Phonological aspects of nasality: An element-based dependency approach
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Citation for published version (APA):

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Throughout this dissertation, I have proceeded on the assumption that nasals function as a natural class. In this final chapter, I consider a range of data which shows that this is not always the case.\(^1\) We will see that in those cases where nasals display “unnatural” class behaviour, the patterning of specific nasals is, on a superficial level at least, related to differences in their place of articulation.

To put the discussion on a concrete footing, consider some facts from Dutch. First of all, there are good grounds to assume that in Dutch the nasals /m n ŋ/ act as a natural class. This is evidenced for instance in diminutive formation. The forms in (1a) show that in stems with a tense vowel or diphthong, the initial consonant of the diminutive allomorph surfaces as homorganic with a stem-final nasal.\(^2\) The forms in (1b,c) show that the diminutive allomorph surfaces as [-tj̃] after other sonorants, and as [-j̃] after obstruents.\(^3\)

\begin{tabular}{lll}
    STEM & STEM+DIM &   \\
    a. raam /ram/ & raampje [rampja] & ‘window’  \\
    tuin /toeyn/ & tuintje [toeyntja] & ‘garden’  \\
    b. taal /tal/ & taaltje [taltja] & ‘language’  \\
    vuur /vyr/ & vuurtje [vyrta] & ‘fire’  \\
    leeuw /lw/ & leeuwtje [lwtja] & ‘lion’  \\
    trui /troey/ & truitje [troeytja] & ‘jumper’  \\
    c. schaap /sxap/ & schaapje [sxapja] & ‘sheep’  \\
    voet /vut/ & voetje [vutja] & ‘foot’  \\
    boek /buk/ & boekje [bukja] & ‘book’  \\
    druif /droeyv/ & druitje [droeyfja] & ‘grape’  \\
    vaas /vaz/ & vaasje [vasjo] & ‘vase’  \\
    huig /hoeyy/ & huigje [hoeyxjo] & ‘uvula’
\end{tabular}

\(^1\) The ideas presented in this chapter have been developed together with Erik Jan van der Torre (see Botma & Van der Torre 2001; see also Van der Torre 2003).

\(^2\) I assume here that the basic distinction in the Dutch vowel system is between tense and lax vowels (see Van Oostendorp 2000a). The tense series is phonetically long; the lax series is phonetically short.

\(^3\) The realization of <tj̃> varies between [tj], [tf], and [χ]; <sj̃> is usually realized as [ʃ] (see also §2.3.2).
In Dutch, /ŋ/ does not occur after tense vowels and diphthongs, so that /m n ŋ/ cannot be compared in this context. However, evidence for the class behaviour of /m n ŋ/ can be found when we consider the pattern of diminutive allomorphy in disyllabic trochaic stems. In case such a stem ends in a nasal, as in (2a), the initial consonant of the suffix surfaces as homorganic with this nasal. Other sonorant-final stems of this type select the allomorph [-tja], as in (2b):4

(2) **STEM** | **STEM+Dim**
--- | ---

| a. bezem | bezempje [ˈbezəmpja] 'broom'
| harem | harem [ˈhærəmpja] 'harem'
| varken | varkentje [ˈvarkəntja] 'pig'
| keuken | keukentje [ˈkœkəntja] 'kitchen'
| haring | harinkje [ˈhærɪŋkja] 'herring'
| koning | koninkje [ˈkɔnɪŋkja] 'king'

b. lepel | lepeltje [ˈlepəltja] 'spoon'
| vader | vadderjje [ˈvædərtja] 'father'
| schaduw | schaduwtje [ˈʃædwtja] 'shadow'
| auto | autootje [ˈɔutɔtja] 'car'

Thus, in disyllabic trochees /m n ŋ/ trigger assimilation of a following suffix-initial stop.

Nevertheless, closer inspection reveals that Dutch nasals do not always display natural class behaviour. For instance, in the formation of compounds we find optional place assimilation of /ŋ/, but not of /m ŋ/, to a following stop:

(3) steen+bok | stee[mb]ok 'Capricorn'
tram+kaart | tra[mk]aart 'tram ticket' (*[ŋk]...)
meng+paneel | me[mn]aneel 'mixing panel' (*[mp]...)

In this process, /m ŋ/ therefore pattern together to the exclusion of /ŋ/.

In other cases, the distribution of /m/ differs from that of /ŋ/. An example of this type of asymmetry can be found in the pattern of allomorphy displayed by the agentive suffix. The forms in (4a) show that monosyllabic verbs select the allomorph -er.5 The situation is more complicated in disyllabic trochaic stems; as the forms in (4b) show, here both -er and -aar are found, with the choice of allomorph depending on the type of stem-final consonant:

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4 Disyllabic trochees with a final obstruent are extremely rare; such forms select [-ja], as in *ganneffe* 'crook-DIM'.

5 A more precise formulation is that -er is the unmarked option, given the existence of forms such as *dienaar* 'servant' and *diender* 'policeman'. The point to note here is that these forms have specialized meanings, and appear to be possible only in addition to the morphologically unmarked form *diener*. 
The forms in (4b) show that sonorant-final stems select -aar with the exception of /m/, which patterns with obstruents and selects -er. Note that Dutch does not have /y/-final stems of the kind in (4b), which makes it impossible to compare /m/ with /y/ in this context.

A similar phenomenon can be observed in the alternation between Dutch disyllabic trochaic place names and the way in which their inhabitants are referred to (see Booij 1995:73, Van der Torre 2003:126). Here we find -aar after sonorant-final forms, as in (5a). After obstruent-final forms and forms which end in /m/ we find -er, as in (5b):

(5) a. Place name   Inhabitant b. Place name   Inhabitant
Berkel       Berkelaar       Gennep       Genneper
Veghel     Veghelaar       Bunnik       Bunniker
Assen       Assenaar       Lochem       Lochemer
Putten     Puttenaar       Hattum       Hattumer

The few place names ending in /y/ also select -er. The form in (6a) is a rare example of a disyllabic trochee. The same pattern is found in the names of islands, as in (6c):

6 Van der Torre (2003:126) notes that forms which end in -er take the suffix -naar, often with concomitant loss of the /r/. This can be attributed to a prohibition on the sequence [rar] (see also Smith 1976, Booij 1995).
(6)  

<table>
<thead>
<tr>
<th>Place name</th>
<th>Inhabitant</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Hollandsche Rading</td>
<td>Hollandsche Radinger</td>
</tr>
<tr>
<td>b. Oude Wetering</td>
<td>Oude Weteringer</td>
</tr>
<tr>
<td>c. Terschelling</td>
<td>Terschellinger</td>
</tr>
</tbody>
</table>

It is reasonable to attribute the selection of -er in (6) to the fact that /ŋ/ cannot be followed by any vowel other than /a/. This is not the only distributional restriction on /ŋ/ in Dutch. As has been noted on a number of occasions (see e.g. Trommelen 1983, Booij 1995), /ŋ/ is disallowed word-initially, as in (7a), and following tense vowels and diphthongs, as in (7b). In intervocalic position /ŋ/ is permitted only when followed by /a/, as in (7c); this is the only prevocalic context in which /ŋ/ is allowed:

(7)  

a.  *[ŋ]ap  
    *[s][ŋ]ap

b.  *[raŋ], *[raŋk]  
    cf.  rang /raŋ/  ‘rank’  
    *[raŋk]  
    cf.  rank /raŋk/  ‘slender’

c.  *[eŋel]  
    cf.  engel /eŋel/  ‘angel’
    *[zwΛŋ]  
    cf.  zwanger /zwaŋər/  ‘pregnant’

The restriction on intervocalic /ŋ/ is psychologically real for speakers of Dutch. In loans and neologisms, such as bingo and Twingo, <ng> is realized as [ŋŋ] or [ŋŋ], never as [ŋ].

The Dutch facts demonstrate that while nasals form a natural class, different nasals may at the same time exhibit asymmetric behaviour. In the remainder of this chapter, I will hypothesize that differences in the phonological behaviour of /m/ and /ŋ/ result from differences in their place of articulation. More specifically, I will claim that each place of articulation is associated with a specific type of markedness effect. Labial place, as expressed by [U], is the most consonant-like place. This captures the observation that the asymmetric behaviour of /m/ is typical of stop-like articulations, and that [U] has a preference for consonantal positions (onsets and, within onsets, onset heads) in the prosodic organization. Velar place, as expressed by [A], is the most vowel-like place. This captures the observation that the asymmetric behaviour of /ŋ/ is typical of vowel-like articulations, and that [A] has a preference for vocalic positions (nuclei and codas) in the prosodic organization. Coronal place, as expressed by [I], is the most unmarked place of articulation for segments in general. As such, the asymmetric behaviour that is displayed by /ŋ/ is characteristic of the markedness effects which are associated with coronals (see e.g. Paradis & Prunet 1991 and McCarthy & Taub 1991).7

7 In this chapter I will be concerned only with nasal asymmetries. Van der Torre (2003) provides an in-depth discussion of asymmetric behaviour displayed by other sonorants, and concludes that the facts support the basic hypothesis outlined here.
This chapter is organized as follows. First, in §7.1, I consider a number of instances of asymmetric behaviour involving /m/. Next, in §7.2, I consider some examples of asymmetric behaviour displayed by /ŋ/. Finally, in §7.3, I briefly examine the issue of coronal unmarkedness in relation to /n/.

### 7.1 Consonantal strength

In this section, I discuss a range of cross-linguistic evidence in support of the claim that in those cases where /m/ shows asymmetric behaviour, this behaviour is characteristic of obstruent stops. Since obstruent stops are the most optimal, least marked consonant type, I interpret the asymmetric behaviour of /m/ as an illustration of “consonantal strength”.

Below, two different types of evidence are considered. First, given that stops are best suited to be combined with dependent structure, we expect to find cases in which /m/, but not /n ŋ/, is compatible with a laryngeal modification. Similarly, we expect to find cases in which /m/, but not /n ŋ/, can appear as the leftmost member of a complex onset. I provide some examples of such asymmetries in §§7.1.1 and 7.1.2. The second type of evidence comes from processes in which /m/ displays natural class behaviour with obstruents to the exclusion of /n ŋ/. I examine some examples of such processes in §7.1.3. In §7.1.4, I briefly consider how the observed asymmetries can be interpreted in terms of Element-based Dependency.

#### 7.1.1 Laryngeal modifications

One argument for taking stops to be the unmarked consonant type is that stops are best suited to be combined with a laryngeal modification (see also §2.1). This is supported by the observation that the consonant inventory of a given language has the maximum range of laryngeal contrasts in its stop series (see Maddieson 1984). If /m/ displays consonantal strength, we expect to find evidence which shows that, of /m n ŋ/, /m/ is best compatible with a laryngeal modification. Inspection of UPSID (Maddieson 1984) reveals that there is some support for this expectation. As regards voiceless nasals for instance, Maddieson (1984:60) observes “a preferential association between bilabial place and voicelessness”.

However, when it comes to the distribution of laryngeal modifications across /m n ŋ/, the most striking asymmetry is observed for /ŋ/, which is least suited to be combined with a laryngeal modification.

The table in (8) gives an overview of the distribution of voicelessness across /m n ŋ/ (and, where present, across other nasals) for each of the languages in

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8 This statement is based on the number of bilabial voiceless nasals nasals as compared to the complete number of voiceless nasals in the corpus.
UPSID with voiceless nasals. For each of these languages, I also give the inventory of plain nasals. Recall here the observation that the presence of a laryngeally modified nasal implies the presence of the corresponding plain nasal (see §5.1).

(8)  

|     | Æ | Ø | | Other | Plain nasals |
|-----|---|---| |       |            |
| Sedang | ✓  | ✓  | ✓ | ✓ | m n p η |
| Sui   | ✓  | ✓  | ✓ | ✓ | m n p η |
| Burmese | ✓  | ✓  | ✓ | - | m n p η |
| Hopi  | ✓  | ✓  | ✓ | - | m n p ηŋw |
| Aleut | ✓  | ✓  | ✓ | - | m n η |
| Yao   | ✓  | ✓  | ✓ | ✓ | m n n η |
| Mazahua | ✓  | ✓  | ✓ | ✓ | m n n η |
| Lakkia | ✓  | ✓  | ✓ | ✓ | m n n ηŋ j |
| Iai   | ✓  | ✓  | ✓ | ✓ | m n n mŋ |
| Klamath | ✓  | ✓  | ✓ | ✓ | m n |
| Otomi | ✓  | ✓  | ✓ | ✓ | m n |

In (8) we observe that 4 out of 11 languages have /Æ Ø | (≈36.4%). This percentage is surprisingly low, given that we normally expect a particular laryngeal modification to be evenly distributed across all places of articulation. Significantly, all languages in UPSID with voiceless nasals minimally have /Æ/. This would suggest that a contrast in nasals in terms of voicelessness must be minimally present in /m nŋ/. I have found only two languages which have voiceless nasals but lack /Æ/, Icelandic (e.g. Árnason 1980) and Tee (Ladefoged 1991); both languages have /Ø/ only. As far as I am aware, there are no languages in which a contrast in voicelessness is restricted to /ŋ/. Consider next the distribution of breathy voice across /m nŋ/. UPSID contains a mere two languages with breathy voiced nasals, Hindi and Zhu|'hõasi.
!Xû. Here, too, we find the expected type of asymmetry; note in (9) the absence of a breathy voiced /ŋ/:\footnote{I argued in §5.2 that breathy voiced nasals and voiceless nasals form a single phonological category of “aspirated nasals”; this does not affect the point at issue.}

(9)  | ṭ | ſ | Other | Plain nasals |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hindi</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Zhu’hõasi !Xû</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>m n ŋ ŋ³</td>
</tr>
</tbody>
</table>

Hindi and Zhu’hõasi !Xû minimally have /‘/. This supports the hypothesis that /m/ displays consonantal strength. The number of languages in UPSID with distinctive breathy voiced nasals is extremely small; however, I have found no other languages with a series of breathy voiced nasals that does not minimally include /m/.

The consonantal strength of /m/ also emerges when we consider the distribution of glottalization across /m n ŋ/. The table in (10) gives an overview of the distribution of glottalization across the nasal series of each of the languages in UPSID with glottalized nasals:

(10)  | m’ | n’ | ŋ’ | Other | Plain nasals |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedang</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>ŋ³</td>
<td>m n ŋ ŋ</td>
</tr>
<tr>
<td>Sui</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>ŋ³</td>
<td>m n ŋ ŋ</td>
</tr>
<tr>
<td>Gbeya</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>m n ŋ mŋ</td>
</tr>
<tr>
<td>Haida</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
<td>m n ŋ</td>
</tr>
<tr>
<td>Tolowa</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>m n</td>
</tr>
<tr>
<td>Nez Perce</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>m n</td>
</tr>
<tr>
<td>Klamath</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>m n</td>
</tr>
<tr>
<td>Otomi</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>m n</td>
</tr>
<tr>
<td>Nootka</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>m n</td>
</tr>
<tr>
<td>Kwak’wala</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>m n</td>
</tr>
<tr>
<td>Acoma</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>m n</td>
</tr>
<tr>
<td>Wappo</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>m n</td>
</tr>
<tr>
<td>Mazahua</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>ŋ³</td>
<td>m n ŋ</td>
</tr>
<tr>
<td>Zhu’hõasi !Xû</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>m n ŋ ŋ³</td>
<td></td>
</tr>
<tr>
<td>Southern Nambiquara</td>
<td>-</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>n</td>
</tr>
<tr>
<td>Yuchi</td>
<td>-</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>n</td>
</tr>
</tbody>
</table>

In (10) we observe that the typical pattern for a language is to have /m’ n’/, but not /ŋ’/: this is the case in 10 of the 16 languages (=62.5%).\footnote{A comment is in order regarding Mazahua, which Maddieson describes as having /m’ ŋ’/ (and /Æ !/). Since Mazahua also has /ŋ/ rather than /ŋ’, the palatal nasal series might be analyzed as being specified for /A/ only. This possibility requires further research.} Observe that 2 of the 16 languages, i.e. Southern Nambiquara and Yuchi, lack /m’/ (=12.5%). It is
interesting to observe, however, that Southern Nambiquara and Yuchi lack non-coronal sonorants altogether. Hence, we may attribute the absence of /\textipa{m}/ to the universal markedness implication that a laryngeal contrast in a particular nasal implies the presence of the corresponding plain nasal. Given this implication, the distribution of glottalization in Southern Nambiquara and Yuchi does not weaken the consonantal strength hypothesis. Similar to Tee and Icelandic, Southern Nambiquara and Yuchi exhibit a preferential association between phonation and coronal place. I assume that in these languages we are dealing with an instantiation of coronal unmarkedness; I return to this issue in §7.3.

The distribution of laryngeal modifications across /\textipa{m n η}/ supports the hypothesis that /\textipa{m}/ displays consonantal strength. Inspection of UPSID suggests that in those languages in which the set of laryngeally modified nasals does not include /\textipa{m}/, the modification is a property of coronal sonorants, and thus includes /\textipa{n}/. More generally, the typological facts encountered suggest that a symmetric distribution of a laryngeal modification across /\textipa{m n η}/ is the exception rather than the norm. This observation has potential diachronic implications. For instance, in his reconstruction of Proto-Mal, Filbeck (1978) finds evidence for *\textipa{m}ʼ but not *\textipa{n}ʼ and *\textipa{η}ʼ, although he postulates the latter two for reasons of pattern congruity. While this assumption is reasonable enough, typological evidence suggests that it is by no means a necessary one, particularly as far as *\textipa{η}ʼ is concerned.

The facts encountered also suggest that of /\textipa{m n η}/, /\textipa{η}/ is least compatible with a laryngeal modification. It appears to be a universal implication that a particular laryngeal contrast in /\textipa{η}/ is possible only if this contrast is also present in /\textipa{m n}/. The markedness of laryngeally modified /\textipa{η}/ can also be observed in diachronic processes. For instance, in some of the languages of the Wambo family of Bantu, word-initial sequences of a nasal and a voiceless stop have developed into aspirated nasals (cf. Baucom 1972). In some of these languages, such as Ndonga, this process has affected *\textipa{mp} and *\textipa{nt}, but not *\textipa{ŋk}. In other languages, such as Kwaluudhi, we find the reflexes /\textipa{E} ʘ ʘ. The different Wambo developments are summarized below, based on Baucom (1972:5) (in (11) PW is short for Proto-Wambo):

<table>
<thead>
<tr>
<th></th>
<th>PW</th>
<th>Kafima</th>
<th>Kwambi</th>
<th>Ndonga</th>
<th>Kwanyama</th>
<th>Kwaluudhi</th>
</tr>
</thead>
<tbody>
<tr>
<td>mp</td>
<td>mp</td>
<td>ʘEp</td>
<td>ʘEp</td>
<td>ʘE</td>
<td>ʘE</td>
<td>ʘE</td>
</tr>
<tr>
<td>nt</td>
<td>nt</td>
<td>ʘk</td>
<td>ʘk</td>
<td>ʘ</td>
<td>ʘ</td>
<td>ʘ</td>
</tr>
<tr>
<td>ηk</td>
<td>ηk</td>
<td>ʘk</td>
<td>ʘk</td>
<td>ʘ</td>
<td>ʘ</td>
<td>ʘη</td>
</tr>
</tbody>
</table>

Comparative evidence suggests that nasal devoicing in Kwaluudhi applied to all nasals, and that after subsequent loss of the voiceless stop, ʘ/, but not /E/ or ʘ/, lost its laryngeal modification. This brings the asymmetric development of Kwaluudhi ʘ/ in line with that of *\textipa{η}b in Proto-Mal and Proto-Thai, as discussed in §5.2.3.1.
Whereas the distribution of laryngeal modifications across /m n ɲ/ offers a clear-cut illustration of asymmetric nasal behaviour, no nasal asymmetries are observed when we consider the distribution of secondary place. Inspection of UPSID does not reveal any preferential association between primary place and palatalization or velarization, neither for nasals nor for any other manner type. As regards labialization, 6 of the 9 languages in UPSID with distinctive labialized nasals contain /ŋw/ only. However, this relation seems to depend primarily on place, since in these languages distinctive labialization is a property of all velars. This suggests that the relative cross-linguistic frequency of /ŋw/ is not due a nasal asymmetry.

In a similar vein, it might be suggested that the distribution of laryngeal modifications across /m n ɲ/ is not due to a nasal asymmetry, but involves a more general asymmetry which depends on place. However, inspection of UPSID suggests that this is not the case. Rather, the distribution of laryngeal modifications appears to depend on the type of manner and the type of laryngeal contrast involved. For instance, as far as stops are concerned, labial place is relatively dispreferred in plain and glottalized stops, velar place is relatively dispreferred in voiced stops, while aspirated stops, both voiceless and voiced, generally have the same range of place contrasts as their plain counterparts. In voiced glottalized stops, on the other hand, velar place is dispreferred. An antagonistic relation between velar place and a laryngeal modification can also be observed in approximants, provided /w/ is classified as having primary labial place: the UPSID sample contains 25 instances of laryngeally modified /w/ (14 instances of /E/ and 11 instances of /ʊw/), 20 instances of /j/ (13 instances of /Q and 7 of /–/), but no laryngeally modified velar approximants. Hence, it might be suggested that the asymmetric distribution of laryngeal modifications across /m n ɲ/ is typical of sonorants (or, more generally, of voiced segments), although further research is required to substantiate this hypothesis.

The preceding discussion raises the question why we find nasal asymmetries in relation to laryngeal modifications, but not in relation to secondary place. I suggest that this is due to the fact that manner is relevant in relation to the former, but not in relation to the latter. In supralaryngeal consonants, whether oral or nasal, primary and secondary place both involve modifications in the oral

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14 The number of palatalized velars in UPSID is slightly lower than that of palatalized labials and coronals. According to Maddieson (1984:38), a plausible explanation for this asymmetry is that “historically velars in ‘palatalizing context’ tend to shift their place of articulation and become palatal or palato-alveolar”.

15 These are Awiya, Iraqw, Guarani, Lakkia, Wantoat, and Hopi.

16 It is reasonable to view the preferential association between labialization and velar place as the consonantal equivalent of the preferential association between roundness and backness in vowels.

17 Note that velar approximants are cross-linguistically rare in any case, particularly if—as is assumed here—/w/ is regarded as having primary labial place.
cavity. As a result, we expect any asymmetry to be the result of a relation—either positive or negative—between primary and secondary place, regardless of the manner type of the consonant. The situation is different with respect to manner. Since manner types such as stops and sonorants differ in terms of their glottal configuration, any asymmetries in the distribution of laryngeal contrasts could be argued to be related to both manner and place.

### 7.1.2 Segment phonotactics

Additional support for the consonantal strength of /m/ comes from an investigation of distributional asymmetries involving /m/. These suggest that the distribution of /m/ is, in some languages at least, characteristic of obstruents rather than of sonorants.

Consider first of all the observation that /m/, parallel to obstruent stops, can in some languages appear as the first member of a consonant cluster. In Polish, for instance, we find complex onsets beginning with /m/ but not /n/ (cf. Rowicka 1999:312):

\[(12)\]  
\[
\begin{array}{ll}
\text{mgiełka} & \text{‘mistr-DIM’} \\
\text{możyć} & \text{‘to multiply’} \\
\text{mleko} & \text{‘milk’} \\
\text{młody} & \text{‘young’} \\
\text{mrugać} & \text{‘to wink’}
\end{array}
\]

The reverse situation is found when we consider the second member of initial clusters. Consider for instance Russian, which has stop-nasal clusters whose second member is /n/ but not /m/ (see e.g. Halle 1959). Note, too, that the existence of /mn/ clusters suggests that /m/ patterns with stops, since both can occur as the leftmost member of an initial onset:

\[(13)\]  
\[
\begin{array}{ll}
\text{[kn]jega} & \text{‘book’} \\
\text{[gn]jezdo} & \text{‘nest’} \\
\text{[dn]jo} & \text{‘bottom’} \\
\text{[mn]jogo} & \text{‘many’}
\end{array}
\]

A similar distributional asymmetry is found in Dutch, German, and Old English, where we find #kn but not *#km.\(^\text{18}\)

So far I have considered sequences which in traditional terms are treated as clusters. However, asymmetries between the distribution of /m/ and /n nj/ are also observed in sequences which are usually interpreted as involving complex segments. For instance, Smallay (1976) describes Hmong, a Miao-Yao language which is spoken in Cambodia, northern Thailand, and southern China, as having

\(^{18}\) The development of English #kn was discussed in §5.3.2.
an underlying contrast between stops, nasals, and prenasalized stops, with each displaying an additional contrast in terms of aspiration. Hmong also has a series of laterally released stops, the distribution of which depends on dialect. Hmong Daw has plain and aspirated nasals, and has an additional aspirated labial nasal with lateral release. Hmong Njua has an additional coronal prenasal with lateral release. The consonantal inventory of Hmong is given in (14), based on Smalley (1976:69). In (14), segments in single brackets occur in Hmong Daw only, and the segment in double brackets occurs in Hmong Njua only; Smalley notes that /ŋ/ is marginal in both dialects:

(14) \[
\begin{array}{cccccc}
p & t & c & k & q \\
p^h & t^h & c^h & k^h & q^h \\
pl & tl & c^h & k^h & q^h \\
pl^h & tl^h & c^h & k^h & q^h \\
mp & nt & nc & nk & nq \\
mp^h & nt^h & nc^h & nk^h & nq^h \\
mpl & ((ntl)) & \\
mp^h & ((ntl)) & \\
m & n & n & n & n & n \\
(m^h) & (n^h) & (n^b) & \\
ml & \\
(ml^h) & \\
\end{array}
\]

The maximum range of contrasts is therefore found in labials, both stops and nasals. A similar asymmetry between /m/ and /n/ŋ/ is found in other Miao-Yao dialects (see §5.2.1).

The consonantal strength of /m/ is also evidenced by phenomena in which /m/ is exempted from an otherwise general distributional restriction on nasals. A case in point can be found in English. On the assumption that coronals are underspecified for place, Yip (1991) observes that English consonant clusters are limited to at most one place specification. There are very few exceptions to this generalization, and these all seem to involve /m/, as in *Camden, stigma, damsel*, and *flimsy*.

Yet another illustration of consonantal strength comes from processes in which /m/ resists an otherwise general process of nasal place assimilation. An example of this type of asymmetry can be seen in Nyanja, a Bantu language of Mozambique. Herbert (1986:160) observes that in Nyanja, prefixation of the class 9/10 marker /n-/ results in a homorganic nasal-consonant cluster, whereas prefixation of the class 3 nominal prefix /m-/ does not. According to Herbert, the prefix /n-/ (or perhaps /N-/) is fused with a root-initial consonant to produce a prenasalized stop or fricative, while the prefix /m-/ is realized as a syllabic nasal:
The prefixes in (15a,b) are historically derived from Proto-Bantu *ni and *mu, which, in Nyanja as well as in many other Bantu languages, have lost the vowels. The prefix nasal in (15a) can be analyzed as /n-/ as has been done here, or as underlyingly unspecified for place. In either case, we are dealing with an asymmetry which can be attributed to the consonantal strength of /m/.

As a final illustration of the consonantal strength of /m/, consider the following facts from Campidanian Sardinian. Bolognesi (1998:26-8) observes that in the Sestu dialect, intervocalic post-tonic /n/ is realized as nasalization on the preceding vowel, as is illustrated by the forms in (16a). The forms in (16b) indicate that in the same environment /m/ is retained:

(16) a. /poni/ [pōi] ‘put-IMP’
   /pɔnɛndi/ [pɔnɛndi] ‘put-GER’

   b. /dɔmu/ [dɔmu] ‘house’
   /tomata/ [tomata] ‘tomato’

The nasalization context is more general in central dialects of Campidanian. In these dialects, intervocalic /n/ is realized as nasalization on a preceding vowel irrespective of the location of stress. Here, too, intervocalic /m/ is retained, as can be seen in (17):

(17) Central dialects Other dialects
    [femà]       [femina] ‘woman’
    [kɔl]        [kɔ-nil] ‘rabbit’

Bolognesi further notes that the Sarrabus dialect of Campidanian is like that of Sestu, but differs from it in two respects: deletion of /n/ with concomitant regressive vowel nasalization occurs in any postvocalic position, and the deleted /n/ has a glottal reflex. The latter observation underscores the componential structure of nasal manner, which, as outlined in §2.3, consists of a combination of the “vowel-like” element [L] and the “stop-like” element [ʔ].

(18) Sestu dialect Sarrabus dialect
    [kanu] [kanu] ‘song’
    [sa nu] [sà ru] ‘the walnut’

---

19 According to Trigo (1993), a similar asymmetry can be observed in Lusitanian Portuguese.
I interpret these facts to mean that Campidanian Sardinian has an asymmetric two-nasal system /m/ /n/. The difference between /m/ and /n/ becomes apparent in foot-internal position (and, in some dialects of Campidanian Sardinian, in any intervocalic position), a context in which segments are prone to undergo lenition. The fact that /n/ is realized as nasalization (through deletion of its manner component) or as [ʔ] (through deletion of the manner element [L]) while /m/ remains unaffected, suggests that the latter is sufficiently strong to withstand lenition.

7.1.3 Obstruent class behaviour

Another type of evidence for the consonantal strength of /m/ comes from processes in which /m/, to the exclusion of /n/, exhibits natural class behaviour with obstruent stops. In this section, I consider some examples of this type of class behaviour.20

Consider first the following facts from Connemara Irish. Connemara Irish exhibits a morphologically conditioned alternation between [n] and [r], in such a way that /n/ is realized as [r] in the context of a preceding stop, as in (19a), and as [n] in the context of a preceding fricative, as in (19b) (cf. Bloch-Rozmej 1998:239):

(19)  a. an tsneachte [ə trəðəτə] ‘of the snow’
    an tsnáthaid [ə trəðəv] ‘the needle’
    sa tsnámh [sə trəðəv] ‘into the deep’
    b. sneachta [sNəxə] ‘snow’
    snámh [sNəxəv] ‘deep’
    snáthaid [sNəxəd] ‘needle’

Note that an analysis in which /n/ is underlying is supported by the fact that surface forms that contain [r] are realized with a following nasalized vowel. The rightward transfer of nasalization corroborates the observation that nasalized vowels are less marked than nasalized approximants (see §§3.1 and 3.3). For present purposes, the point to note is that /m/ patterns with stops in the [n–r] alternation, as is evidenced by the forms in (20):

20 It has been claimed on a number of occasions that in Goidelic Celtic lenition /m/ patterns with obstruents, given that /m/, like obstruents but unlike sonorants, lenites to a voiced fricative (see for instance Anderson 1975, Davenport 1995). As was argued in §3.3, my interpretation of these facts is different: I claim that the outcome of nasal lenition, in Goidelic as well as in other languages, has sonorant status. According to this interpretation, Goidelic lenition does not qualify as an example of natural class behaviour of /m/ and obstruents.

21 In (19), “N” represents non-lenited /n/.
(20) gnás [grǎːs] ‘custom’
tnuth [tɾu] ‘desiring’
cnoc [krǔk] ‘hill’
cnáimh [krǎv] ‘bone’
mná [mɾǎ] ‘women’

Note, too, that a further similarity between stops and /m/ is that both can occur as the leftmost member of a consonant cluster, similar to what was observed in §7.1.2 for Polish and Russian.

Another example of natural class behaviour of stops and /m/ is found in Hindi. As Bharati (1994:57) observes, English loans in Hindi are incorporated with a prothetic vowel if they contain an initial cluster /sp sk sm/, as in (21a). There is free variation between a prothetic and an epenthetic vowel if the initial cluster is /sn sl/, as in (21b). (21c) shows that an initial cluster /sr/ is consistently realized with an epenthetic vowel:

(21) a. English Hindi
   special ispesal slow silo-islo shrewd suruud
   school iskuul snake sinek~isnek
   smile ismaail

The observation that /m/, in contradistinction to other sonorants, consistently patterns with stops supports the consonantal strength of /m/.

A final illustration of class behaviour of stops and /m/ concerns the observation that in Arabic roots we find coocurrence restrictions on /n l r/ and /m b f/ (see, among others, Ferguson 1975, Yip 1988, and McCarthy 1994). This suggests that we are dealing with a restriction in terms of place, given that /n l r/ are coronal and /m b f/ are labial. However, the fact that /n/ can occur together with coronal obstruents such as /t/ and /s/ indicates that these cooccurrence restrictions also reflect natural class behaviour of /m/ with obstruents.

7.1.4 Discussion

In the preceding sections, a number of different types of evidence for the consonantal strength of /m/ were provided. In this section, I will briefly consider some avenues of approach as regards the interpretation of this evidence.

Given that the difference between /m n ɳ/ is, superficially at least, one of place, it is plausible to interpret the consonantal strength of /m/ as due to it being specified for [U]. This is the position taken in Van der Torre (2003:55,140), who argues that [U] is “the most consonantal place element” of [U], [I], and [A]. In his discussion of nasals, Van der Torre pays particular attention to distributional asymmetries involving /m n ɳ/, which he accounts for in terms of Optimality Theoretic constraint rankings. One of the constraints which Van der Torre uses is ONSETCONDITIONSONORANT, a representational constraint which sanctions only
those sonorant onset clusters whose leftmost member is labial (cf. Van der Torre 2003:140). The Element-based Dependency interpretation of this constraint is given in (22):

(22) \[
\begin{array}{c}
| \ \ \ | \\
\text{O} \\
\text{L} \ \ \ L \\
\text{U} \ \ \ \text{place}
\end{array}
\]

That is, the leftmost sonorant in a complex onset which contains two place-specified manner structures must be specified for [U].

The constraint in (22) guarantees that /m/, but not /n/ or /ŋ/, can occur as the leftmost member of a sonorant onset cluster. The data in (12) above suggests that Polish is an example of a language in which (22) is high-ranked. Van der Torre argues that Dutch is another such language. In Dutch, the high-ranking ONSETCONDITIONSONORANT sanctions the initial cluster in the word mnemonisch [mnemonis] ‘mnemonic’ (the only example of this kind), and it ensures that foreign names such as Mladic [mladitʃ] are realized with the initial cluster left intact. As regards non-nasal sonorants, (22) accounts for the fact that Dutch permits onsets such as /vl vr/, but not /jl jr/ (cf. Van der Torre 2003:180-3). As Norval Smith (p.c.) notes, support for this asymmetry comes from Sranan. Whereas earlier Sranan allowed /vr/ and /jr/, as in /vr̥ko/ ‘work’ and /jrepi/ ‘help’, present-day Sranan only permits /wr/ (with /jrepi/ > /rẹpi/).

It is dubious whether all instances of consonantal strength are equally amenable to an analysis in terms of place. Consider for instance the observation that /m/ may sometimes display natural class behaviour with obstruents to the exclusion of /n/ (see §7.1.3). While it is evident that /m/ can be singled out on account of having [U], it is unclear how this fact can be employed to establish a structural parallel between /m/ and obstruent manner. A more feasible approach might be to analyze this asymmetry between /m/ and /n/ in terms of a difference in manner. For instance, the obstruent-like characteristics of /m/ could be expressed by a switch in the dependency relation between the elements which make up nasal manner, such that in /m/ /r/ dominates [L], and in /n/ /ŋ/ [L] dominates [ʔ].

---

22 An alternative account for this asymmetry is to regard /w/ as an inherently voiced fricative rather than as an approximant, as was suggested in §2.1.3.
According to this interpretation, obstruent stops and /m/ are both headed by [], which makes it possible to express natural class behaviour of these two segment types. Note that while /m/ is still identified as a sonorant by virtue of the presence of [L], the headedness of [] makes /m/ more “consonantal” than /n/.

However, it should be observed that the manner structure in (21a) was also argued to represent inherently voiced stops (see §2.2.4). I leave the question whether—and if so, to which extent—these two interpretations are compatible for further research.

7.2 Vocalic strength

In this section, I discuss a range of cross-linguistic evidence in support of the claim that in those cases where /ŋ/ shows asymmetric behaviour, this behaviour is characteristic of vowel-like segments. In §7.1, we already observed that of the nasals /m n ŋ/, /ŋ/ is least suited to be combined with a laryngeal modification. On the assumption that the capacity to support laryngeal modifications reflects relative consonantal strength, we can interpret the relative markedness of such modifications in /ŋ/ to be a sign of consonantal weakness, or—as I will refer to it—as “vocalic strength”.

Below, I will consider two other types of evidence in support of the vocalic strength of /ŋ/. Both types of evidence are based on the assumption that if vocalic strength is equated with vowel-like behaviour, then we expect to find cases in which /ŋ/ patterns with vowels to the exclusion of /m n/. In §7.2.1, I examine some cases in which a vocalic position—a nucleus or a coda—permits /ŋ/ but not /m n/, and some cases in which a consonantal position—an onset—permits /m n/, but not /ŋ/. Next, in §7.2.2, I will briefly consider how the facts encountered can be interpreted in Element-based Dependency.

7.2.1 Prosodically conditioned asymmetries

In this section, I take as my starting point the assumption that the onset position of a syllable is associated with consonantal properties while the nucleus position (and, to a lesser extent, the coda position) are associated with vocalic properties.
General support for this assumption comes from the distribution of consonants and vowels in syllable structure. Consider for instance the observation that many languages restrict the range of possible coda consonants to sonorants. Given that sonorants consist of vocalic material, in the sense that they have a manner structure which contains \( [L] \), I interpret this to mean that the coda position is a vocalic position. The same point can be made regarding the nucleus, which in most languages is restricted to vowels.

If \( /n/ \) displays vocalic strength, then we expect to find languages in which \( [n] \), rather than \( [m n] \), is the realization of syllable-final nasals. This can be observed for instance in those dialects of French which lack nasal vowels. As is Ploch (1999) notes, the nasal vowels of Standard French correspond to vowel-nasal sequences in Montpellier French. These nasals surface as homorganic with a following consonant word-internally, as in (24a), and as \( [n] \) word-finally, as in (24b):

(24)  

<table>
<thead>
<tr>
<th></th>
<th>jambe ([\text{samba}]) ‘leg’</th>
<th>un ([\text{œn}]) ‘a-MASC’</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>menthe ([\text{manta}]) ‘mint’</td>
<td>vin ([\text{ven}]) ‘wine’</td>
</tr>
<tr>
<td></td>
<td>banque ([\text{banka}]) ‘bank’</td>
<td>vent ([\text{van}]) ‘wind’</td>
</tr>
</tbody>
</table>

The same pattern is found in Midi French (see e.g. Durand 1988, Rice 1996), as well as in some dialects of European Portuguese (see e.g. Trigo 1988). Note, too, that in the Andalusian dialect of Spanish underlying word-final coronals are realized as velar (see Rice 1996).

Another language in which final nasals are realized as velar is Japanese (see e.g. Itô 1986, Yip 1991). Here we find homorganic nasals word-internally, while in word-final prepausal context we find variation between \( [n] \) and \( [M] \). Consider the forms in (25):

(25)  

<table>
<thead>
<tr>
<th></th>
<th>do([\text{mb}])uri ‘bowl’</th>
<th>ho([\text{n–M}]) ‘book’</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mo([\text{nd}])ai ‘problem’</td>
<td>ze([\text{n–M}]) ‘goodness’</td>
</tr>
<tr>
<td></td>
<td>da([\text{ng}])o ‘dumpling’</td>
<td>a([\text{n–M}]) ‘idea’</td>
</tr>
</tbody>
</table>

The fact that the realization fluctuates between \( [n] \) and \( [M] \) can be taken as an argument for nasal lenition (see §3.3). For present purposes, the point to note is that both the vocalic and the consonantal allophones surface as velar, which suggests that \( [A] \) is the preferred place element in syllable-final context.

In other languages, we find surface variation between nasalized vowels and sequences of an oral—or, more precisely, a non-distinctively nasalized—vowel followed by \( [n] \). For instance, Smith (1987) notes that Sranan exhibits variation of the kind \( [\text{an–ã–ãn}] \). In a similar vein, Ohala & Ohala (1993:235) note that

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23 Another type of evidence comes from position-dependent patterns of allophonic variation, for instance the variation between clear and dark \( /l/ \) (see e.g. Sproat & Fujimura 1993, Botma & Van der Torre 2000).
word-final nasalized vowels in Acatlan Mixtec and Mbay are usually followed by a light velar closure. This realization is also found in Phlong (cf. Cooke et al. 1976:203). Recall, too, that there are languages which at some point in their history have undergone a process in which nasal vowels develop into sequences of an oral vowel plus /ŋ/. Examples of such languages include Bisu (see §5.2.3.2) and Inor (see §6.1.1).

The emergence of [ŋ] in the context of a preceding nasalized vowel is also observed in foreign accents of languages which have nasalized vowels. Citing Delattre (1965), Herbert (1986:203) observes that in a typical English accent of French, nasalized vowels are realized as sequences of an optionally nasalized vowel followed by a homorganic nasal in word-internal position, and by an optionally nasalized vowel followed by /ŋ/ in word-final position. This observation ties in with one of the main findings of Paradis & Prunet (2000): if a language borrows a word from a language with nasalized vowels, and if that language does not itself have nasalized vowels, then vowel nasality is often “unpacked” into a sequence of an oral vowel followed by /ŋ/. Thus we find, for instance, Swedish <restaurang> corresponding to French restaurant [restɔʁɑ̃].

The emergence of syllable-final [ŋ] is not always conditioned by a preceding nasal vowel. Dixon (1980:211) observes that some Pama-Nyungan languages, such as Wik-Meñnh and (some dialects of) Anmatjera, have undergone a diachronic process in which /ŋ/ has been added to final open syllables. Dixon reports a similar process for Uradhi, which displays a synchronic process in which final open syllables are augmented by [k] or [ŋ]. According to Dixon, the nasal variant occurs in case the root itself also contains a nasal. Two examples are given in (26) (cf. Dixon 1980:211):24

(26) /juku/ [júkuk] ‘tree’
/ama/ [amâŋ] ‘man’

Dixon attributes this phenomenon to the requirement that words end in a consonant. The fact that the inserted consonant is [k] or [ŋ] supports the unmarked status of velars in syllable-final position, and thus supports the hypothesis that [A] is the most vocalic place element.25

In the cases considered so far, [ŋ] can be interpreted as the unmarked consonantal realization of nasality in vocalic context. This scenario is to be

24 According to the description of Crowley (1983), epenthetic [ʔ] is also attested, and appears to be possible regardless of the phonological context. For a more detailed analysis of Uradhi, see Trigo (1988), Paradis & Prunet (1993), and Rice (1996).

25 The issue is complicated by the observation that in some Australian languages, such as Muk-Thang, [ŋ] is also inserted in word-initial context. Dixon suggests that this is not so much due to a property of [ŋ], but to the unmarked status of non-coronals. This unmarkedness is a characteristic trait of Pama-Nyungan languages, where the majority of consonantal contrasts is made on the basis of subtypes of coronal place.
distinguished from those cases in which the emergence of [ŋ] is due to the spreading of vowel place features. An example of the latter type of process is observed in the now extinct Wieringen dialect of Dutch. In Wieringen Dutch, nasals surface as [ŋ] in the context of a preceding /a/ or /ɔ/ and a following coronal stop, as in the forms in (27a). In other contexts, the nasal surfaces as homorganic with a following stop, as in the forms in (27b) (cf. Daan 1950, Van Oostendorp 2000b):

(27)  a. mond [mɔŋt] ‘mouth’  b. kind [kɪnt] ‘child’
     hand [hɑŋt] ‘hand’    lamp [lɑmp] ‘lamp’

There is evidence to suggest that this pattern was more widespread in earlier stages of Dutch. Hoeksema (1999:94) observes that in Dutch 17th and 18th-century literature, the speech of “farmers and other people of humble origin” (translation mine) is marked by the same phenomenon. Some examples are given in (28):

(28)  | Dutch     | Literature forms |
      | mond [mɔŋt] | [mɔŋt] ‘mouth’ |
      | onder [ɔndər] | [ɔndər] ‘beneath’ |
      | ander [ɔndər] | [ɔndər] ‘other’ |
      | Frans [frans] | [frɑns] ‘French’ |

Van der Torre (2003:104-6) argues that these facts can be accounted for in terms of the constraint VELARNAS(R). This constraint requires nasals that are dominated by a rhyme position to be specified for [A]. In Wieringen Dutch, VELARNAS(R) outranks DEP-[l], the latter a correspondence constraint militating against the insertion of [l]. This ranking captures the fact that [ŋ] occurs after low back vowels only, which are themselves specified for [A]. To account for the fact that /m/ but not /n/ is affected, Van der Torre further hypothesizes that the identity constraint which militates against the deletion of [U], i.e. IDENT-[U], outranks the identity constraint which militates against the deletion of [l], i.e. IDENT-[l]. Van der Torre argues that this ranking is universal.27

Another illustration of the vocalic strength of /ŋ/ comes from those languages in which syllable-final /ŋ/ is compatible with a greater range of preceding vowels than syllable-final /m n/. An example of this asymmetry is

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26 Van der Torre argues that VELARNAS(R) is also high-ranked in Cologne German, Afrikaans, Antwerp Dutch, and some dialects of Limburg Dutch; these dialects display syllable-final alternations between coronal and velar nasals similar to those observed in Wieringen Dutch.

27 Van der Torre also assumes that IDENT-[l] is universally dominated by IDENT-[A], the latter requiring that [A] be retained in outputs. This ranking derives the cross-linguistically unmarked status of coronal place.
found in the Bisoid languages Bisu and Pyen. Regarding these languages, Bradley (1985a:240) notes that

the generalization that can be made ... is that final /m/ occurs after a small number of vowels, notably /u/ and /a/; while /n/ occurs after a few more, and final /ŋ/ occurs after nearly all.

Like the data considered above, this type of distributional asymmetry suggests that /ŋ/ is less marked in vocalic positions than /m n/. The unmarked status of /ŋ/ in vocalic positions can also be observed in Mandinka, a Manding language of Guinea-Bissao, Senegal, and the Gambia. According to Tourville (1991), Mandinka permits /m n p ŋ/ syllable-initially, but only /ŋ/ syllable-finally, where /ŋ/ is the only consonant that is allowed. In distributional terms, /ŋ/ therefore patterns with vowels. Further support for the natural class behaviour of /ŋ/ and vowels in Mandinka comes from the observation that /ŋ/ is the only consonant which can be syllabic and tone-bearing. The Mandinka facts therefore support the hypothesis that of /m n ŋ/, /ŋ/ displays vocalic strength.

The hypothesis that /ŋ/ displays vocalic strength leads us to expect not only that /ŋ/ is relatively favoured in vocalic positions, but also that /ŋ/ is relatively disfavoured in consonantal positions. A clear illustration of this can be observed in Indo-European, where initial /ŋ/ is absent. In other language families, initial /ŋ/ is allowed; however, it appears to be the case that if a particular language permits /ŋ/ in the onset, it will also permit /ŋ/ in the coda. Van der Torre (2003:116-8) discusses a number of apparent counterexamples to this generalization, based on a recent typological overview in Anderson (2003), but concludes that none of these constitutes compelling evidence against the antagonistic relation between /ŋ/ and the onset position.

Aside from synchronic asymmetries, we also expect to find evidence from diachronic processes which shows that initial /ŋ/ is less stable than initial /m n/. One example of this asymmetry is observed in Sabaki, a Bantu subfamily of East Africa which includes Swahili. As Nurse & Hinnebusch (1993:147) note, Sabaki has retained all instances of Proto-Bantu *m, *n, but only some instances of *ŋ. Most synchronic occurrences of Sabaki /ŋ/ are instead derived from *ŋ through a process of stop deletion, which, Nurse & Hinnebusch conclude, must have been active in an earlier stage of Sabaki.

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28 In fact, Indo-European is generally reconstructed as lacking /ŋ/ altogether. Subsequent developments in daughter languages have resulted in the observed asymmetry between syllable-initial and syllable-final context.

29 In a similar vein, it appears to be the case that if a language permits /m/ in codas, it will also permit /m/ in onsets. Neither Van der Torre nor I have found any counterexamples to this generalization.

30 In Bantu linguistics this process of postnasal stop deletion is referred to as Meinhof’s Law.
An additional illustration of the instability of */ŋ/ concerns the development of */Ng/ clusters in Sabaki. As is the case for Bantu in general, the development of such clusters in Sabaki is characterized by a host of changes affecting both the nasal and the stop part, including postnasal voicing, nasal devoicing, and postnasal aspiration. Mwani, a Sabaki language of northern Mozambique, shows a development which is different from that of other Sabaki languages. In Mwani, labial and coronal */N±/ clusters have lost the stop portion, while velar */N±/ sequences have been lost completely. This is illustrated in (29):

(29)  

<table>
<thead>
<tr>
<th>Proto-Sabaki</th>
<th>Mwani</th>
</tr>
</thead>
<tbody>
<tr>
<td>*/mpula/</td>
<td>mula</td>
</tr>
<tr>
<td>*/munu/</td>
<td>munu</td>
</tr>
<tr>
<td>*/ŋkuku/</td>
<td>uku</td>
</tr>
</tbody>
</table>

According to Nurse & Hinnebusch (1993:162), Mwani has been influenced by the non-Sabaki languages Ruvu and Kagulu, where */N±/ clusters have changed into aspirated nasals (cf. Kagulu /ŋuku/ <*/ŋkuku/). If this is correct, this might be taken to suggest that there was an intermediate stage in which Mwani had initial /mŋ/ where /mŋ/ subsequently developed into /m n/ while /ŋ/ was lost. This would be another example of the antagonistic relation between /ŋ/ and laryngeal modifications.

The diachronic loss of initial /ŋ/, but not /m n/, can also be observed in a number of Pama-Nyungan languages. For instance, Blevins (2001) notes that word-initial */ŋ/ was lost before /a/ in Arabana and before /i/ in Baagandji. According to Blevins, this type of loss typically affects segments which have intrinsically weak perceptual cues. These segments include /p g j/ and also /ŋ/, which, Blevins (2001:483) observes, is the “weakest nasal”.

### 7.2.2 Discussion

The distributional asymmetries considered in the previous section strongly suggest that the behaviour of /ŋ/ is more vowel-like than that of /m n/. In this section, I consider some avenues of approach as regards the interpretation of these asymmetries.

A reasonable assumption is to relate the vocalic strength of /ŋ/ to the fact that it is specified for [A]. This is the position taken in Van der Torre (2003:140), who argues that [A] is “the most vocalic place of articulation”. To this effect, Van der Torre proposes two representational constraints; the Element-based Dependency versions of these constraints are given in (30a,b):
The constraint in (30a) is the representational version of $\text{VELAR}_{\text{NAS}}(R)$, introduced in §7.2.1. It states that /ŋ/ can only occur in case it is dominated by a coda constituent. The constraint in (30b) rules out |A|-specified nasals in onset position. Most of the distributional asymmetries involving /ŋ/ can be captured using the constraints in (30), although the specific interaction between these and other constraints requires further research (see Van der Torre 2003 for a more detailed investigation of some of the facts considered above). Consider as an illustration the distribution of /ŋ/ in Dutch. As was observed in (7), /ŋ/ in Dutch is disallowed in word-initial onsets as well as after tense vowels and diphthongs. These restrictions can be accounted for in terms of the constraint in (30a). If it is assumed that /ŋ/ can only follow lax vowels, and that lax vowels must be followed by a consonant within the same syllable (see Van Oostendorp 2000a), then the distribution of /ŋ/ is restricted to the dependent position of the rhyme, as in (30a).

As was also observed in connection with /m/, it is questionable whether all instances of vocalic strength can be accounted by reference to place. This holds in particular with regard to the antagonistic relation between /ŋ/ and laryngeal modifications, which, as was noted in §7.1.1, appears to be the result of the combination of nasal manner and |A|-place. A possible avenue of approach here is to represent /ŋ/ in terms of a more vocalic manner structure, for instance by making it |L|-headed as compared to /m n/, or perhaps by representing /ŋ/ as lacking place altogether (see §4.2.3 for this suggestion). I leave this issue for further research.

### 7.3 Coronal unmarkedness

In this section, I briefly consider some evidence in support of the claim that in those cases where /n/ exhibits asymmetric behaviour, this behaviour is characteristic of the markedness effects associated with coronals. That is, where the asymmetric behaviour of /m n/ seems in many cases to be specific to these nasals, the asymmetric behaviour of /n/ appears to be typical of coronal place in general. In this section, I illustrate the asymmetric patterning of /n/ by focusing on some distributional differences between /n/ and /m n/ in Dutch.
In Dutch, there are two contexts in which /n/ is permitted, but not /m n/.

First, Dutch permits only those obstruent-nasal clusters whose second member is /n/. Here clusters with initial labials are very rare, as are forms with initial velar fricatives; forms with initial velar stops are, on the other hand, quite frequent:

(31) a. *Stop-/n/
   
   [pn]euma ‘pneuma’
   [kn]je ‘knee’
   [kn]oop ‘button’
   [kn]al ‘bang’

   b. *Fricative-/n/
   
   [fn]uiken ‘to thwart’
   [xn]oe ‘gnu’
   [xn]iffelen ‘to snigger’

The possibility of /kn/, but not of /km/, is also found in Russian (cf. (13) above). Note that clusters with /m n/ are ruled out for different reasons: the consonantal strength of /m/ renders it unfit to appear in the dependent position of an onset, while the vocalic strength of /n/ renders it unfit to appear in onsets altogether. The fact that /n/ is tolerated in the dependent position of an onset can be attributed to its unmarked coronal status.

Second, word-final /n/, but not /m n/, can occur after a sequence of a tense vowel and a following /r/, as is illustrated by the forms in (32):

(32) hoorn [horn] ‘horn’
   doorn [dorn] ‘thorn’
   Baarn [barn] ‘id. (place name)’

In some versions of syllable theory, the position in which /n/ occurs in (31) is termed the syllable “appendix” (see Fudge 1969; see also Booij 1995 in relation to Dutch). While the appendix is typically reserved for coronal obstruents, the Dutch facts indicate that it can also be occupied by coronal sonorants. Hence, we may conclude that the relatively unrestricted distribution of /n/ ties in with the general unmarkedness effects associated with coronal place.

Further evidence for the unmarked status of /n/ comes from deletion and insertion processes. Consider first the observation that in Dutch both /m n/ can occur after /s/. In this context /n/, but not /m/, is usually deleted in casual speech:

(33) a. lopen /lopən/ [lɔpə] ‘to walk’
   sokken /sɔkən/ [sɔkə] ‘socks’
   varken /varkən/ [varko] ‘pig’

   b. bezem /bezəm/ [bezəm] ‘broom’ (*[beza])
   adem /admə/ [adəm] ‘breath’ (*[ada])

31 Disregarding /s/, the distributional status of which is exceptional, Dutch does not tolerate homorganic clusters within the same subsyllabic constituent. This accounts for the absence of initial /m n/ clusters.
The distribution of /n/ after /s/ in Dutch bears a resemblance to the distribution of [r] in non-rhotic varieties of English. Parallel to English [r], Dutch [n] is realized in the context of a following vowel, as in (34):

(34)  we / lopan om/ / səkən an/ het / vərkən et/
we [ lopan om] [ səkən an] het [ vərkən et] we walk around socks on the pig eats
‘we take a detour’ ‘(put your) socks on!’ ‘the pig eats’

Some speakers of Dutch also exhibit a process of “intrusive-[n]” formation to avoid vowel hiatus (cf. Booij 1995). This process involves the insertion of [n] in the context of a preceding schwa and a following vowel. Some examples are given in (35):

(35)  hij / vtldə het/ / vtldə hei/ komen het / xəkə is/
hij [ vtldə -n-ət] [ vtldə -n-i] het [ xəkə -n-Is] he wanted it wanted he come the crazy is
‘he wanted it’ ‘did he want to come?’ ‘the strange thing is’

The coronal place of the epenthetic consonant again ties in with the cross-linguistically unmarked status of these segments. The reason why [n] is inserted in post-/s/ context rather than, say, [t], can be attributed to the fact that /n/ is deleted in exactly the same context. Given this, [n]-intrusion can be viewed as an instance of hypercorrection.

A final piece of evidence in favour of the unmarkedness of /n/ comes from patterns of Dutch place assimilation. The forms in (36) illustrate that /n/ is the only nasal which assimilates in place to a following obstruent. This occurs in prefixation, as in (36a), and in compounding, as in (36b). The forms in (36c-e) indicate that in these contexts /m ɲ/ are not targeted by place assimilation (cf. Van der Torre 2003:136-7).

(36)  a. in+pakken i[m]akken ‘to wrap up’
on+verstandig o[n]erstandig ‘unwise’
in+dienien i[n]ienen ‘to hand in’
on+kunde o[n]unde ‘incompetence’
b. steen+bok stee[m]bok ‘Capricorn’
steen+tijd stee[n]tijd ‘stone age’
steen+kool stee[n]kool ‘coal’
c. om+brengen o[m]brengen ‘to kill’
om+draaien o[m]druwen ‘to push over’
om+kopen o[m]kopen ‘to bribe’

32 This example of nasal asymmetry was briefly discussed in (3) above.
On a related point, Dutch does not tolerate any morpheme-internal sequences of /n/ and a following heterorganic stop. As is the case in most languages, Dutch morpheme-internal nasal-consonant clusters are predominantly homorganic. The few exceptions to this generalization all involve a combination of /m/ and a following coronal obstruent, as in (37a), or a combination of /ŋ/ and a following coronal obstruent, as in (37b):

(37)  a. labial nasal-coronal obstruent  b. velar nasal-coronal obstruent

\[
\begin{align*}
\text{vreemd} & \rightarrow \text{vreem} \quad \text{langs} \rightarrow \text{langs} \\
\text{hend} & \rightarrow \text{hent} \quad \text{hengst} \rightarrow \text{hengst} \\
\text{gems} & \rightarrow \text{xems} \quad \text{angst} \rightarrow \text{anzst}
\end{align*}
\]

The nasal asymmetries in (35) and (36) suggest that /l/ is weaker than /U/ and /A/, in the sense that /l/ is more prone to undergo deletion in processes of place assimilation. The fact that this asymmetry is the cross-linguistically typical scenario supports the view that, all things being equal, /l/ is the unmarked place of articulation.

Like Van der Torre, I assume that nasal asymmetries involving /n/ arise from coronal unmarkedness effects. As Paradis & Prunet (1991) note, support for the unmarkedness of coronals comes from their distributional frequency, their cross-linguistic frequency, their susceptibility to processes of assimilation, and from the observation that coronals are generally the preferred default option and epenthetic filler. The last observation is underscored by the pattern of nasal place specification in languages which have only a single underlying nasal consonant. The UPSID sample contains 7 such languages, i.e. Tlingit, Yuchi, Chipewyan, Wichita, Southern Nambiquara, Mixtec, and Taoripi (cf. Maddieson 1984). The phonetic realization of the nasal in these languages is variable. If the language has nasal-consonant clusters, then place is usually determined by the consonant, as is the case for such clusters in general. If there is no following consonant, then the nasal has variable place. Here Tlingit, Chipewyan, Wichita, Yuchi, and Southern Nambiquara have [n], Mixtec has [ŋ], and Taoripi has [m]. The fact that the majority of languages has [n] can be attributed to coronal being the cross-linguistically unmarked place. Mixtec [ŋ] can be attributed to the fact that this nasal is found in postvocalic position only. More generally, it might

33 Note that Mixtec displays a process of nasal harmony in which a series of sonorant stops alternates with a series of nasals. Based on the description in Piggott (1992), Mixtec [ŋ]

### NASAL ASYMMETRIES

- d. tram+bestuurder tra[m]estuurder ‘tram driver’
  tram+tunnel tra[m]tunnel ‘tram tunnel’
  tram+kaart tra[m]kaart ‘tram ticket’
- e. meng+paneel me[n]paneel ‘mixing panel’
  meng+tafel me[n]tabel ‘mixing table’
  meng+kwas tra[n]kwaast ‘mixing brush’
be suggested that in one-nasal systems, the choice between [n] and [ŋ] is prosodically conditioned (see Rice 1996 for discussion of this issue). The fact that the nasal of Taoripi is realized as [m] rather than [n] or [ŋ] is unexpected.

7.4 Summary

In this chapter, I have shown that although nasals typically behave as a natural class, many languages display asymmetries in the phonological behaviour of particular nasals. The data considered suggests that these asymmetries, rather than being random, are related to specific markedness effects associated with different places of articulation. In general, the asymmetric behaviour displayed by /m/ is typical of consonant-like articulations, which suggests that [U] is the most consonantal place. The asymmetric behaviour that is displayed by /ŋ/ is typical of vowel-like articulations, which suggests that [A] is the most vocalic place. Finally, the asymmetric behaviour displayed by /n/ is associated with the cross-linguistically unmarked behaviour of coronals, and suggests that [I], in nasals as well as in other segment types, is the unmarked place element.