a single unit of phonological distance.

Unlike primary and secondary articulations, the two elements of a (monosegmental) diphthong are of course sequential rather than simultaneous. It nevertheless seems plausible that the difference between /a/ and /a̯/ is parallel to the difference between /p̩/ and /p/ for the purpose of computing phonological distance, and more generally that the secondary or less prominent portion of a contour vowel is equivalent to a secondary articulation for that purpose. If so, and using in illustration diphthongs that will figure in our examples below, the phonological distance between /æ/ and /æ̯/ or between /a/ and /a̯/ will be one unit, like the difference between /p/ and /p̩/, and the phonological difference between /e/ and /æ̯/ or between /o/ and /a̯/ will be two units, one for the height difference (assuming that the rounding difference is nondistinctive in the second case) and one for the secondary articulation.

Moving now to our first example, the Present stem of Old English verbs like streck-an ‘spread out’ < PGmc. *strakjan and þecc-an ‘cover’ < PGmc. *thakjan reflects (in addition to the fronting of /a/ to /æ/ (“Anglo-Frisian Brightening’)), Umlaut (/æ/ > /e/), and palatalization and gemination of the stem-final velar consonant, all three effects conditioned by the palatal semivowel of the ancestral form. In Past forms (Indicative and Participle), which lacked this palatal element, none of these changes occurred, and a form like Past Ind. 1st/3rd Sg. *strak-te developed regularly to /strækt/, with the stem vowel then undergoing Breaking to give /stræxt/, written streadhe. At this stage, then, the stem vowel displayed the alternation /e/ ~ /æ/, and the stem-final consonant the alternation /œ/ ~ /œ/ (see Fertig 2016: 440-441). As indicated above, there are plausibly two units of phonological distance between /æ/ and /æ̯/, although given the regularity of breaking for /æ/ before [+back] /œ/, it is possible that the [+back] offglide of /æ̯/ constitutes nondistinctive information, in which case the phonological distance in question would reduce to a single unit. /œ/ and /œ/, in contrast, in addition to showing a geminate/singleton distinction, differ in their values for [back], [coronal], and [continuant], and thus are separated by roughly four units of phonological distance.

This phonological distance differential between the two alternations is reflected in their subsequent history. In the transition from early to late West Saxon, as noted by Campbell (1961: 330) and Fertig (2016: 440-441), the stem vowel alternation of the relevant forms is leveled in favor of /æ/, so that later texts uniformly show strehte for the Past of streccan. The alternation of the stem-final consonant, in contrast, remains intact. It is clear, then, that the alternation involving less phonological distance was the more susceptible to leveling, and the alternation involving greater phonological distance the more resistant.

Our first example involved alternations $X_1 \sim X_2$ and $Y_1 \sim Y_2$ affecting two distinct phonological segments. Our second, from the history of Romanian, involves a double alternation $X_1 \sim X_2 \sim X_3$ in a single phonological segment, the *o of verb stems like *porta- ‘carry’ and *mor-i- ‘die’. Tone *o alternates with *aa (/qa/) when followed by a (typically word-final) nonhigh vowel (Lombard 1954: 129, Chitoran 2002: 201, Alkire & Rosen 2010: 255). Atonic *o, on the other hand, reduces to u. As a result, the Present Indicative of a verb like ‘carry’ (see Alkire & Rosen
In the paradigm of a small number of verbs, the alternation \( \text{o/\text{pa}}u \) has been leveled in favor of \( u \) (Lombard 1954: 144, Alkire & Rosen 2010: 270), which is the most frequent alternant across the full verbal paradigm because the majority of forms are stressed on the theme vowel. In several other verbs, however, the unstressed alternant \( u \) has been replaced by \( a \), while the alternant \( \text{pa} \) has remained stable. A well-known example of this second development involves *\( \text{dorn-i} \) ‘sleep’, for which the unstressed alternant *\( \text{durn-} \) is attested in older documents and survives today in the dialect of Transylvania (Lombard 1954: 131), but which in the modern standard language has been replaced everywhere in the paradigm by *\( \text{dorn-} \). The set of verbs with the alternation \( \text{o/\text{pa}} \) for which there is documentary evidence for the stage with atonic \( u \) either in the historical record or in regional varieties (see Lombard 1954: 131-134) includes *\( \text{inmod-a} \) ‘tie’, *\( \text{not-a} \) ‘note down’, *\( \text{plow-a} \) ‘min’, *\( \text{inflor-i} \) ‘bloom’, and *\( \text{sort-b-i} \) ‘sip’; atonic \( u \) also survives in the Perfect of *\( \text{coas-e} \) ‘sew’. Crucially, there appear to be no verbs in which the alternation \( \text{o/\text{pa}} \) has been leveled while the alternation \( \text{o/u} \) has been maintained. Given that \( u \) and \( u \) are separated by a single unit of phonological distance, while \( a \) and \( \text{pa} \) are separated by two (assuming that the rounding difference is nondistinctive), it is thus again the alternation involving less phonological distance that has proven more susceptible to leveling.

Our third case suggesting the relevance of phonological distance to whether or not leveling is observed, parallel in structure to the second, draws on German data cited by Paul (1920: 203-205). The stem of a verb like *\( \text{nehmen} \) ‘take’ displays an alternation in the present tense between *\( \text{neh/m} \) in 2sg. *\( \text{nimmst} \) and 3sg. *\( \text{nimm} \) and *\( \text{nehm} \) otherwise that goes back to Proto-Germanic (see Ringe 2006: 126-128). Open syllable lengthening in the early modern period resulted in a third present tense allomorph *\( \text{neh/m} \) in forms with vocalic endings, specifically 1sg. *\( \text{nehme} \) and 1pl./3pl. *\( \text{nehmen} \). Subsequently, *\( \text{neh/m} \) was extended to the 2pl. form in *\( \text{nehmt} \), as the modern spelling *\( \text{nehmt} \) indicates. The alternation *\( c/e \) in, in which the alternants differ only in length, was leveled, in other words (as it was throughout the paradigm in verbs like *\( \text{leben} \) ‘live’ that had never had any other alternation) while the alternation *\( e/i \) in which the alternants differ both in length and in height, has been retained.\(^6\)

The evidence we have seen in this subsection suggests that, other things being equal, alternations involving only minimal phonological distance between alternants will submit to leveling more readily than alternations involving greater phonological distance. Phonological distance, it goes without saying, may be overridden by other factors as a determinant of leveling. In particular, an alternation that is taken by speakers to express a morphosyntactic distinction, as in the case, referred to above, of English *\( \text{choose/} \text{chosen} \), will be retained regardless of phonological distance. Similarly, given the English forms *\( \text{drink/drunk} \), *\( \text{drank} \), we know independently of all phonological considerations that if the distinction between two of them is leveled, it will be the distinction between the second and third, both of which realize the morphosyntactic feature specification \([+\text{Past}]\). However, building on the evidence we have just seen, we will propose that it is phonological distance that has been the decisive factor in determining the course of regularization in our two Japanese cases.

### 5.2 Blocking: Phonological distance and the course of regularization in Japanese

As we noted in §4.2.1, leveling of the Inferential (later Volitional/Hortative) suffix alternation -\( \text{yuu}/\text{yoo} \) preceded leveling of the stem alternations *\( \text{ok/-oki-} \) and *\( \text{ak/-ake-} \), and leveling of the stem alternation is limited geographically to locations that have also undergone leveling of the suffix alternation. If we now ask why the two changes should show this temporal and spatial distribution rather than, for example, the opposite distribution, with leveling of the stem alternation preceding leveling of the suffix alternation and leveling of the suffix alternation occurring in only a proper subset of the locations that show leveling of the stem alternation, it is clear that the factor of phonological distance is potentially relevant. Concretely, while the stem alternations *\( \text{ok/-oki-} \) and *\( \text{ak/-ake-} \) involve a full segment alternating with zero, the suffix alternation -\( \text{yuu}/\text{yoo} \) involves a single degree of vowel height.

In conjunction with the examples of §5.1, then, the Inferential case suggests a principle to the effect that, within a

\(^6\) Paul (1920: 203) notes that length has been extended while leaving a quality alternation in the same segment intact in the case of verbs like *\( \text{tragen}/\text{tragen} \) ‘carry’, 3sg. *\( \text{trigt} /\text{trikt} \); as Fertig (2015: 224) points out, the same is true in the contemporary language for verbs like *\( \text{lesen}/\text{lezien} \) ‘read’, 3sg. *\( \text{liest} /\text{lrest} \). While these developments might be taken to suggest that the phonological distance occupied by a length difference is less than that occasioned by a difference in backness or height, this is a question we will have to leave for future research.
specified morphological domain, an alternation involving a greater degree of phonological distance cannot be leveled before an alternation involving a lesser degree thereof. The morphological domain within which pairs of alternations will be subject to this principle must minimally be the size of a morpheme; I will assume that, for a given pair of alternations, it may extend across morpheme boundaries to encompass a full inflected form, on condition that there be a well-defined set of inflected forms that, as a result of morpheme concatenation, are subject to both of the alternations in question. Remembering that under the proposals of §4.1, the analytic trigger of leveling is the assignment of default structure to lexical entries, the relevant principle can be stated as a hypothesis about speakers’ analytic choices as in (7), where “simpler” paraphrases “involving lesser phonological distance between alternants”.

(7) Within the domain of the inflected word, no grammar can assign a default value for a given alternation while failing to do so for a simpler alternation.

It is of course possible that principle (7) represents a tendency rather than an absolute restriction. In the historical development of Inferential forms, okyuu and akyoo will have been derived from /oki + u/ and /ake + u/, respectively, as long as the monophthongizations iu > yuu and eu > yoo remained active phonological rules. When the monophthongizations ceased to be active and these derivations became impossible, the alternation between -yuu and -yoo will have ceased to be predictable, since nothing in stem alternants like ok- and ak- indicates which of the two Inferential suffix alternants is the appropriate one. Given the ten-to-one type frequency imbalance in favor of -yoo, that alternant will quickly have been taken as the default form, resulting in leveling. At this point, with default structure assigned to the simpler alternation, assignment of default structure to the more complex stem alternation will also have become possible.

Principle (7) is clearly applicable to the phenomenon of bigrade blocking as well. The bigrade alternation, under which a front vowel alternates with i, involves the single feature [back] when the front vowel is i and the two features [back] and [high] when the front vowel is e. The irregular suffix alternations introduced in Table 1, on the other hand, involve a wide variety of segment-zero alternations and one alternation, that of the Imperative, that is frankly suppletive. (7) will have the consequence, then, that Analysis A, which takes consonant-stem suffix alternants as defaults, is impossible as long as the bigrade alternation is given a symmetrical analysis. And the fact that that alternation remained stable, at least in polysyllables, for many centuries indicates that over that period, the analysis in force must indeed have been a symmetrical one, one that did not involve treating the front vowel alternants, the eventual targets of leveling, as defaults. In fact, a simple analysis in terms of morphological categories, under which front vowel alternants occurred in the Conjunctive and Imperative and before inflected auxiliaries, while back vowel alternants occurred in the Conclusive, the Adnominal, and the Provisional (and their historical antecedents) will satisfy this condition. It is natural to attribute the longevity of the bigrade alternation, then, to the availability of a plausible analysis of it that did not involve default structure. Once front vowel alternants were taken as defaults and the bigrade alternation began to be leveled, however, there will have been no further obstacle to the adoption of Analysis A.

5.3 The question of triggering effects

Leveling of the bigrade alternation, then, made possible the adoption of Analysis A. But is removal of the obstacle that, under principle (7), the bigrade alternation had represented sufficient to explain the fact that after leveling of that alternation, Analysis A was promptly adopted in a wide range of Japanese dialects? According to de Chene (2016: 53-54), more than 60 percent of the Japanese dialect locations recorded in the GAJ display one or more of the five innovative -initial V-stem suffix alternants of Table 1, column 4, and when the innovative V-stem Potential suffix -re- that results from generalization of Potential -e- to V-stems is included, the share of dialect locations showing evidence for the adoption of Analysis A rises to over 80 percent. de Chene (2016: 54-56) notes further than because of underreporting of innovative Conjunctive -ri-, phonological loss of intervocalic r in some locations, and the existence of innovative -initial V-stem suffixes other than the five of Table 1, even these figures understated the extent of the
evidence for Analysis A in contemporary varieties of Japanese.

The question thus arises of whether it is necessary to admit a triggering relationship between leveling of the bigrade alternation and adoption of Analysis A over and above the blocking relationship already documented; as noted above, such a triggering relationship is proposed by Ônishi (2016: 150). In this section, I will argue that, in fact, the adoption of Analysis A can be understood without reference to a triggering effect. Rather, referring to a parallel case of stem-boundary epenthesis from Modern Greek, I will attribute the widespread adoption of Analysis A to its inherent naturalness under a principle that rewards minimal input-output divergence in the postulation of morphophonological rules.

As is well known (Casali 1997, 1998), hiatus, the juxtaposition of heterosyllabic vowels (V₁V₂), is disfavored in many languages. At the same time, creation of hiatus by the addition of vowel-initial suffixes to vowel-final stems is extremely common. As a result, many languages display strategies for resolving hiatus at stem boundary, among them truncation of V₁ or V₂, coalescence of V₁ and V₂, and epenthesis of a consonant between V₁ and V₂. In Modern Greek, two distinct stem-boundary hiatus-resolution strategies, truncation of V₁ and epenthesis of a consonant between V₁ and V₂, compete with each other in the inflection of masculine (and to a lesser degree, feminine) nouns. de Chene (MS) argues that, of these two hiatus-resolution strategies, δ-Epenthesis constitutes the default option, citing (a) the inflection of loanwords and personal names, for which there is reason to doubt that memorized lexical information exists; (b) the ongoing transfer of certain nouns from truncating to epenthesizing status; and (c) the far more extensive expansion of the range of δ-Epenthesis that is observed in nonstandard dialects (Dawkins 1916, Melissaropoulou 2013). On de Chene’s proposal, while δ-Epenthesis will be subject to no lexical restriction, Truncation will be limited to stems marked, either individually or as the result of redundancy rules of more or less generality, to undergo it.

As illustrated by the Korean case sketched in §4.1 above, default or regular morphophonological processes are in some cases chosen from among multiple candidates on the basis of lexical or type frequency. The default status of Greek δ-Epenthesis, however, cannot be explained in this way, since epenthesizing nouns are a clear minority with respect to truncating nouns in Standard Modern Greek. Thus, in Institute of Modern Greek Studies (1998), among masculines with nom./acc. pl. -es, there are 2274 truncating stems (74%), but only 798 that show epenthesis (26%). If masculines with nom. pl. -i and acc. pl. -us, naturally analyzed as truncating, are included in the calculation, the percentage of epenthesizing masculines drops to under 13%.

The Greek case suggests, then, that speakers will choose epenthesis over deletion as the rule-governed, default means of hiatus resolution at stem boundary even in the face of a considerable type frequency deficit. In seeking to explain this preference, I will appeal to two intuitions or leading ideas. The first is that in choosing among candidates for a morphophonological rule, speakers value a close relation between input and output representations. This idea is validated both by experimental evidence indicating that artificial rules involving minimal (single-feature) changes are learned more easily than those whose input and output differ by two features or more (Skoruppa et al. 2011) and by the fact that (apart from epentheses) there is a tendency for cases in which speakers productively extend nonautomatic alternations to involve input-output divergence of a single feature only; such cases may involve either direct morphologization of sound change, as in Finnish t → s before past tense -i (Kiparsky 1973 [1982]: 167-171) or German umlaut, on the one hand, or morphologization accompanied by input-output inversion, as in Portuguese lowering of e o under stress in verbal inflection (see e.g. de Chene 2016: 71 and references cited there) or the Korean t → s rule introduced in §4.1 above, on the other. Hayes & White (2015: 290) provide additional evidence that “phonetically salient alternation is disfavoured in comparison to less salient alternation”, although they show as well that unusual sequences of diachronic developments can lead to counterexamples.

The second idea I will appeal to, more speculative, is that epenthesis, by allowing all underlying segments of both stem and suffix to appear in the surface form, represents a less severe distortion of the input representation than does truncation. Given that both truncation and epenthesis involve an input-output divergence of precisely one segment, it might appear that they should be equivalent in their effect on the input-output relationship. Suppose we assume, however, that stem-boundary epenthetic consonants are inserted intermorphemically, thus belonging to the morphological word without belonging to any of its constituent morphs. In that case, it will be possible to see stem-boundary epenthesis as involving less input-output divergence than truncation—in fact, as involving in principle a completely faithful or transparent input-output relation, one that involves zero divergence between the two representations at the level of the morph.
In view of the first of the two points just cited, I propose that there is a principle of evaluation that rewards minimal input-output divergence in choosing between competing analyses of nonautomatic (i.e. morphophonological) alternations; that principle is stated in (8). In view of the second point, I will take epenthetic \( \delta \) in Greek masculine nouns to be inserted intermorphemically, so that the choice of epenthesis as the default stem-boundary hiatus-resolution strategy is explicable as a consequence of (8).

(8) Given two observationally adequate analyses of a set of nonautomatic alternations, each incorporating a rule candidate, prefer the analysis whose rule candidate occasions the lesser divergence between input and output.\(^8\)

Note that (8) evaluates the two analyses in question on the basis of their associated rule candidates, abstracting away from the existence of exceptions. In the Greek case, for example, the choice of epenthesis over truncation under (8) will not be prejudiced by the fact that there are many more exceptions associated with the epenthesis analysis than with the truncation analysis.

If epenthesis is chosen over truncation in Greek without reference to type frequency, under a principle that rewards minimal input-output divergence and in conjunction with a treatment of stem-boundary epenthetic consonants as intermorphemic, that fact will have clear consequences for our understanding of the choice, in the Japanese case, of Analysis A, characterized by stem-boundary \( \gamma \)-Epenthesis, over the rival Analyses B and C, both of which involve rules of deletion. In de Chene (2016), the choice of Analysis A is attributed to type frequency. This explanation, however, is less than fully satisfying because there is only a small type frequency differential between \( \gamma \)-Epenthesis, which affects three suffixes, and a potential rule of suffix-initial vowel deletion, which would affect two (the Conjunctive and Negative, as shown in Table 1). The Greek case, in which the choice of epenthesis over truncation is manifestly not the result of type frequency, suggests that the type frequency account of the choice of Analysis A may well be misguided, and that that choice should probably be understood, like the choice of epenthesis over truncation in Greek, as motivated by principle (8) in conjunction with a treatment of epenthetic \( \gamma \) as intermorphemic.

In this connection, we may note that in previous discussions of Japanese \( \gamma \)-Epenthesis, the question of whether the epenthetic consonant is inserted into the suffix alternant or between the stem and suffix has been a point of analytic indeterminacy, so that, while de Chene (1985) assumes intermorphemic insertion, de Chene (2016) assumes intramorphemic insertion, with neither paper raising the issue or attempting to treat it as an empirical matter. Since under (8), epenthesis must be intermorphemic to explain its priority over deletion, appealing to that principle to explain the adoption of \( \gamma \)-Epenthesis means that this descriptive indeterminacy will be resolved by an explanatory principle, a general condition on speakers’ choice of analyses. This is arguably precisely the kind of interaction one would wish to see between descriptive and explanatory considerations.

We began this subsection by asking whether we should interpret the high frequency of evidence for Analysis A across Japanese dialects as evidence of a triggering relationship between leveling of the bigrade alternation and adoption of that analysis. Given our argument that Analysis A follows from principle (8) if stem-boundary epenthetic consonants are intermorphemic, I conclude that it is unnecessary to hypothesize such a triggering relationship. Rather, we may take the adoption of Analysis A to be simply a consequence of the naturalness of the analysis type it exemplifies.

6. Conclusion

In §5, the concept of phonological distance emerged as a central theme in our account of the course of the several processes of regularization that have affected Japanese vowel-stem verbal inflection over the last four centuries. We claimed first that simpler alternations, in the sense of those displaying lesser phonological distance between alternants, are less resistant to leveling than more complex alternations and that, by extension, the stability of a simpler alternation can inhibit regularization of one that is more complex. With respect to the postulation of innovative morphophonological rules, we then claimed that speakers favor rule candidates involving minimal phonological

\(^8\) Speakers do not, of course, literally weigh one analysis against another, as a reviewer notes. Rather, they are endowed with principles that make it possible for them to home in on a particular analysis, given particular input data, and it is those principles that we are attempting to model in proposing criteria of evaluation (Chomsky 1957: 51) like (8) or conditions like (7) that restrict the range of possible analyses.
distance between input and output. Conversely, our claims imply, relatively complex alternations will resist extension and, relative to simpler alternations, will resist leveling as well. Both of these propositions clearly need to be tested against a wider range of data than we have been able to adduce here. I would suggest, however, that our discussion, in addition to making a prima facie case for the relevance of phonological distance to processes of regularization, has shown that the mutual interactions among instances thereof constitute a potentially fruitful area of inquiry. If so, the question of the role played in the actuation of analogical processes by factors internal to the linguistic system has a secure place on the linguist’s research agenda, and our initial skepticism about Kuryłowicz’s (1945-1949 [1966]: 174) claim that the timing of analogical change is essentially a sociological phenomenon was well-founded.

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