Sundanese nasal substitution: An optimality theoretic analysis

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Nasal substitution (NS) is among the distinctive phonological characteristics of Austronesian languages, including Sundanese (and Indonesian). Pater (1999, 2001) has proposed a set of phonological constraints couched under Optimality Theory (OT) for Indonesian. Given the close resemblance between Indonesian and Sundanese phonology, Pater’s proposals are to be extended to Sundanese. This paper systematically lays out Sundanese NS data; demonstrates that Pater’s analyses cannot account for the full range of Indonesian facts and thus cannot be extended to Sundanese parallel data; and offers an OT analysis to explicate Sundanese NS by making reference to Fukazawa & Kitahara’s (2001, 2002) UNIFORMITY[VOICE] constraint, as an alternative to the new phonological IDENTPHAREXP constraint invoked in Pater (2001).

1. Introduction

Nasal substitution (henceforth NS) phenomena are well documented in many of the world’s languages, especially in Austronesian languages (see Pater, 1999 and Blust, 2004 for a crosslinguistic survey of NS within Austronesian languages). NS is described as a phonological process in which a root-initial voiceless obstruent is replaced by a homorganic nasal as a remnant of final nasality in a prefix. Given that the nature of the consonant in the output has the characteristics of both the input consonants, that is, nasality plus the place of the obstruent, NS is also taken to be a case of coalescence or segmental fusion (Pater, 1999, 2001). Some representative examples from Standard Indonesian are given in (1).

(1) Standard Indonesian

/məŋ-pan-/ [məŋaŋ] ‘to nail’
/məŋ-tari/ [məŋari] ‘to dance’
/məŋ-sikat/ [məŋiŋkat] ‘to brush’
/məŋ-kawal/ [məŋawal] ‘to escort’

As is obvious from (1), a root-initial voiceless obstruent is obligatorily replaced by a prefixal nasal that agrees in place of articulation with that obstruent. Notice that the velar nasal is underlying, for it occurs with a variety of vowels, as illustrated in the following Indonesian examples.

(2) /məŋ-aŋkat/ [məŋaŋkat] ‘to lift’
/məŋ-išap/ [məŋišap] ‘to inhale’
/məŋ-uap/ [məŋuap] ‘to evaporate’
/məŋ-elak/ [məŋelak] ‘to deny’
/məŋ-əbro/ [məŋəbro] ‘to chat’

Closely related to the process of NS is nasal place assimilation (henceforth NPA), a phonological process in which the segments in a nasal+voiced obstruent cluster are both retained and the nasal takes on the place of articulation of the consonant. (3) presents

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instances where NPA in Standard Indonesian occurs in these nasal-voiced obstruent clusters.

(3) Standard Indonesian

/məŋ-bantu/ [məmbantu] ‘to assist’
/məŋ-dorøŋ/ [məndorøŋ] ‘to push’
/məŋ-gantuŋ/ [məngantuŋ] ‘to hang’

There have been numerous phonological studies of NS and/or NPA in a wide range of languages, such as a number of Bantu languages (Rosenthall, 1989) and a variety of Austronesian languages, including Chamorro (Topping, 1969, 1973), Indonesian/Malay (Halle & Clements, 1983), Malagasy (Dziwirek, 1989), and Tagalog (Zuraw, 2010). In particular, several phonologists have posited accounts in the context of Optimality Theory (OT; McCarthy and Prince, 1995) to capture the well-known NS facts in (Standard) Indonesian/Malay, including Archangeli, Moll, & Ohno (1998), Delikan (2007), Jaafar (2015), Kurniawan (2015), Pater (1999, 2001), and Nomoto (2009). However, to date there has been no formal phonological analysis of NS in the closely related Sundanese language.

The goal of this paper is to offer an OT analysis to capture the NS and NPA facts of Sundanese, most of which are described in Robins (1953). Before turning to an analysis of the data, I set the scene in Section 2 by outlining the sound inventory of Sundanese. Then, in Section 3, I enumerate the Sundanese NS facts and show that the phenomena take place specifically in derived environments. Cross-linguistic facts that parallel those found in Sundanese are illustrated in Section 4, in order to show that Sundanese NS is not idiosyncratic. In Section 5, I present Pater’s (1999, 2001) analysis of Indonesian NS, and show that his analysis fails to account for the whole range of Sundanese NS facts, in addition to all the Indonesian NS facts. Finally, in Section 6, I offer a new analysis by drawing upon Fukazawa & Kitahara’s (2001, 2002) UNIFORMITY[VOICE] constraint as an alternative to the PHAREXP constraint adopted by Pater (2001).

2. The Sundanese sound inventory

Before I proceed to lay out the Sundanese NS facts, it is necessary to delineate the Sundanese sound inventory, since NS is sensitive to place of articulation and obstruent voicing.

The Sundanese vowel inventory consists of seven contrasting vowels, according to Kulikov (2010), which largely accords with Robins’ (1953) description, and can be classified based on two phonetic categories, namely, vowel height and vowel frontends/backness. This is shown in Table 1.

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2 Sundanese is a Western Austronesian language spoken in the western part of Java Island, Indonesia. It is estimated to have over 36 million speakers (Grimes 2017).

3 According to Robins, Sundanese has a tense mid front unrounded vowel /e/ instead of /ɛ/ and a mid-central vowel instead of a high central rounded one. In Cohn’s (1990) description of the Sundanese vowel inventory, the mid front and mid back vowels are both tense.
Sundanese consonants occur at five different places of articulation: bilabial, dental/alveolar, palatal, velar, and glottal. Table 2, adapted from Robins (1953), presents the Sundanese consonant phonemes. When consonants appear in pairs, the one on the left represents a voiceless consonant and the one on the right a voiced one.

### Table 2. Sundanese consonants

<table>
<thead>
<tr>
<th></th>
<th>Bilabial</th>
<th>Dental/Alveolar</th>
<th>Palatal</th>
<th>Velar</th>
<th>Glottal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stop</td>
<td>/p/ – /b/</td>
<td>/t/ – /d/</td>
<td>/k/ – /g/</td>
<td></td>
<td>/ʔ/</td>
</tr>
<tr>
<td>Nasal</td>
<td>/m/</td>
<td>/n/</td>
<td>/n/</td>
<td>/ŋ/</td>
<td>/h/</td>
</tr>
<tr>
<td>Fricative</td>
<td>/s/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affricate</td>
<td>/ʧ/</td>
<td>/ʤ/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glide</td>
<td>/w/</td>
<td></td>
<td>/j/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trill</td>
<td></td>
<td>/r/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquid</td>
<td></td>
<td></td>
<td>/l/</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Kurniawan’s (2010) acoustic study of Sundanese demonstrates that word-initial voiced stops have robust prevoicing, whereas voiceless stops have a short-lag VOT; these characteristics are typical of those reported for “true voice” languages such as Spanish, Polish, French, Czech, or Hungarian (Iverson and Salmons, 1995).

Another point to note regarding the Sundanese consonantal system is that /t/ is dental and /d/ is alveolar. /n/, /r/ and /l/ are alveolar, as attested crosslinguistically. Robins (1953) notes that articulatorily /s/ occurs between post-alveolar and pre-palatal position. However, /s/ can be phonologically categorized as a palatal consonant, based on its patterning in the process of NS. Another point of interest is the behavior of /h/, which Kurniawan (2014) hypothesizes is a voiced glottal fricative, unlike English /h/.

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4 Kulikov (2010) suggests that Sundanese vowels exhibit a vowel raising phenomenon whereby the non-high vowels /a/, /e/, /ɛ/, /ɔ/ undergo raising and fronting after voiced stops, while their high counterparts do not, as shown in (i). A similar phenomenon occurs in neighboring languages such as Javanese and Madurese.

(i) /a/ → [ɨ]–[œ] ombah ‘wave’
/s/ → [ɔ] gedeh ‘big’
/e/ → [ɛ] gedeh ‘big’
/s/ → [o] botol ‘bottle’

5 The parentheses here signify that the glottal stop in Sundanese is sometimes argued to be allophonic rather than phonemic. Levi (2008), for instance, claims that the Sundanese glottal stop is not phonemic because the environment in which it occurs is non-overlapping and predictable. However, the fact that the glottal stop patterns exactly like /h/ in that both are transparent to nasal harmony could signal phonemic status for it (Cohn, 1990).
3. Sundanese nasal substitution

Sundanese presents a prototypical case of NS, where a root-initial voiceless obstruent coalesces with a prefixal nasal, resulting in a nasal prefix with the obstruent’s place of articulation, as illustrated in (4).

(4) NS for voiceless obstruents\textsuperscript{6}

\[
\begin{align*}
/\eta\text{-paku/} & \quad [\text{maku}] \quad \text{‘to nail’} \\
/\eta\text{-tari/} & \quad [\text{nari}] \quad \text{‘to dance’} \\
/\eta\text{-sikat/} & \quad [\text{nikat}] \quad \text{‘to brush’} \\
/\eta\text{-fjakar/} & \quad [\text{nakar}] \quad \text{‘to scratch’} \\
/\eta\text{-kawal/} & \quad [\text{niawal}] \quad \text{‘to escort’}
\end{align*}
\]

The nasal prefix is argued to be underlyingly velar in light of the fact that the velar nasal co-occurs with a variety of vowels, as exemplified in (5).

(5) Nasal prefix with vowel-initial roots

\[
\begin{align*}
/\eta\text{-adjar/} & \quad [\text{nadjar}] \quad \text{‘to teach’} \\
/\eta\text{-indjim/} & \quad [\text{indjim}] \quad \text{‘to borrow’} \\
/\eta\text{-entep/} & \quad [\text{entep}] \quad \text{‘to stack up’} \\
/\eta\text{-olo/} & \quad [\text{olo}] \quad \text{‘to persuade’} \\
/\eta\text{-usap/} & \quad [\text{usap}] \quad \text{‘to rub’}
\end{align*}
\]

In the case of root-initial voiced consonants, however, NS does not occur. Nasal-voiced consonant sequences are avoided by epenthizing a vowel.\textsuperscript{7} Significantly, vowel epenthesis does not exclusively target nasal-voiced obstruent clusters but also affects nasal-sonorant consonant sequences. This is what differentiates Sundanese NS from Indonesian NS. This difference argues tellingly for an alternative to Pater’s (1999, 2001) analysis of Indonesian/Malay, which, as I will illustrate in more detail in 5.2, cannot distinguish the desired outcome for nasal-obstruent clusters and nasal-sonorant consonant clusters.

(6) Vowel epenthesis for voiced consonants\textsuperscript{8}

\[
\begin{align*}
/\eta\text{-bosch/} & \quad [\text{nabosch}] \quad \text{‘to pedal’} \\
/\eta\text{-dahar/} & \quad [\text{nadahar}] \quad \text{‘to eat’} \\
/\eta\text{-djawab/} & \quad [\text{nadjawab}] \quad \text{‘to answer’} \\
/\eta\text{-guar/} & \quad [\text{naguar}] \quad \text{‘to unearth’} \\
/\eta\text{-rampok/} & \quad [\text{narampok}] \quad \text{‘to steal’} \\
/\eta\text{-larang/} & \quad [\text{nalarang}] \quad \text{‘to forbid’} \\
/\eta\text{-wawar/} & \quad [\text{nawawar}] \quad \text{‘to spread the news’} \\
/\eta\text{-jakin(kin)/} & \quad [\text{njakin(kin)}] \quad \text{‘to convince’} \\
/\eta\text{-mandi(an)/} & \quad [\text{namandi(an)}] \quad \text{‘to bathe’} \\
/\eta\text{-naschat(an)/} & \quad [\text{nanaschat(an)}] \quad \text{‘to advice’} \\
/\eta\text{-naha(kin)/} & \quad [\text{naha(kin)}] \quad \text{‘to familiarize’} \\
/\eta\text{-jinah(kin)/} & \quad [\text{njinah(kin)}] \quad \text{‘to make feel good’}
\end{align*}
\]

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\textsuperscript{6} Here I am not showing nasal harmony—whereby the nasal feature propagates to the following vowels—in any of the Sundanese forms, for it is quite remotely tangential to the topic under investigation.

\textsuperscript{7} One may wonder why the underlying prefix is not /\eta/, making the vowel part of the prefix, not epenthetic. However, this is not a viable proposal, since the context in which NS occurs, i.e., a nasal-voiceless obstruent sequence would disappear, for the vowel would intervene between them.

\textsuperscript{8} The morphemes in parentheses are not part of the root. They are commonly analyzed as applicative suffixes.
NPA is also observed root-externally, where nasals and stops agree in place of articulation. As illustrated below, a homorganic nasal precedes a stop root-externally. This is the case in both Sundanese and Indonesian. Notably, neither NS nor vowel epenthesis occurs in that context.

(7) Root-internal nasal assimilation in Sundanese

\[
\begin{align*}
[\text{tembok}] & \quad \text{‘wall’} \\
[\text{lampu}] & \quad \text{‘lamp’} \\
[\text{bendera}] & \quad \text{‘flag’} \\
[\text{benteng}] & \quad \text{‘fortress’} \\
[\text{saŋgar}] & \quad \text{‘studio’} \\
[\text{boŋkar}] & \quad \text{‘to destroy’}
\end{align*}
\]

To recapitulate, I have shown that NS and epenthesis in Sundanese occur in derived environments. That is, these processes exclusively target clusters of nasals and initial consonants (obstruents and sonorants) from prefixes and roots, respectively. Meanwhile, NPA without substitution occurs root-externally.

4. Crosslinguistic parallels

In this section, I will outline a host of behaviors parallel to those in Sundanese in order to show that Sundanese NS and NPA are not unique. Essentially, I will show that NS and NPA occur in a great number of languages (see Blust 2004 for a comprehensive survey of NS and NPA across Austronesian languages).

As I showed in (1), Indonesian/Malay bans the sequence of a nasal followed by a voiceless obstruent, much like Sundanese. The strategy the language employs is to fuse the nasal with the following obstruent. In the following section, I will present Pater’s (1999) argument concerning the superiority of the fusional analysis I have outlined to a set of ordered rules of NPA and obstruent deletion.

Pater (2001) adds Muna, a language of Southern Sulawesi, to the inventory of languages that parallel Indonesian and Sundanese in allowing the fusion of nasal+voiceless obstruent sequences.\(^9\) This is exemplified in (8).\(^{10}\)

(8) Muna NS (Pater 2001)

\[
\begin{align*}
/\text{um-pili}/ & \quad [\text{mili}] \quad \text{‘choose’} \\
/\text{um-futaa}/ & \quad [\text{mutaa}] \quad \text{‘laugh’}
\end{align*}
\]

As we can see in (8), when the infix –um- is added to voiceless obstruent-initial roots, the vowel of the infix deletes and the nasal and the root-initial voiceless obstruent get fused.

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\(^9\) Blust (2004) provides an alternative analysis for the Muna facts and claims that the purportedly fusional process with root-initial voiceless obstruents is actually pseudo-NS. According to his analysis, substitution results from “a phonotactically well-established avoidance of unlike labial onsets in successive syllables” (p. 133), not a typical repair strategy to avoid nasal+voiceless obstruent clusters in canonical ‘NS’ languages.

\(^{10}\) It is important to point out that segmental deletion and substitution of the infix only occurs with labial-initial roots. As the following examples show, the infix remains intact before non-labial-initial roots.

\[
\begin{align*}
/\text{um+dadi}/ & \quad [\text{dumadi}] \quad \text{‘live’} \\
/\text{um+gaa}/ & \quad [\text{gumaa}] \quad \text{‘marry’} \\
/\text{um+rende}/ & \quad [\text{rumende}] \quad \text{‘alight’} \\
/\text{um+solo}/ & \quad [\text{sumolo}] \quad \text{‘flow’ (Pater 2001)}
\end{align*}
\]
Recall from Section 1 that NS occurs in Indonesian/Malay. Like Sundanese, vowel epenthesis can be observed alongside NS in Indonesian/Malay. A vowel is inserted between the nasal prefix /məŋ-/ and base-initial consonants only in monosyllabic bases (active verbs).

(9) Indonesian and Sundanese vowel epenthesis

<table>
<thead>
<tr>
<th>Indonesian</th>
<th>Sundanese</th>
</tr>
</thead>
<tbody>
<tr>
<td>/məŋ-ʧap/</td>
<td>/məŋʧap/</td>
</tr>
<tr>
<td>/məŋ-tik/</td>
<td>/məŋtik/</td>
</tr>
<tr>
<td>/məŋ-bor/</td>
<td>/məŋbor/</td>
</tr>
</tbody>
</table>

Indonesian

<table>
<thead>
<tr>
<th>Indonesian</th>
<th>Sundanese</th>
</tr>
</thead>
<tbody>
<tr>
<td>/məŋ-ʧap/</td>
<td>/məŋʧap/</td>
</tr>
<tr>
<td>/məŋ-tik/</td>
<td>/məŋtik/</td>
</tr>
<tr>
<td>/məŋ-bor/</td>
<td>/məŋbor/</td>
</tr>
</tbody>
</table>

Vowel epenthesis co-occurring with NS is also found in Mapun, an Austronesian language spoken in the province of Tawi-Tawi, Philippines. According to Collins, Collins, and Hashim (2001), a vowel /a/ is epenthesized between a nasal prefix /ŋ/ and a sonorant, and /u/ between a nasal and w-initial roots.

In addition, Indonesian shares with Sundanese the phenomenon in which root-internal nasals resist assimilation of place to following continuant segments. This is shown in (10).

(10) Root-internal nasal and continuant consonant in Indonesian

<table>
<thead>
<tr>
<th>Sundanese</th>
<th>Indonesian</th>
</tr>
</thead>
<tbody>
<tr>
<td>/məŋsa/</td>
<td><em>[məpsa]</em></td>
</tr>
<tr>
<td>/maroŋron/</td>
<td><em>[maronrɔn]</em></td>
</tr>
<tr>
<td>/malaŋlan/</td>
<td><em>[malaŋlan]</em></td>
</tr>
</tbody>
</table>

In sum, Sundanese NS and the other related phonological processes that I have presented in this section are neither peculiar nor idiosyncratic to Sundanese. Parallel instances are also instantiated in other languages. It is important to note, however, despite the striking similarities between Sundanese and Indonesian NS, they differ significantly in resolving the undesired sequence of nasal-consonant, whereby Indonesian exhibits a contrast between nasal-obstruent versus nasal-sonorant sequences, whereas Sundanese does not. A careful examination of Pater’s analyses is therefore called for to ascertain whether his proposal can be extended to Sundanese.

5. Previous analyses

As described in Section 3, Sundanese displays a prototypical NS pattern of behavior whereby the substitution occurs at the prefix-root juncture. The same is true of Indonesian/Malay. For convenience, a comparison of Sundanese and Indonesian/Malay regarding NS is presented below.

Table 3. Comparison of Sundanese and Indonesian NS

<table>
<thead>
<tr>
<th>Sundanese</th>
<th>Indonesian</th>
</tr>
</thead>
<tbody>
<tr>
<td>/ŋ-paku/</td>
<td>/məŋ-paku/</td>
</tr>
<tr>
<td>/ŋ-tari/</td>
<td>/məŋ-tari/</td>
</tr>
<tr>
<td>/ŋ-sikat/</td>
<td>/məŋ-sikat/</td>
</tr>
<tr>
<td>/ŋ-kawal/</td>
<td>/məŋ-kawal/</td>
</tr>
</tbody>
</table>

In what follows, I will apply Pater’s (1999, 2001) analyses of Indonesian/Malay NS to the Sundanese facts, unless noted otherwise. Section 5.1 discusses the extent to which Pater’s (1999, 2001) analyses successfully account for the facts; and Section 5.2 describes where his analyses fail.
5.1 Applying Pater’s (1999, 2001) analysis: Where it works

Pater (1999) argues that within the context of OT a fusional analysis for the prefixation facts is superior. In a fusional analysis, a pair of input segments is mapped onto a single output segment.

(11) Correspondence diagram for fusion

<table>
<thead>
<tr>
<th>Input</th>
<th>/ŋ₁p₂aku/</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>m₁₂</td>
</tr>
</tbody>
</table>

Pater sees fusion as a repair strategy to surmount a purportedly universal but violable prohibition against sequences of a nasal and a voiceless obstruent, formulated as follows.

(12) *NC

No nasal/voiceless obstruent sequences (Pater 1999)

*NC interacts with constraints on Input-Output Correspondence to yield NS. The NS candidate contravenes a faithfulness constraint that militates against fusion. This constraint is LINEARITY-IO, formally stated as follows.

(13) LINEARITY-IO

S₁ reflects the precedence structure of S₂, and vice versa. (McCarthy & Prince 1995)

As depicted in (13), the nasal precedes the obstruent in the input. However, the same is not true in the output, because the output correspondents of 1 and 2 are simultaneous rather than linearly ordered. Hence, fusion candidates will always violate LINEARITY.¹¹ To generate NS, the violation of LINEARITY should be rendered minimal, so LINEARITY must be ranked beneath *NC, as shown in Table 4.

Table 4. Sundanese: *NC ≫ LINEARITY

<table>
<thead>
<tr>
<th>Input: /ŋ₁p₂aku/</th>
<th>*NC</th>
<th>LINEARITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ŋ₁p₂aku</td>
<td>*!</td>
<td>*</td>
</tr>
<tr>
<td>b. m₁₂aku</td>
<td>♯</td>
<td></td>
</tr>
</tbody>
</table>

The candidate with NS (b) is optimal since it satisfies *NC, which is high-ranking in this grammar. The wholly faithful candidate (a), on the other hand, is eliminated as it runs afoul of *NC, which is a fatal violation.

*NC, as Pater (1999) claims, could be grounded in articulatory mechanisms and supported by evidence from child language acquisition studies.¹² Nevertheless, a wide range of typological facts enumerated in Blust (2004) reveals that this constraint is questionable.¹³ In fact, Pater (2001) in his reanalysis of nasal-obstruent sequences in

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¹¹ Pater (1999) is assuming that “the input is made up of a linearly sequenced set of morphemes.” However, he admits that this formulation is not that important since LINEARITY is respected only root-internally. Moreover, there are other constraints that are able to rule out NS candidates.

¹² See Pater (1999) for more specifics of the phonetic and language acquisition motivation for postulating *NC.

¹³ Blust (2004) mentions that Pater’s (1999) *NC analysis is problematic because it does not adequately address typological differences. He brings up a variety of cases from several languages that he claims run counter to the universality of *NC. To capture all the cases, he posits revisions to Pater’s formulation of *NC, which in the end gets complicated. He concludes that Austronesian languages lend little support to the postulation of *NC as a general markedness constraint.
Indonesian/Malay acknowledges that the *NC analysis of NS faces some “insurmountable challenges” (p. 4), one of which stems from Muna where NS is not triggered by any clusters whatsoever.

Another deficit of the *NC analysis, as Pater (2001) points out, is the very fact that NC clusters are found between prefixes, root-internally, and at the root-suffix boundary, as exemplified below. And yet, NS does not result, in any of those contexts.

\[(14)\] (i) /məŋ+pər+buas/ [məmpərbuas] ‘to exaggerate’
(ii) /məŋ+pər+tonton+kən/ [məmpərtontonkən] ‘to showcase’

Pater (2001) acknowledges the awkwardness of the way his (1999) analysis handles the absence of fusion between morphemes by using DISJOINTNESS constraints and the lack of fusion in root-internal NC clusters to adopt root-faithfulness constraints, thus the disadvantage of his (1999) analysis. Even in the Indonesian case, he suggests that NS is not a response to *NC, but to the requirement of edge “crispness” (Ito and Mester 1999) at prefix-root boundaries. Edge crispness is a requirement that a segment or the features of a segment at the edge of a certain category may not be multiply-linked. The crisp-edge constraint is stated in (16).

\[(15)\] CRISPEDGE[PRWD]

No element belonging to a Prosodic Word may be linked to a prosodic category external to that Prosodic Word. (Pater 2001) This constraint essentially rules out any multiple linking across the PrWd boundary, and Pater invokes it given that NS occurs only at prefix-root boundaries. It does not occur root-Internally, nor does it occur at prefix-prefix boundaries.\(^{14}\)

Pater assumes that NPA is triggered by a constraint that compels a nasal to be homorganic with a following obstruent. It is not possible to avoid a CRISPEDGE violation by simply leaving the prefix nasal unassimilated. The NPA constraint is formulated as follows.

\(^{14}\) The strength of this reanalysis lies in fact that the restricted application of NS can now be explained by associating it with the special status of the left edge of the root (Cohn and McCarthy 1994). Following Cohn and McCarthy, Pater conjectures that prefixes are not part of the Prosodic Word structure; that is why feature sharing across prefix-root boundaries will always incur a violation of the CRISPEDGE constraint. This requirement is satisfied by NS since the resulting segment is assumed to be part of the root and thus internal to the Prosodic Word, as illustrated in (ii).

(iii) Nasal substitution
   /ŋ-paku/ ‘to nail’ (Sundanese)
   \{maku\}
   [lab]
   CRISPEDGE satisfied

The requirement of edge crispness is violated by NPA, because the prefixal nasal shares place features with the root-initial obstruent. In other words, the place feature is linked across the PrWd boundary. This is shown in (iii).

(iv) Nasal assimilation
   /pəŋ-paku/ (hypothetical case)
   pam {paku}
   [lab]
   CRISPEDGE violated
(16) **NASASSIM**  
A nasal must share place features with a following consonant. (Pater 2001)

Because the CRISPEDGE and NASASSIM constraints have high rank in the grammar, NS is going to emerge as the best option in Sundanese. However, the optimal candidate does violate a general faithfulness constraint, namely **UNIFORMITY**, that prohibits fusion.\(^{15}\)

(17) **UNIFORMITY-IO** --- (‘No coalescence’)  
No element of the output has multiple correspondents in the input. (McCarthy & Prince 1995)

For the substitution candidate to win out, UNIFORMITY-IO should be dominated by CRISPEDGE[PRWD] and NASASSIM so that violation of the former is minimal. Table 5 verifies this ranking argument.

### Table 5. Sundanese: CRISPEDGE[PRWD], NASASSIM \(\gg\) UNIFORMITY-IO

<table>
<thead>
<tr>
<th>Input: /ŋ-p_aku/</th>
<th>CRISPEDGE[PRWD]</th>
<th>NASASSIM</th>
<th>UNIFORMITY-IO</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. m_1p_1aku</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. ŋ_1p_1aku</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. m_1 hóa_1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The NPA (a) and the faithful candidate (b) are both eclipsed by the high ranking CRISPEDGE[PRWD] and NASASSIM, leaving the substitution candidate (19c), with fusion, as optimal.

As it stands now, the analysis that Pater proposes predicts that all nasal+consonant sequences will result in NS, which is certainly not the case. Recall from Section 3 that vowel epenthesis occurs for nasal-voiced consonant sequences in Sundanese. Several examples are repeated in (18).

(18)  
/ŋ-bocêh/  [nabocêh] *[mocêh] ‘to pedal’  
/ŋ-dahar/  [nadahar] *[nahar] ‘to eat’  
/ŋ-djawab/ [nadjawab] *[nawab] ‘to answer’  
/ŋ-guar/   [naguar] *[ňuar] ‘to unearth’

Note that forms in which the nasal is fused with a following voiced consonant are unattested in Sundanese. The same situation in fact holds in Indonesian. Of course, it is noteworthy that the strategies Sundanese and Indonesian pick to eliminate the above unattested outcomes are crucially quite different: Sundanese resorts to epenthesis but Indonesian prefers place assimilation.

Under Pater’s (2001) analysis, due to the absence of restrictions on the type of consonant in the input, any consonant sequence would be forced to undergo fusion. This is shown in Table 6.

---

\(^{15}\) Pater employs **UNIFORMITY-IO** in his (2001) analysis as a replacement for the **LINEARITY-IO** that he incorporated in his earlier analysis.
Table 6. Sundanese

<table>
<thead>
<tr>
<th>Input: /ŋ1-bɔsɛh/</th>
<th>CRISPEDGE [PRWD]</th>
<th>NAS ASSIM</th>
<th>UNIFORMITY-IO</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. m_bɔsɛh</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. ŋ_bɔsɛh</td>
<td></td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>c. ʃm_bɔsɛh</td>
<td></td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

We see in Table 6 that the grammar incorrectly selects the illicit output (c), with fusion as the winning candidate, since it honors the high-ranked constraints. In contrast, the other two candidates, (a) and (b), are disfavored by the grammar because they fail to satisfy either CRISPEDGE[PRWD] or NASASSIM. So, the analysis to this point fails for Sundanese, and it also fails to account for the Indonesian facts, where place assimilation wins. In other words, up to this point, Pater’s (2001) analysis cannot successfully generate either outcome.

Pater (2001) proposes that an additional constraint is necessary to distinguish nasal-voiced consonant clusters from nasal-voiceless obstruent clusters: we need to have some constraint that is violated by fusion of a nasal and a voiced obstruent (but crucially not by fusion of a nasal and a voiceless obstruent), or some special constraint that is borne by any voiced consonant other than a sonorant. Pater proposes IDENTPHAREXP, following Trigo (1991) and Steriade (1995), as one that will potentially serve this purpose. This constraint is formulated in (19).

(19) IDENTPHAREXP

Correspondent segments in input and output must have the same specification for [pharyngeal expansion]. (Pater 2001)

In his (1999) analysis, Pater had hinted that an obstruent-specific feature was called for to explicate the asymmetrical patterning of nasal-voiceless obstruent and nasal-voiced obstruent sequences. The following is his argument for the new feature.

Based on the fact that obstruents do require an articulatory adjustment to produce voicing that is not required of sonorants (specifically, expansion of the supralaryngeal cavity), as well as on Trigo’s (1991) work on consonant/vowel interactions, Steriade (1995) proposes that voiced obstruents are specified for both a feature [pharyngeally expanded] and a feature [vibrating vocal cords], whereas sonorants are only specified for the latter. I will adopt Steriade's proposal, using [Voice] as the feature common to sonorants and obstruents, [Exp] as the feature specific to obstruents (p. 19).

IDENTPHAREXP is a necessary component of Pater’s analysis of the blocking of fusion of nasals and voiced obstruents.

(20) a. N₁T₂ → N₁₂ IDENTPHAREXP satisfied
    [+nas, +voi, -PE][-nas, -PE]    [+nas, -PE]

b. N₁D₂ → N₁₂ IDENTPHAREXP violated
    [+nas, +voi, -PE][-nas, +PE]    [+nas, -PE]

As (20b) illustrates, IDENTPHAREXP is violated when an underlying voiced obstruent that is arguably [+PE] is fused with a preceding nasal that is [-PE], leading to the loss of the [PE] feature. In contrast, when an underlying voiceless obstruent is fused with the nasal, the pharyngeal expansion faithfulness constraint is respected, as in (20a). It is
clear that Pater would specify other sonorants as [-PE]. This position, as I will show later, makes a wrong prediction regarding the attested output for nasal plus other sonorant sequences in Sundanese as well as Indonesian.

The postulation of this new pharyngeal feature [pharyngeal expansion] is based on the behavior of nasals and voiceless obstruents that pattern together in blocking vowel harmony in Madurese. Madurese appears to have vowel harmony conditioned by preceding consonants. A certain feature (Lowered Larynx or ATR) is argued to propagate from the voiced and heavy aspirated stop to the following vowels, except following a nasal or a voiceless obstruent (Trigo 1991). This blocking, according to Trigo, arises because there is a mismatch between the spreading feature and the combination of nasals and voiceless obstruents.\(^{16}\)

With the ranking of IDENTPHAREXP above CRISPEDGE[PRWD] and NASASSIM, NS is restricted to root-initial voiceless obstruents. The grammar can yield the desired output in Sundanese, the one with vowel epenthesis, by ranking the anti-epenthesis constraint in (24) quite low in the hierarchy. DEP-IO should, however, outrank UNIFORMITY-IO, since segmental insertion is disfavored in nasal-voiceless obstruent sequences. The same ranking is also necessary for Indonesian NPA, where DEP-IO must specifically be ranked above NASASSIM and UNIFORMITY-IO to generate the NPA outcome.

\[(21) \text{DEP-IO} \rightarrow \text{('No epenthesis')} \]

Output segments must have input correspondents. (McCarthy & Prince 1995)

Table 7 illustrates the crucial ranking of IDENTPHAREXP in relation to all the constraints introduced thus far.

**Table 7. Sundanese: IDENTPHAREXP \(\gg\) CRISPEDGE[PRWD], NASASSIM \(\gg\) DEP-IO \(\gg\) UNIFORMITY-IO**

<table>
<thead>
<tr>
<th>Input: /ŋˌ-,pˌ,əsəh/</th>
<th>IDENTPHAR EXP</th>
<th>CRISPEDGE [PRWD]</th>
<th>NAS ASSIM</th>
<th>DEP-IO</th>
<th>UNIFORMITY-IO</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ŋˌbˌəsəh</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. mˌbˌəsəh</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. mˌəsəh</td>
<td></td>
<td></td>
<td>!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. (\sim)mˌəbˌəsəh</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input: /ŋˌ-,pˌ,əku/</th>
<th>IDENTPHAR EXP</th>
<th>CRISPEDGE [PRWD]</th>
<th>NAS ASSIM</th>
<th>DEP-IO</th>
<th>UNIFORMITY-IO</th>
</tr>
</thead>
<tbody>
<tr>
<td>e. ŋˌpˌəku</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. ŋˌpˌəku</td>
<td></td>
<td></td>
<td>!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. ŋˌapˌəku</td>
<td></td>
<td></td>
<td></td>
<td>!</td>
<td></td>
</tr>
<tr>
<td>h. (\sim)mˌəaku</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This table shows that the attested candidates (d) and (h) are selected as the winners as they both satisfy one of the higher-ranked constraints (IDENTPHAREXP, CRISPEDGE[PRWD], NASASSIM) at the cost of minimally violating one of the lower-ranked constraints (DEP-IO, UNIFORMITY-IO).

---

\(^{16}\) In defense of Trigo’s proposal, Steriade (1995) remarks that invoking a feature that specifically targets voice obstruents enables us to look at the cases in which only voiced obstruents assimilate (such as Russian) or dissipilate (such as Japanese) without resorting to underspecification.
5.2 Applying Pater’s (1999, 2001) analysis: Where it does not work

Up to this point, it appears that Pater’s (2001) reanalysis of Indonesian NS suffices to account for the Sundanese data. However, this is not the case. The set of constraints and rankings that Pater posits does nothing to stop non-obstruent consonants from undergoing substitution (or fusion). As shown in (22), root-initial sonorants result in epenthesis, as do voiced obstruents.

(22) /ŋ-laraŋ/ [ŋalaran] *[ŋaran] ‘to forbid’
/ŋ-wawar/ [ŋawawar] *[mawar] ‘to spread the news’
/ŋ-jak(in)kin/ [ŋajak(ın)kin] *[pakin(ın)] ‘to convince’
/ŋ-mandi(ın)/ [ŋamandi(ın)] *[mandi(ın)] ‘to bathe’
/ŋ-nase(ḥat)an/ [ŋanase(ḥat)an] *[nase(ḥat)an] ‘to advice’
/ŋ-paḥo(ın)/ [ŋapaha(ın)] *[paḥo(ın)] ‘to familiarize’
/ŋ-qinah(ın)/ [ŋaqinah(ın)] *[qinah(ın)] ‘to make feel good’

Pater’s IDENTPHAREXP constraint is inapplicable to root-initial sonorant consonants, which resist substitution. Recall that IDENTPHAREXP simply prohibits voiced obstruents from being fused with a preceding nasal. It permits voiceless obstruents and even other sonorants to undergo fusion, given the (purported) identical feature specification of voiceless obstruents and other sonorants with respect to the [PE] feature.

Table 8 confirms that Pater’s proposal makes an incorrect prediction.

### Table 8. Sundanese

<table>
<thead>
<tr>
<th>Input: /ŋ-laraŋ/</th>
<th>IDENTPHAR EXP</th>
<th>CRISPEDGE [PRWD]</th>
<th>NAS ASSIM</th>
<th>DEP-IO</th>
<th>UNIFORMITY -IO</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. n1laraŋ</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. ŋ1laraŋ</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. ŋn3araŋ</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>d. ŋŋ1alaraŋ</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As is apparent from Table 8, the actual surface form (d) loses out to the unattested fusion candidate (c), because it incurs a violation of the no-epenthesis constraint, which is ranked higher than the no-fusion constraint. Hence, the violation is fatal. As is obvious in this table, IDENTPHAREXP is silent about the fusion of nasal-sonorant sequences, as in (c).

In fact, Pater’s (2001) reanalysis of the Indonesian/Malay data also incorrectly predicts that NPA should be the favored outcome for both nasal-obstruent and nasal-sonorant consonant sequences, because IDENTPHAREXP is not sensitive to the obstruent/sonorant distinction. This is evidenced in (23).
(23) Standard Indonesian

<table>
<thead>
<tr>
<th>INPUT</th>
<th>ACTUAL OUTPUT</th>
<th>PREDICTED OUTPUT</th>
<th>MEANING</th>
</tr>
</thead>
<tbody>
<tr>
<td>/məŋ-bantu/</td>
<td>[məmbantu]</td>
<td>[məmbantu]</td>
<td>‘to assist’</td>
</tr>
<tr>
<td>/məŋ-doroŋ/</td>
<td>[məndoroŋ]</td>
<td>[məndoroŋ]</td>
<td>‘to push’</td>
</tr>
<tr>
<td>/məŋ-gantun/</td>
<td>[məŋgantun]</td>
<td>[məŋgantun]</td>
<td>‘to hang’</td>
</tr>
<tr>
<td>/məŋ-laran/</td>
<td>[məlaran]</td>
<td>[mənlaran]</td>
<td>‘to hang’</td>
</tr>
<tr>
<td>/məŋ-warna(i)/</td>
<td>[məwarnai]</td>
<td>*[məmwarnai]</td>
<td>‘to color’</td>
</tr>
<tr>
<td>/məŋ-jakin(kan)/</td>
<td>[məjakinkan]</td>
<td>*[məpjakinkan]</td>
<td>‘to convince’</td>
</tr>
<tr>
<td>/məŋ-mandi(kan)/</td>
<td>[məmandikan]</td>
<td>*[məmmandikan]</td>
<td>‘to bathe’</td>
</tr>
<tr>
<td>/məŋ-naschat(i)/</td>
<td>[mənaschati]</td>
<td>*[mənaschati]</td>
<td>‘to advice’</td>
</tr>
</tbody>
</table>

To summarize, I have shown that Pater’s proposal, while successfully capturing most of the Sundanese data, crucially fails to block the fusion of the nasal with sonorant consonants. A new line of analysis is required to account for the whole array of Sundanese and Indonesian data.

6. Proposed analysis

This section will delineate my proposed analysis to account for NS facts in Sundanese by making reference to Fukazawa & Kitahara’s (2001, 2002) UNIFORMITY[VOICE] constraint, which penalizes the fusion of two adjacent voiced segments, as an alternative to the inapplicable IDENTPHAREXP of Pater (2001).

As was shown in Table 8, Pater’s account encounters a ranking paradox. On the one hand, DEP-IO should outrank UNIFORMITY to allow the fusion candidate to win over the epenthesis candidate with respect to nasal-voiceless obstruent clusters. On the other hand, DEP-IO should be ranked below UNIFORMITY to allow the epenthesis candidate to win over the fusion candidate when the input contains nasal-voiced consonant clusters.

This is precisely the difference in behavior that led Pater (2001) to propose IDENTPHAREXP—which, as I have previously shown, did not work. It is apparent that a different constraint is needed to separate the cluster of nasal and voiced consonant from that of nasal and voiceless obstruent. Such a constraint is given in (24).

(25) UNIFORMITY [VOICE]

No fusion for two adjacent segments that agree in [voice].

The UNIFORMITY [VOICE] constraint penalizes the fusion of two adjacent voiced segments, in this case nasal-voiced consonant sequences. It draws on Fukazawa & Kitahara’s (2001, 2002) proposal of a specific UNIFORMITY constraint for capturing Japanese consonant voicing. They argue that support for the adoption of this sort of constraint derives from recent developments in Correspondence Theory, in which it is possible to relativize faithfulness with respect to a variety of categories or domains. They cite a number of proposals regarding relativized faithfulness constraints with respect to certain sub-groupings in the lexicon (Benua, 1995; 1997; Fukazawa & Kitahara, 1999; Lubowicz, 2004; Urbanczyk, 1995; 1996) and positional faithfulness (Beckman, 1995).

17 It must be noted that this ranking paradox cannot be avoided by, for example, assuming OT with levels where there is a different ranking of DEP and UNIFORMITY—because the morphological composition of these cases is identical, both nasal-voiceless consonant and nasal-voiced consonant sequences would have to pass through the grammar with the ranking of DEP >> UNIFORMITY on the same level.
In my analysis, I pursue this idea of relativized uniformity by extending the scope of the UNIFORMITY[VOICE] constraint to forms in which fusion of adjacent voiced consonants is not permitted. In other words, UNIFORMITY[VOICE] in my analysis concerns segmental fusion, not simply featural fusion. A consequence of this might be a family of uniformity constraints that block fusion of various different segment classes such as UNIFORMITY[SON] or UNIFORMITY[NASAL].

Possible support for the extension of UNIFORMITY[VOICE] comes from typological facts enumerated by Blust (2004). A dichotomy between nasal-voiceless consonant sequences and nasal-voiced consonant sequences is a prevalent pattern in a great many languages. Blust (2004) points out that there is a varied pattern of NS along the lines of voicing specification. While NS is used as a repair in nasal-voiceless consonant sequences, a variety of repairs are exhibited in nasal-voiced consonant sequences. Interestingly, for our purposes here, a large number of languages, such as Mapun, Yakan, Timugon Murut, Kadazan, Kayan, Sasak and Long Anap Kenyah, use vowel epenthesis as a strategy for resolving the disfavored nasal-voiced consonant sequences, much like Sundanese.

In the grammar of Sundanese, UNIFORMITY [VOICE] must be ranked below DEP-IO to ensure the selection of the correct candidate, the one in which vowel epenthesis is the repair chosen under pressure from UNIFORMITY [VOICE].

Table 9. Sundanese: CRISPEDGE[PRWD], NASASSIM, MAX-IO, UNIFORMITY [VOICE] ≫ DEP-IO ≫ UNIFORMITY

<table>
<thead>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ŋ,-l,aranj</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. n,-l,aranj</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. l,aranj</td>
<td>*</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>d. n,arang</td>
<td>*</td>
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<td></td>
</tr>
<tr>
<td>e. ŋ,al,aranj</td>
<td>*</td>
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</tbody>
</table>

In Table 9, the wholly faithful candidate (a) does not heed CRISPEDGE[PRWD] and is thus eliminated. Candidate (b) circumvents a violation of CRISPEDGE[PRWD] by way of NPA, violating NASASSIM. Candidate (c) satisfies both CRISPEDGE[PRWD] and NASASSIM but contravenes MAX-IO, since the nasal prefix is elided. The fusion candidate (d), which is otherwise favored in nasal-voiceless consonant sequences, fails to satisfy UNIFORMITY [VOICE], because two adjacent voiced segments are fused. The actually occurring (e) incurs a violation of DEP-IO by having the epenthized [a] break up the ill-formed clusters, but the violation is rendered irrelevant given the quite low ranking of DEP-IO. I now return to the original cases to show that even this enhanced constraint set, with all the proposed rankings, correctly handles all of the original data. (25) is a summary of most of the constraints and rankings that we have assumed so far.

(25) CRISPEDGE[PRWD], NASASSIM, MAX-IO, UNIFORMITY [VOICE] ≫ DEP-IO ≫ UNIFORMITY

Table 10 evaluates some relevant candidates to show the correctness of this proposed final ranking.
Table 10. Sundanese

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<tbody>
<tr>
<td>/ŋ₁-b.ɔ.seh/</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>a. m₁b.ɔ.ʊeh</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. ŋ₁b.ɔ.ʊeh</td>
<td>*!</td>
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<td></td>
</tr>
<tr>
<td>c. b₁.ɔ.ʊeh</td>
<td>*!</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. m₁.ɔ.ʊeh</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. ŋ₁a.b.ɔ.ʊeh</td>
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</thead>
<tbody>
<tr>
<td>/ŋ₁-p.aʃul/</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. m₁p.aʃul</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. ŋ₁p.aʃul</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. p.aʃul</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. ŋ₁a.p.aʃul</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. ŋ₁,m.p.aʃul</td>
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</tr>
</tbody>
</table>

It is apparent from Table 10 that my analysis is able to correctly choose the attested candidates for the whole array of Sundanese NS and NPA facts. Pater’s (1999, 2001) analyses, on the contrary, while capturing a subset of facts, namely nasal-voiceless obstruent and nasal-voiced obstruent sequences, fails to account for the resistance of root-initial sonorants to coalesce with the nasal.¹⁸

The results of this paper suggest that my analysis accounts for the Indonesian NPA facts. Recall that Indonesian shares with Sundanese the phenomenon that root-initial voiced consonants of all types fail to fuse with a prefix-final nasal. In Indonesian, NPA obtains in the avoidance of fusion. Rendering NASASSIM and DEP-IO undominated with respect to UNIFORMITY[VOICE] and making CRISPEDGE[PrWd] as well as UNIFORMITY dominated derives NPA in the proper contexts. This is evident in Table 11.

¹⁸ An anonymous reviewer points out the NS/NA facts of Mapun, in which root-initial sonorant consonants behave differently from root-initial voiced obstruents. If this is the case, Mapun provides (indirect) support for Pater’s analysis. However, the Mapun facts are fuzzy. According to Collins, Collins, and Hashim (2001), a sequence of nasal-root-initial voiceless obstruents (plus /b/) triggers NS. Vowel epenthesis emerges as the desired strategy for avoiding nasal-sonorant clusters. Before root-initial voiced obstruents (minus /b/), the nasal+epenthetic vowel appears with a homorganic nasal. To some extent, the fusion and epentheses strategies that Mapun employs resemble those of Sundanese. Crucially, epenthesis distinguishes root-initial voiceless and voiced consonants. The key difference between the two languages lies in homorganic nasals after the epenthetic vowel, which appears before voiced obstruents. Noteworthy here is the emergence of the homorganic nasal, which Blust (2004: 86) characterizes as “an additional unspecified change”. Putting this additional unspecified nasal aside, given the similarity in terms of NS and vowel epenthesis before voiced consonants, it is safe to conclude that the Mapun facts actually lend support to my proposed analysis.
Table 11. Indonesian: NASASSIM, DEP-IO, UNIFORMITY [VOICE] ≫ CRISPEDGE[PRWD] ≫ UNIFORMITY-IO\(^9\)

<table>
<thead>
<tr>
<th>Input: /məŋ₁-b,antu/</th>
<th>NASASSIM</th>
<th>DEP-IO</th>
<th>UNIFORMITY [VOICE]</th>
<th>CRISPEDGE[PRWD]</th>
<th>UNIFORMITY-IO</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. məŋ₁-b,antu</td>
<td>*</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>b. məŋ₁-ab,antu</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>c. məm₂,antu</td>
<td>*</td>
<td>*</td>
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<td></td>
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</tr>
<tr>
<td>d. məm₂,b,antu</td>
<td></td>
<td></td>
<td></td>
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<td>*</td>
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</table>

<table>
<thead>
<tr>
<th>Input: /məŋ₁-p,aku/</th>
<th></th>
<th></th>
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<tbody>
<tr>
<td>a. məŋ₁-p,aku</td>
<td>*</td>
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</tr>
<tr>
<td>b. məŋ₁-ap,aku</td>
<td>*</td>
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<td></td>
<td></td>
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<tr>
<td>c. məm₂,p,aku</td>
<td></td>
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<td></td>
<td>*</td>
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<tr>
<td>d. məm₂,p,aku</td>
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</table>

To block root-initial continuant consonants from assimilating with the preceding nasal, such as in the context of /məŋ₁-l,araŋ/ becoming [mən₁,l,araŋ], we must invoke *[NASCONT]. The motivation behind the postulation of such a constraint comes from Padgett (1994), who observes a cross-linguistic asymmetry between stops and continuant consonants such as fricatives in the context of NPA. While nasals generally assimilate to following stops, one of the three situations in (26) obtains before fricatives:

(26) a. The nasal fails to assimilate, resorting to its default place.
    b. The nasal deletes.
    c. The nasal assimilates but hardens the fricatives.

Padgett further claims that what unifies all the situations in (26) is the avoidance of nasals assimilating to fricatives, which is reportedly a pervasive phenomenon in a great number of languages. Cohn (1990) posits the following constraint.

(27) *[+nas, +cons, +cont]

Constraint (27) is proposed to account for the fact that continuant segments act as blockers to nasal spreading in Sundanese nasal harmony (see fn. 6). Padgett sees a connection between this phenomenon of nasal blocking and NPA, in which NPA to fricatives is ruled out. He proposes the following geometry for a place-assimilated nasal-continuant cluster, with [continuant] as a dependent of Place:\(^20\)

(28) Root /\ /
    [+nas] Place
    | [+cont]

An anonymous reviewer raises the question of how my analysis deals with Indonesian vowel epenthesis when roots are monosyllabic. The existing set of constraints and its ranking rule out the expected outcome, where the illicit fused candidate, e.g., [məm₁₂,ɔr] ‘to drill a hole’, wins over the licit epenthetic candidate, e.g., [məŋ₁₂,ɔr]. One possible solution to this question is to posit a UNIFORMITY constraint that is sensitive to a monosyllabic structure (in the spirit of Alber, 2001; Beckman, 1997; Trommer, 2012; Zoll, 1996, 2004) that must be crucially ranked above the anti-epenthesis constraint.

It should be mentioned that Padgett’s geometry is not universally accepted. His geometric analysis is just an attempt to account for this asymmetry fairly directly.

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\(^20\) It should be mentioned that Padgett’s geometry is not universally accepted. His geometric analysis is just an attempt to account for this asymmetry fairly directly.
Hence, (27) is violated when nasals share place features with continuant segments. This appears to be the crucial constraint that we need to invoke to ban NPA in nasal-continuant consonant sequences. We can formulate (29) as follows.

(29) *[+nas, +cons, +cont] abbreviated *[NASCONT]
Nasals are prohibited from assimilating to a following continuant segment.


<table>
<thead>
<tr>
<th>Input: /məŋ₁-laraŋ/</th>
<th>NASASS</th>
<th>DEP</th>
<th>UNIFORMITY</th>
<th>*[NAS] CONT</th>
<th>CRISPEDGE</th>
<th>UNIFORMITY-IO</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. məŋ₁,laraŋ   *!</td>
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<td></td>
</tr>
<tr>
<td>b. məŋ₁,laraŋ   *!</td>
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<td></td>
</tr>
<tr>
<td>c. mən₁,laraŋ   *!</td>
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<tr>
<td>d. mən₁,laraŋ   *!</td>
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<tr>
<td>e. mən₁,laraŋ   *!</td>
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</table>

Thus, my approach successfully accounts for the Indonesian NS and NPA facts.

7. Conclusion and implications

This paper has shown that Pater’s (1999, 2001) analyses fail to capture the general reluctance of root-initial voiced consonants in Sundanese to be fused with a prefixal nasal. In particular, Pater’s IDENT[PHAREXP] constraint is unable to explain the fact that even sonorants are reluctant to be fused with a preceding prefixal nasal (e.g., /ŋ+mandian/ → *[mandian]). Thus, Pater’s prediction that fusion should not be resisted by adjacent nasals, or more generally adjacent sonorants, that bear the identical [-PE] feature was proven untenable.

My proposed analysis, invoking Fukazawa & Kitahara’s (2001) UNIFORMITY[VOICE] as an alternative to IDENT[PHAREXP] constraint, has successfully accounted for the entire array of facts with regard to the resistance to fusion of nasal-voiced consonant sequences—not solely the voiced obstruent subset of voiced consonants. My approach captures the Sundanese NS facts and can also successfully account for the Indonesian NS and NPA facts. Further research will be necessary to determine whether this analysis can account for the full typology of Austronesian NS and NPA facts. Further investigation is also necessary into phonetic and other possible motivations for UNIFORMITY[VOICE] and other feature-specific UNIFORMITY constraints suggested by the adoption of UNIFORMITY[VOICE].

References


