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Heritage Language Obstruent Phonetics and Phonology

American Norwegian and Norwegian-American English

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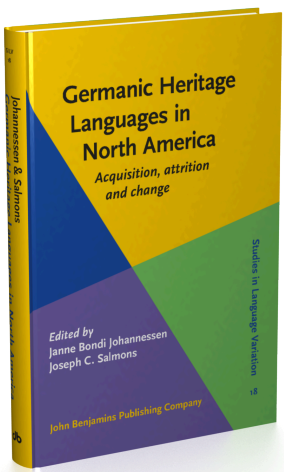

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Heritage language obstruent phonetics and phonology

American Norwegian and Norwegian-American English

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This chapter explores the acoustics and phonology of speech sounds produced by Norwegian heritage speakers in the Upper Midwest in Norwegian and to a lesser extent in English. The study reports work on acoustic differences in obstruents spoken by heritage speakers whose L1 and L2 are both 'aspiration' languages, namely Norwegian and American English, but which differ phonologically in other ways. Our focus falls in particular on laryngeal features, that is, the realization of the distinction between 'voiced' and 'voiceless' or 'lenis' and 'fortis' consonants, along with the closely related issue of durational contrasts in Norwegian. Building on Allen and Salmons (2012), we argue that the Norwegian and English spoken by Norwegian-American bilinguals will each show influence from the other language, but asymmetrically.

Keywords: laryngeal phonetics, laryngeal phonology, aspiration, sonorant devoicing, passive voicing, duration

1. Introduction[1]

This chapter deals with speech sounds produced by Norwegian speakers in the Upper Midwest in Norwegian and, to a lesser extent, English. Our focus falls on laryngeal features, the distinction between 'voiced' and 'voiceless' or 'lenis' and 'fortis' consonants,

1. This paper is an expansion and development of material first presented in Allen and Salmons (2012). We are grateful to Janne Bondi Johannessen and colleagues for inspiring us to undertake this work, as well as to Luke Annear and Kristin Speth for sharing their field recordings with us. An initial version of this paper was presented at the Second Workshop on Immigrant Languages, Fefor, September 2011. We thank the following for comments and suggestions on this project: The audience at the Fefor workshop, Curt Rice and Nina Gram Garmann, as well as Arnstein

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along with the closely related issue of durational contrasts in Norwegian. Norwegian and English spoken by Norwegian-American bilinguals both show influence from the other language, but asymmetrically.

A first basic goal here is simply descriptive. We know much about English phonetics and phonology generally, but far less about Upper Midwestern English. We know less yet about some relevant areas of Norwegian. Some work has been done on the phonetics and phonology of American Norwegian, but no instrumental analysis until Allen and Salmons (2012). Our second, broader goal is to look at heritage speaker sound patterns and realizations in terms of van Coetsem's theory of borrowing and imposition, situated in phonetic and phonological theory and language change.

This paper is hardly the first study of Norwegian in the Upper Midwest, or English as spoken by Norwegian Americans there. Before the papers in the present volume, Simley (1930) examines Norwegian and English as they were spoken in Minnesota. Haugen (1953) is an exhaustive study of Norwegian dialects across America in addition to being a classic text on language contact and sociolinguistics, a tradition continued by many papers in Johannessen and Salmons (2012) and in other work especially by Hjelde (e.g., 1992). Moen (1988, 1991, 2001) investigates in particular the English of Norwegian Americans in terms of both pronunciation and syntax. However, these studies are largely descriptive and impressionistic in nature. The present paper differs from previous work in presenting, as far as we are aware, the first acoustic study of the speech of Norwegian Americans (aside from Allen and Salmons 2012).

In the rest of this paper, we present theoretical background in §2, first in terms of language-contact theory and then phonetics and phonology. We give information on the speakers in §3. The heart of the paper then presents phonetic data for our speakers: §4 treats one claimed phonological difference between Norwegian and English, namely that Norwegian lacks the pattern of 'sonorant devoicing.' In line with Allen (2011), we show that the phonetics of European Norwegian aligns more closely with English than the literature would suggest. That is, analysis of the hearth language shows that we should not have expected differences. §5 examines intervocalic voicing. In both languages we expect partial voicing of lenis obstruents, save for the absence of /z/ in Norwegian. This is particularly important as the absence of [z] is widely reported to be characteristic of Norwegian-influenced English in the Upper Midwest. Our speakers show English-like realizations of English /z/. §6 treats the realization of final laryngeal contrasts. Here, the evidence suggests that heritage speakers' English shows subtle influence from Norwegian. Conclusions are provided in §7.

Hjelde, Luke Annear, Greg Iverson, Janne Bondi Johannessen, Signe Laake, Tom Purnell, Eric Raimy, Alyson Sewell and Kristin Speth. The feedback from these colleagues has greatly helped our thinking on this topic but the usual disclaimers apply.

2. Theoretical background

We first introduce the framework we adopt for understanding contact between English and Norwegian in the American setting and then the phonological perspective we adopt here.

2.1 Language contact

We adopt the model of borrowing and imposition first developed by van Coetsem (1988, 2000), since developed by Howell (1993), Winford (2005) and others. At the heart of this theory is an asymmetry between the effects of an L1 on an L2 and vice versa in a situation of language contact involving adult learners. Coarsely reckoned, with our speakers, people who learned Norwegian first and English only later, we expect borrowings into Norwegian, which may be more or less integrated into the sound system, but impositions from Norwegian onto English in phonetics and phonology. A Norwegian heritage speaker would be expected, then, to borrow lexical material like *store, tavern, lake* from English. At the same time, in speaking English as a second language, they may fail to produce segments that are contrastive in English but absent in Norwegian, so that the interdental fricatives /θ, ð/ are produced as [t, d] and /z/ as [s]. In other cases, speakers may not produce allophones, like the English 'light' (alveolar) /l/ versus 'dark' (velarized) [ɬ], where many varieties of Norwegian have only the alveolar variant and, mainly in Eastern and Trøndelag Norwegian, the so-called *tjukk* 'thick' (retroflex) /ɭ/. Or they may produce a different form of a sound that is readily interpreted by English speakers, such as having a dental rather than alveolar place of articulation for /t, d, n/. In fact, such effects are reported for American English spoken by Norwegian-English bilinguals. Simley (1930: 470) finds, for instance, widespread fortis realization of /z, ʒ/ as [s, ʃ] as well as 'stopping' of interdental fricatives, so that *thing* can be pronounced [tʰɪŋ]. Since then, Haugen (1953: 47) and Moen (1991: 104–105) have found similar patterns.

In terms of imposition, work on second language phonology has long shown clear effects of a traditionally-learned L2 on an L1, as detailed by Eckman and Iverson (forthcoming). These effects include changes to the laryngeal system of the L1, both allophonic and phonemic. For instance, recent work on Dutch speakers who are advanced learners of English shows that they develop longer Voice Onset Time (VOT) in Dutch than other native speakers (Simon 2011). Beyond such phonetic effects, the rise of a word-initial laryngeal distinction in English /v/ ≠ /f/ has been tied to influence from Norman French speakers by some scholars, though Minkova (2011) shows the complexities of that case. With regard to borrowing, we see more complexity than the basic model predicts, though in ways consistent with van Coetsem's thinking. Haugen (1953: 394) notes about English loans into American Norwegian: "The loan is … subject to continual interference from the model in the other language, a process which will here be called *reborrowing*." He exemplifies this with data including the following (with his original transcription):

Table 1. Examples of Haugen's 'reborrowing.'

	tavern	*crackers*	*lake*
Older	ta`van	kræk′is	le′k
Younger	tæ′vərn	kɻæ′kəɻs	lei′k

That is, a lexical item and its basic meaning are borrowed early, while later generations of speakers, at home in both languages, may produce them with English-like phonetics and phonology.

2.2 English and Norwegian laryngeal phonetics and phonology

We adopt here the view now known as 'laryngeal realism' (Iverson and Salmons 1995 et seq., and a view so named by Honeybone 2005), namely that the distinction often called one of 'voicing' and spelled typically with *t* vs. *d* and *s* vs. *z* in the Roman alphabet in fact corresponds to two different phonological systems, [voice] and [spread glottis] languages, or Glottal Width versus Glottal Tension languages (Avery and Idsardi 2001). Languages like Dutch, French and Polish on the one hand have essentially unaspirated *p, t, k* but heavily voiced *b, d, g*. We treat the phonological feature [voice] as active in these languages. In such languages, it is voicing rather than voicelessness which tends to spread. Languages like English, German and Somali, on the other hand, have heavily aspirated *p, t, k* at least in stressed positions and show limited voicing on *b, d, g*. In these languages, voicelessness rather than voicing tends to spread. We treat the phonological features [spread glottis] as active in these languages. An important consequence of this analysis is that laryngeal features appear to be privative. That is, there is only one active feature in each system and it may spread, while the absent feature is truly absent and cannot spread.

Much work on second language acquisition and language contact to date has contrasted, if without benefit of laryngeal realist thinking, [voice] and [spread glottis] languages, like Flege (1987), Piske et al. (2001), and much other work on Romance languages and English, Simon (2011) on Dutch and English, or Nagy and Kochetov's (2011) work on English and a variety of other languages, especially Slavic. These comparisons are extremely valuable because they have provided a secure starting point in terms of maximally different phonological and phonetic systems. Norwegian and English, however, are in our view both [spread glottis] languages, albeit with significant differences in terms of phonological contrasts and their phonetic implementation.

Differences between the systems include inventory differences like these: (1) English contrasts /s/ ≠ /z/, while Norwegian has only /s/, and (2) Norwegian possesses geminate consonants while English does not. Another reported difference involves a phonological process. English, like most [spread glottis] languages, shows sonorant devoicing in obstruent-sonorant clusters in stressed positions. Norwegian is reported to lack this process with /s/ (Kristoffersen 2000).

Other, relatively minor differences may be attributable to the implementation of contrasts. Both languages have final laryngeal contrasts, unlike their cousins Dutch and German, but English is reported to implement the contrast more by lengthening a preceding vowel, while Norwegian is reported to have less lengthening and more actual glottal pulsing (see, for example, Chen 1970 and Ringen and Van Dommelen 2013).

Finally, we provide data on an issue of phonetic implementation. Under a privative analysis in a [spread glottis] system, the contrast is typically carried by the fortis character of sounds like *p, t, k, s*, not by glottal pulsing on *b, d, g* and *z*. In such a system, the latter are free to pulse in voicing-friendly contexts, as an enhancement of the contrast. That is, in the environment between robustly voiced sounds like vowels, these laryngeally-unspecified segments are susceptible to glottal pulsing. While both labials in *bob* are usually pronounced with little glottal pulsing in English, the same obstruent in *Abba* is typically heavily voiced. This process, known as 'passive voicing,' may exist in Norwegian depending on the patterns of phonetic implementation the language possesses.

Let us turn now to our speakers and then to data and findings on the issues mentioned above, namely sonorant devoicing, medial voicing, and final laryngeal distinctions.

3. Speakers and community

Our data are drawn from interviews with three heritage speakers conducted by Luke Annear and Kristin Speth in 2010. All three were living in Minnesota at the time of the interview but all have ancestry in different dialect regions of Norway:

1. Mandal area, Vest-Agder, southernmost area of West Norwegian
2. Singsås, Trøndelag Norwegian
3. Nesna, Nordland, near Mo-i-Rana, North Norwegian

Our first speaker, a female, was born in 1924 in New York, not the Midwest. Her parents came from the Mandal area in Vest-Agder county at the southern tip of Norway and left Norway in 1907 (mother) and 1910 (father). She lived in California briefly as an adult before moving to Minneapolis, and has since lived in various places in Illinois, Wisconsin, and Minnesota, and currently resides in Burnsville, MN. The second speaker, also female, was born in 1929 in Hendricks, MN, and has lived there all her life. Her grandparents came from Singsås and Digre in South Trøndelag county, though we do not know exactly when they left Norway. The third speaker is male, born in 1937 in Tracy, MN, and has lived in Minneapolis for most of his adult life, but lived in Oslo for two years as an adult. His grandparents came from Nesna in Nordland county and left Norway in 1893. We therefore have a set of speakers with considerably different backgrounds in terms of dialect and life experience. The idea here is not to start from a particularly representative sample, but to survey the kinds of patterns we

may find within a single small community of speakers, and the diversity in our speakers aids that.

After a century in the Upper Midwest, there may be considerable realignment of dialect patterns, as suggested by Johannessen (p.c., also Hjelde, this volume). In that case, so-called base dialect patterns may be less important than the later development of compromise forms in North America. This would parallel patterns well attested in German in the same region (Nützel and Salmons 2011, many others). At any rate, we are not aware of dialect differences on the issues at hand, though we'll say more about this below. Only one major known dialect pattern, lenition of /p, t, k/ in some areas, appears in the speech of our Burnsville consultant, a typical feature of the Mandal dialect.

Following the traditions of sociophonetics rather than laboratory phonetics, we draw our data from conversational settings, in this case made with non-native interviewers from the same region of the U.S. who learned Norwegian at the university.

Our data comes from heritage speakers. Rothman (2009: 159) defines a heritage language this way (with related views found through the present volume):

> A language qualifies as a heritage language if it is a language spoken at home or otherwise readily available to young children, and crucially this language is not a dominant language of the larger (national) society. Like the acquisition of a primary language in monolingual situations and the acquisition of two or more languages in situations of societal bilingualism/multilingualism, the heritage language is acquired on the basis of an interaction with naturalistic input and whatever in-born linguistic mechanisms are at play in any instance of child language acquisition. Differently, however, there is the possibility that quantitative and qualitative differences in heritage language input and the influence of the societal majority language, and difference in literacy and formal education can result in what on the surface seems to be arrested development of the heritage language or attrition in adult bilingual knowledge.

That is, the situations of heritage speakers may not conform fully to usual patterns of acquisition, but we are not concerned with exactly what the sources of those differences might be, e.g., in attrition or incomplete acquisition, but rather with the contact effects in this setting. Heritage speakers may or may not have relatively comparable control of the two languages, but even if they do, with reference to van Coetsem above, their bilingualism is strikingly asymmetrical and the situation anything but 'stable.'

4. The problem of description: Sonorant devoicing

The definitive work on Norwegian phonology is Kristoffersen's *Phonology of Norwegian*, where he notes (2000: 10):

> Not much has been published in English, German or French that covers substantial portions of Norwegian phonology. … Also when we turn to what is published in Norwegian, the account will by no means be impressive.

Aside from a few often controversial issues like retroflexion, this remains as true now as when Kristoffersen wrote. Aside from retroflexion and some work on vowels, there is less on Norwegian phonetics. We begin with a pattern identified as a difference between English and Norwegian. English has pervasive devoicing of sonorant consonants after fortis obstruents. For instance, in word-initial clusters, a sonorant following an initial fortis obstruent largely lacks glottal pulsing, illustrated here with the lateral after an obstruent:

(1) Sonorant devoicing in English

play	[pl̥]
clay	[kl̥]
slay	[sl̥]

Kristoffersen posits a more limited rule for Norwegian: "sequences where a nonnasal sonorant (including /ʋ/) follows a voiceless stop or /f/" exhibit full or partial sonorant devoicing (2000: 75). He further reports that "devoicing does not take place after /s/" (2000: 81), in forms such as: *slå* /slo/ [ʃlo:] 'to beat,' and *svi* /svi/ [svɪ:] 'to burn' (2000: 76). In contrast, Popperwell's impressionistic description of Norwegian pronunciation describes "partial devoicing" of /n/, including after /s/ (1963: 50) but asserts that /l/ "tends to devoice after p, k, f," without any indication of devoicing of the lateral after /s/ (1963: 52). Phonologically, Kristoffersen argues, the absence of an /s/ ≠ /z/ contrast in Norwegian leaves /s/ laryngeally unspecified, so that it does not trigger sonorant devoicing.

This description suggests a potentially fruitful area of phonological comparison. To secure the phonetic underpinning and allow more precise comparison, Allen (2011) analyzed a set of obstruent-sonorant onsets from a broad range of Norwegian dialects, drawing data from the Nordic Dialect Corpus (see Johannessen et al. 2009). The range of dialects surveyed was intended to see how widespread and how variable sonorant devoicing might be across major Norwegian areas. The key results, reproduced below, show the same amount of sonorant devoicing after /s/ as elsewhere.[2]

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2. Beckman and Ringen (2009) come to similar conclusions on different grounds.

Table 2. Percent glottal pulsing in sonorants in word-initial fortis obstruent-sonorant clusters.

	Hammerfest	Skaugdalen	Fredrikstad	Lyngdal	Stryn
pr	34.34	29.89	51.55	17.12	46.61
pl	35.87	72.19	80.51	27.37	55.19
tr	17.02	39.97	59.40	8.11	34.65
kr	34.90	47.64	49.09	12.91	51.09
kl	32.98	59.61	76.03	19.77	50.81
kn	29.74	40.89	40.46	46.69	60.78
sl	28.19	49.57	40.30	30.46	45.03
sn	34.79	42.11	56.13	47.51	50.60

Earlier work on related problems in American English (Purnell et al. 2005) has used greater than 50% glottal pulsing as a guide to considering a segment phonetically 'voiced.' In this dataset, some speakers (Hammerfest, Lyngdal) show consistently less than 50% pulsing while the most heavily voicing speakers are mostly around 50%, but none show consistently higher rates of pulsing. Allen (2011) concludes, as we do here, that Norwegian /s/ is indeed specified for [spread glottis]. As argued at length by Allen (2011), this undermines Kristoffersen's analysis of Norwegian phonology, which accepts the basics of laryngeal realism, but not privativity. Based on Allen's data (and see his paper for much more detail), Norwegian appears to be a well-behaved [spread glottis] language.

This analysis is supported by the following data from our heritage speakers, which shows approximately the same amount of sonorant devoicing after voiceless obstruents for both English and Norwegian as seen in Allen's results above.[3]

Table 3. Speaker from Findlay: English and Norwegian percent glottal pulsing.

English		**Norwegian**	
Token	**%Pulsing**	**Token**	**%Pulsing**
pleasure	47.85	klokkar	65.06
sledge	62.99	pliktet	51.03
slips	49.00	slepp	53.92
Average	**53.28**	**Average**	**56.67**

3. Results were only available for the speakers from Findlay and Hendricks. The recording for the speaker from Burnesville contained low-level static that made it difficult to make reliable measurements.

Table 4. Speaker from Hendricks: English and Norwegian percent glottal pulsing. Numbered tokens (e.g., 'slag1', 'slag2', etc.) indicate that there were multiple tokens in the recording and they were numbered in the order they occurred, though it was not always the case that each token was usable (e.g., 'snakka2', 'snakka6', etc.).

English		**Norwegian**	
Token	**%Pulsing**	**Token**	**%Pulsing**
Christmas	49.19	klasse	72.88
closer	8.39	slag1	55.09
(Eau) Claire	78.46	slag2	33.91
		slag3	100.00
		slag4	64.15
		slag5	37.33
		slekt	39.89
		slik	75.93
		snakka2	47.37
		snakka6	29.91
		snakka10	30.70
Average	**45.35**	**Average**	**53.38**

We notice here quite a bit of variability in percent glottal pulsing between tokens, but the average for both speakers, for both English and Norwegian, is consistently around 50%. We stress, however, that in nearly every case there is at least some, and in most cases quite a bit, of sonorant devoicing, which is an indication of aspiration after the stops and a spread configuration of the glottis for all fortis obstruents. The large amount of variation is likely due to the nature of the recordings, which contain free conversation rather than controlled experiments and wordlists.

In some tokens, though, there is no sonorant devoicing for good reasons. We see quite often, in both Allen (2011) and in the American Norwegian data, the presence of schwa epenthesis before flapped /r/ and retroflex flapped /l/. We have not included tokens exhibiting schwa epenthesis in our discussion, but Endresen (1989) explains that this is a common feature in Norwegian because of what he terms *open overgang* (open transition), contrasting with *tett overgang* (tight transition) in English, referring to the amount of articulatory overlap in consonant clusters. We mention this here only in passing since some tokens may have a wider transition without necessarily showing schwa epenthesis, but the reader should be aware of this feature of Norwegian.[4]

The major point is this: Something discussed in the best available literature as a difference between the languages turns out, on systematic investigation, to be illusory, at least in the data presented to date. It would have been quite easy to declare the Norwegian-American patterns the result of American English influence on American Norwegian, save for a study of closely comparable forms available thanks to the Nordic Dialect Corpus.

4. See Bradley (2002, 2007) for discussion of schwa epenthesis in word-final clusters in Norwegian.

5. Medial voicing: An under-investigated area

In light of the last section, an obvious area to pursue is the phonetic realization of lenis obstruents in Norwegian. If Norwegian /s/ were unspecified laryngeally, it should first and foremost show passive voicing effects in intervocalic position, as does the laryngeally unspecified /z/ in English. Even if European Norwegian fails to evince these patterns – as we would expect based on the preceding section – this would be a place where American Norwegian-English might show different patterns, directly or indirectly connected to English.

This is also an area for which we have some acoustic data from a relevant variety of Norwegian. Van Dommelen and Ringen (2007) provide a study of intervocalic stops in Trøndelag Norwegian. The key findings are reproduced in Figures 1 and 2, for consonant duration in the first instance and glottal pulsing in the second.

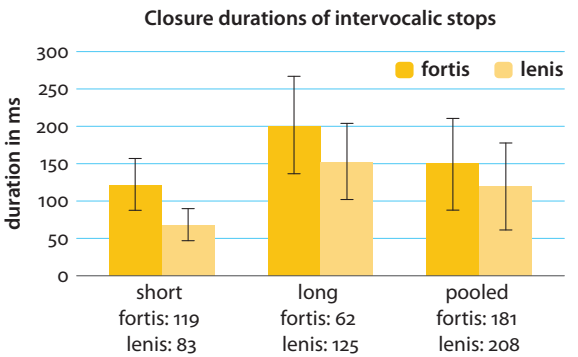

Figure 1. Closure durations of intervocalic fortis and lenis stops. Short consonants are preceded by long vowels; long consonants are preceded by short vowels. Means and standard deviations in ms. Numbers of each type of token are noted below each category. (Data from Van Dommelen and Ringen 2007)

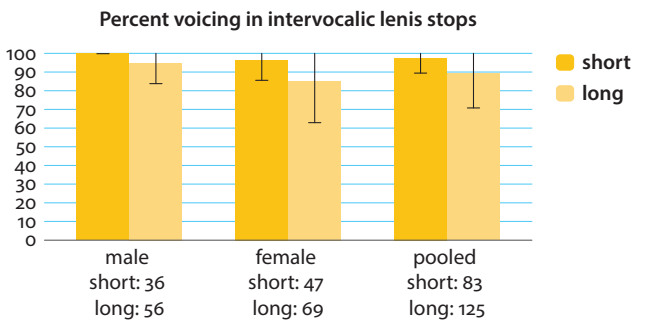

Figure 2. Amount of voicing in % in intervocalic lenis stops. Short consonants are preceded by long vowels; long consonants are preceded by short vowels. Numbers of each type of token are noted below each category. (Data from Van Dommelen and Ringen 2007)

In short, fortis stops are much longer than lenis, and lenis show considerable voicing, that is, they have passive voicing, possible because they are not specified for [spread glottis] which would prohibit phonetic voicing.

Comparing first lenis and fortis closure duration (measured from the offset of discernible formant structure in the spectrogram to the burst release after closure) in American Norwegian with Van Dommelen and Ringen's results, we see that fortis obstruents are longer than their lenis counterparts, and that singleton /s/ is about as long as fortis geminates at just over 120 ms (Figure 3).

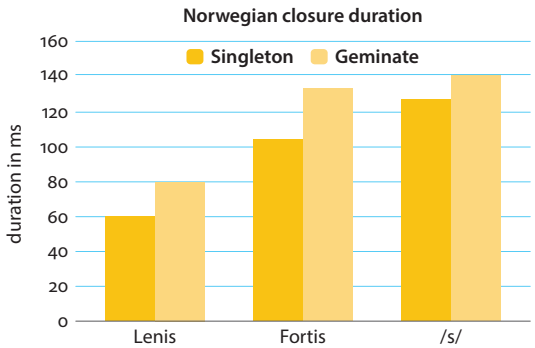

Figure 3. American Norwegian: mean medial obstruent closure duration in ms.

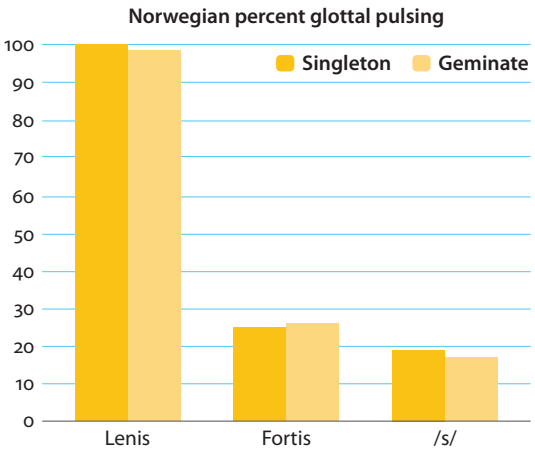

Figure 4. American Norwegian: mean medial obstruent percent glottal pulsing.

However, the results in Figure 4 indicate that medial /s/ shows relatively little voicing, around 20% or less, which is even less than the fortis geminates. This suggests that /s/ is not subject to passive voicing and is specified for [spread glottis] in American Norwegian.

As far as the English of our speakers is concerned, evidence from earlier speakers in Norwegian American communities indicates that Norwegian imposition on English played a clear role here. As noted in §2, in a study of English spoken by Norwegian Americans in Crookston, Minnesota (in the northwestern part of the state), Simley (1930:470) found very widespread fortis realization of /z, ʒ/ as [s, ʃ], a finding echoed clearly by Haugen (1953:47). Indeed, Simley points to this as the most consistent impact of Norwegian on the English pronunciation of her subjects: 95 of 115 American-born school students of Norwegian heritage showed the feature, including in final position.

From our contemporary speakers, the patterns are somewhat different. First of all, we see that /s/ is generally longer than /z/, which suggests that there is still some distinction being made between the two.

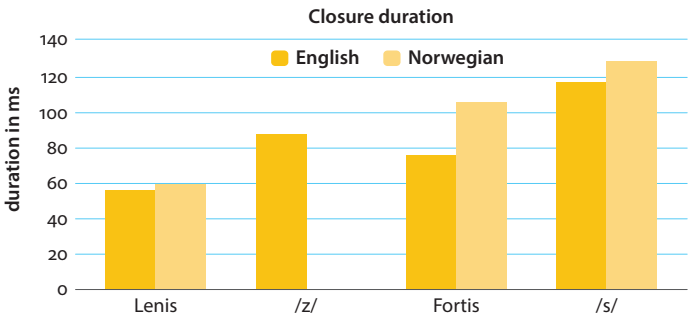

Figure 5. Mean medial obstruent closure duration in ms for all speakers.

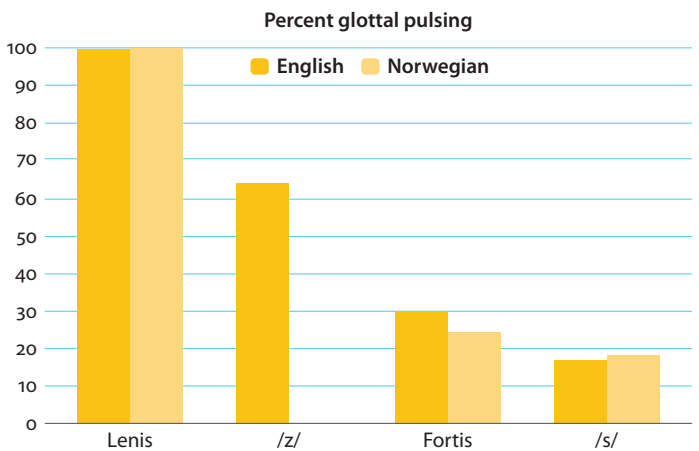

Figure 6. Medial consonants: mean percent glottal pulsing for all speakers.

The difference between /s/ and /z/ is even more pronounced in terms of percent glottal pulsing. In Figure 6, we see that /z/ is approximately 60% percent voiced whereas /s/ is closer to 20%. This means that if /z/ is around 85 ms long, only about 20–30 ms

will be voiceless. The inverse would be true for /s/, with about 20–30 ms being voiced. This suggests that the fortis realization of /z/ may no longer be a feature of Norwegian-American English speech, and that a more native-like pattern has emerged with a clear laryngeal distinction between /z/ and /s/. Even though /z/ is longer in duration than the fortis stops in our speakers' English, the fortis stops nevertheless have a much lower percent glottal pulsing.

This raises phonological questions that we will not pursue here about the nature of phonological contrast, but we note two scenarios in passing. One way of explaining this situation would be to argue that the fortis stops (as well as /s/) are specified for [spread glottis] and are therefore resistant to passive voicing, which /z/ is not because it is unspecified. Another possibility is that we have an instantiation of Vaux's Law (Vaux 1998), namely that a laryngeally unspecified fricative acquires specification for [spread glottis] as a phonetic enhancement.

The prominence of this feature raises the question of whether there is more at play than simple phonological specification. There appears to be. First, note that /s/ appears in the above figures to be the longest obstruent in Norwegian. Fintoft (1961) in fact indicates that /s/ is the longest of Norwegian stops, fricatives, nasals, and liquids. Stevens et al. (1992: 2979), moreover, write the following about how listeners perceive fricative voicing:

> Listeners base their voicing judgments of intervocalic fricatives on an assessment of the time interval in the fricative during which there is no glottal vibration. This time interval must exceed about 60 ms if the fricative is to be judged as voiceless.

In other words, based on this, a speaker could produce a Norwegian or Norwegian-like /s/ and even with voicing through half of it, it could be perceived as voiceless.

We see that /s/ is not subject to passive voicing in the Norwegian or in the English of our heritage speakers. This suggests that /s/ is specified for [spread glottis] in both languages. This raises the question of whether the [spread glottis] specification was inherited from Norwegian or borrowed from English. As noted previously, if Norwegian /s/ is laryngeally unspecified, we might expect to see passive voicing as we do for the laryngeally unspecified /z/ in English. However, there is no evidence that Norwegian /s/ has ever behaved like English /z/ in the speech of Norwegian immigrants. In fact, the opposite is reported; both Simley and Haugen found that the English /z/ of (at least the earlier) Norwegian immigrants behaved more like Norwegian /s/. Based on the findings presented above and in §3, the most plausible explanation for this is that the [spread glottis] specification was inherited in their Norwegian and then imposed on their English, and that later heritage speakers have learned to make the distinction in English.

6. Final laryngeal distinctions

Turning finally to the phonetics and phonology of final laryngeal distinctions, English generally and Upper Midwestern English in particular show striking patterns we do not expect to see shared with Norwegian. First, while languages in general show longer

vowel duration before a voiced or lenis coda consonant than before a fortis or voiceless one, English is widely reported to show this to a much greater extent than many other languages. The figure below, reproduced from Chen (1970: 138) shows this for a variety of languages, including, it happens, Norwegian (with data drawn from Fintoft 1961). In the Upper Midwest, a stream of research (especially Purnell et al. 2005) has shown that some parts of the region appear to be undergoing a neutralization of the distinction. Those areas, typically in eastern Wisconsin and heavily settled by German-speaking immigrants, are becoming much more distinct in this regard from the southwestern part of the state where, in addition to significant German settlement, there was always a large Old Stock American or Yankee presence and, in many areas, significant Norwegian immigration.

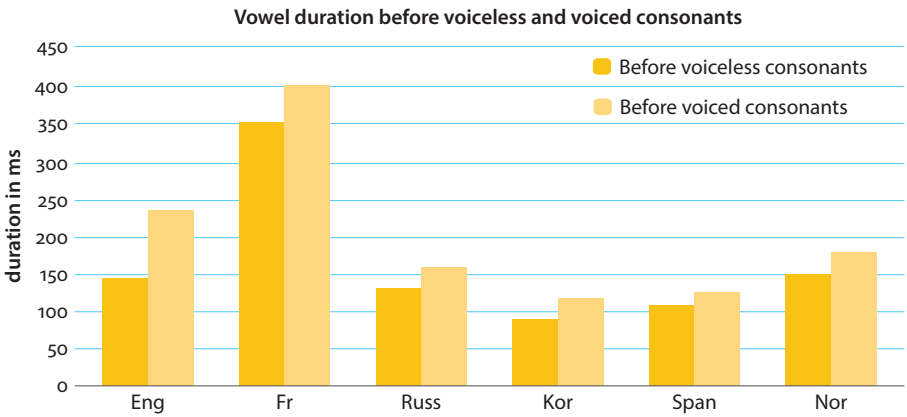

Figure 7. Vowel duration before voiceless and voiced consonants (Chen 1970: 138).

The values in Figure 7, presented with additional data in Table 5, show that English is somewhat unusual cross-linguistically in that the ratio of vowel length before lenis and fortis stops is much greater than in the other languages reported on, suggesting that vowel length plays a greater role in marking laryngeal distinctions in English.

Table 5. Additional figures for vowel length from Chen (1970: 138–139).

	Vowel duration in ms			
	Before voiceless consonants	**Before voiced consonants**	**Mean difference**	**Ratio**
English	146	238	92	0.61
French	354	407	53	0.87
Russian	131	160	29	0.82
Korean	91	119	28	0.78
Spanish	109	127	18	0.86
Norwegian	148	181	33	0.82

If we compare these numbers with the data from our heritage speakers, we see that the difference in vowel length before lenis and fortis stops in both their English and Norwegian look very similar to Chen's results in Figure 7 and Table 5, the main difference being a shorter duration in general:

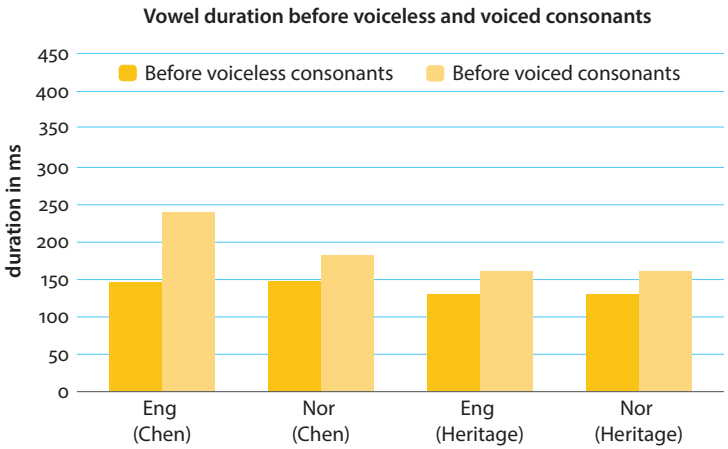

Figure 8. Vowel duration before voiceless and voiced consonants; Chen's (1970) results compared with our heritage Norwegian speakers.

Table 6 shows that while our heritage speakers may have shorter durations than Chen reports for both English and Norwegian in his study, the mean differences and vowel duration ratios are very similar to Norwegian:

Table 6. Chen's and heritage speakers' results compared.

		Vowel duration in ms			
		Before fortis stops	**Before lenis stops**	**Mean difference**	**Ratio**
Chen (1970)	English	146	238	92	0.61
	Norwegian	148	181	33	0.82
Heritage speakers	English	128.72	160.84	32	0.80
	Norwegian	129.19	161.25	32	0.80

This suggests that heritage Norwegian speakers in the Upper Midwest have retained a Norwegian-like method of marking final laryngeal distinctions, relying less on vowel length than is otherwise reported for English.[5]

5. Chen (1970) cites several other studies that include relevant data from English, namely Peterson and Lehiste (1960), Zimmerman and Sapon (1958), and House and Fairbanks (1953), all of whom report results similar to his.

Figure 9 reveals that final lenis stops are heavily voiced, which suggests that instead of using vowel length to distinguish between final lenis and fortis stops, which tends to be the pattern in American English, these speakers make the distinction between lenis and fortis by actively voicing final lenis stops rather than lengthening the vowel.

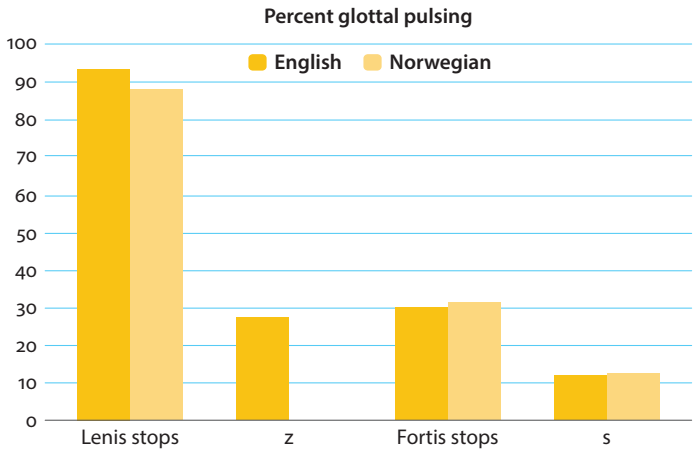

Figure 9. Percent glottal pulsing of word-final consonants in both English and Norwegian.

When comparing the vowel duration ratio data in Table 6 with Chen's results for English and Norwegian, we see that the English of the Norwegian Americans is more in line with Chen's results for Norwegian. If the heritage speakers are relying less on vowel duration to mark laryngeal distinctions in finals, we would expect to see them making this distinction in some other way, and in fact the results for percent glottal pulsing in Figure 9 suggest that they rely more heavily on laryngeal activity, i.e., voicing of lenis stops, than vowel duration. In terms of Keyser and Stevens (2006), this is seen as a phonetic enhancement of final laryngeal distinctions. In the case of at least much of American English, the phonetic enhancement is an increase in the duration of a vowel preceding a final lenis obstruent, whereas for the Norwegian Americans in the Upper Midwest, the phonetic enhancement appears to be the active voicing of a final lenis obstruent.

7. Summary and conclusions

This paper has provided an initial foray into a new area in several regards, but a number of patterns emerge. Even where we cannot directly map the productions of heritage speakers to those of European Norwegian speakers or, to a lesser extent, to American English speakers in the Upper Midwest, we have provided some descriptive baseline for future comparison.

First, while previous research led us to expect differences in patterns of sonorant devoicing between the two languages, specifically with regard to /s/-sonorant clusters, investigation of a set of European Norwegian dialects indicates none. We take this as a reminder of the need for careful verification of the empirical basis of heritage language research, an issue well known in other settings, such as German-American linguistics.

Second, with regard to passive voicing of obstruents in medial, especially intervocalic position, our evidence suggests that Norwegian /s/ in the Upper Midwest behaves like a phonologically or phonetically marked /s/, that is, not a lenis segment susceptible to passive voicing.

Third, in English, our bilingual speakers no longer show clear evidence of what was once a very prominent, perhaps the most prominent feature of a Norwegian-American accent: realization of /z/ as [s]. This classic feature has receded at least for these speakers.

Fourth, there are subtle differences in the ways that final laryngeal distinctions are realized in Norwegian American English as opposed to values reported for monolingual Americans. This suggests some influence from Norwegian in the phonetic implementation of laryngeal phonology. Such phonetic patterns can easily be exploited sociolinguistically and if these features persist into monolingual English in Norwegian American communities, they would provide evidence for substratal effects beyond the bilingual generation. This would parallel the findings of Purnell et al. (2005, also Annear et al. 2011) on German influences on the English of eastern Wisconsin.

Overall, Heritage Norwegian, in fact, looks largely like its parent language and its contact language. The speech of the bilinguals reported here shows full command of the phonetics and phonology of both languages on the issues investigated, with obvious adjustments for regional variation in both languages. Evidence of influence or 'seepage' between the languages is relatively modest, in sharp contrast particularly to the heavily Norwegian-colored English reported for earlier generations in the region.

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