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Short-a in Northern New England

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Abstract

This article investigates the relationship between the Boston speech community and two New Hampshire (NH) speech communities with respect to the phonetic status of short-a. Analysis of twenty-six recordings shows that (1) breaking is more prevalent in New England than previous isoglosses suggest and (2) younger NH speakers are exhibiting a pattern distinct from both Boston and older NH speakers. The author suggests that the latter result is related to migration patterns and geographic attitudes in New England, which may have contributed to dialect leveling in the sense of Kerswill.

Keywords

dialectology, sociolinguistics, sociophonetics, New England

Researchers have established that short-a, the /a/ in words such as *cat* and *fact*, is of crucial importance to the structure of English phonological systems (e.g., Labov 1991; Boberg & Strassel 2000). Boberg and Strassel (2000:109) identify short-a as one of the main "starting points for a phonological typology of American dialects." Labov (2007) uses short-a, among other vowels, as a way to study the transmission and diffusion of linguistic forms over geographical space. Labov, Ash, and Boberg (2006) give special attention to short-a, showing most of eastern New England to exhibit a "nasal system" and a limited distribution of "Northern breaking."

The present study examines short-a in northern New England with three aims in mind. First, it documents, with respect to this well-studied and decidedly important linguistic variable, how English is spoken in New Hampshire (NH) specifically and New England generally. Recent work has shown that speech patterns in NH are

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more and more becoming distinct from those of neighboring Boston (Nagy 2001; Nagy & Roberts 2004; Irwin & Nagy 2007b; Ryback-Soucy & Nagy 2000). The results presented in this article support and elaborate on this line of research. Second, this study contributes to a growing body of research, some summarized in Labov (2007), documenting the effects of linguistic diffusion on phonological systems. I suggest that dialect contact and migration patterns have played a crucial role in effecting changes to New England English, specifically with respect to short-a; changes in the short-a systems of NH speakers occurred in a time period where NH endured heavier in-migration than any other New England state (Morris 1995). Third, under the general rubric of the apparent time construct (Bailey et al. 1991), I provide evidence for a change in progress in NH (but not Boston), where younger speakers seem to have adopted the nasal short-a system. These results are similar to those reported in other areas, such as Cincinnati (Boberg & Strassel 2000), suggesting that some general process is driving both changes. I propose that the process at hand is diffusion and leveling.

The article is organized as follows. The first section provides an overview of short-a, describing its importance to dialect research and summarizing the typology of short-a systems given in Labov, Ash, and Boberg (2006). I discuss previous work on short-a in New England to situate the present study within a broader context. I then present an acoustic analysis of two speakers from NH and argue that there are three distinct variants of short-a found in New England: laxing, raising, and breaking. Having established this, I present the results of an impressionistic examination of 714 tokens of short-a and demonstrate that younger NH speakers have a different short-a system from the rest of the sample. Finally, I turn to documented migration patterns and models of dialect leveling, relating results of this study to other documented cases of language change differentiating NH and Boston.

Short-a

One of the main reasons for the importance of short-a to studies of English phonological systems is that a systematic change to short-a can lead to a chain shift, thus changing a large subset of vowels. According to Labov (1991), short-a is one of the two pivot points driving the Northern Cities Shift (NCS) in English phonological systems, the other being the *caught*/*cot* merger. That is, most phonological systems have contexts where short-a is phonetically "raised" (lower F1 and higher F2 frequencies), but if such raising is generalized to all contexts, and the *caught*/*cot* merger has not applied, a chain shift known as the NCS will occur.[1] Furthermore, short-a systems have been shown to have an intricate typology, subject to various subtle constraints, making detailed documentation important to an understanding of both the synchronic grammar and diachronic change. In this section, I discuss a subset of the short-a typology presented in Labov, Ash, and Boberg (2006). The five relevant systems are the New York City (NYC) split system, the broad-a system, the generalized tensing (NCS) system, the nasal system, and Northern breaking.[2]

Perhaps the most interesting system, from the standpoint of its consistency and subtle complexity, is the NYC "split" system. Labov (2007) has argued that various changes in short-a systems in particular and phonological systems in general have stemmed from the NYC system diffusing into other geographic areas and subsequently losing some of its subtler systematic constraints. In the NYC system, short-a is raised before voiced stops and affricates, voiceless fricatives, and nasals other than [ŋ]. This system is constrained by a number of other factors, however, as described in Labov (2007:354-355): (1) function words (*an, can*) are lax with simple codas but raised with complex codas (*can't*); (2) closed syllables are raised (*plan*) while open syllables are lax (*planet*); (3) inflectional boundaries close syllables, so *planning* is raised while *planet* is not; (4) words without an onset (*aspirin*) are lax except for very common lexical exceptions (*ask*, *after*); (5) abbreviated personal names are lax (*Cass*); (6) lexical exceptions exist, so that *avenue* is raised whereas *average* is not, and many "late-learned" words (*alas*) are lax. Except for the lexical exceptions, this system is thus highly predictable but quite complex. As the system spreads out of NYC, the constraints are often lost and lexical exceptions vary. For example, the function word constraint is lost as close as in neighboring New Jersey, making *can* and *can't* sound identical whenever the [t] is deleted in *can't*, roughly [keᵊn]. In NYC, however, a distinction is maintained: lax *can* [kæn] but raised *can't* [keᵊn].

Another system is the "broad-a" system, reportedly found in eastern New England (Labov, Ash, and Boberg 2006:174). In this system, a class of words preserves a British low-back vowel instead of the low-front or raised short-a, resulting in *laugh* [laf] or *aunt* [ant]. Despite its being restricted to eastern New England, this system plays little role in the current study. The only sign of it is in one speaker, a seventy-five-year-old female Bostonian, who exhibits broad-a in *path*, *bath*, *can't*, and *asked*. No other speaker provides even a single token of broad-a in short-a words. However, data reported in Laferriere (1977), discussed below, suggest that the Boston system documented here is an innovation of the latter half of the twentieth century.

A third system is the "raised" system characterizing the NCS, where short-a is raised everywhere, without regard to the function/content word distinction, syllabic or morphemic structure, or lexical class (though the degree of raising may be sensitive to phonological context, as pointed out by a reviewer). While the NCS short-a does not play a direct role in the current study, its existence is worth keeping in mind. Both Laferriere's sample and my own contain tokens of short-a raising in contexts which are not generally part of other variably raising dialects. Since migration and dialect contact are argued to play a crucial role in the evolution of New England short-a, it cannot be ruled out that such tokens originate in NCS speech. However, no evidence for or against this hypothesis is presented.

The final two systems I discuss play the largest role in the phenomena examined in the present study. These are the "nasal" system and "Northern breaking." In the nasal system, which has become quite prevalent in North America, short-a is raised before nasals and lax elsewhere. In most cases, syllable structure has no effect, nor does any function/content word distinction. This system is found in many geographical locations,

including NH, as shown below. As discussed later, many NH speakers and Bostonians actually appear to have a nasal system superimposed over a diffused split system, which I argue is likely the result of migration and dialect contact.[3]

Finally, a fifth system is known as "Northern breaking." The major difference between Northern breaking and ordinary raising is that while raising involves a higher F2 (and lower F1) followed by a sharp off-gliding drop toward the end of the vowel, F2 in breaking is lower than in raising, and instead of an off-glide, F2 lowers to a second steady state, resulting in two distinct vowel qualities of approximately equal duration. To represent this distinction, raising is transcribed in this article as [eᵊ], and breaking is transcribed as [eə]. This is described in detail in the acoustic analysis section using data from this study's sample. Auditorily, breaking sounds like a diphthong or off-glide.[4] In the data presented below, breaking is most common before voiceless fricatives and voiced stops.

Previous Work on Short-a in New England

New England short-a has been discussed by Laferriere (1977) and Labov, Ash, and Boberg (2006:174).[5] In addition, Nagy and Roberts (2004) mention all three realizations of New England short-a discussed here. Although there is no discussion of New England in particular with respect to breaking, the map in Labov, Ash, and Boberg (2006:179) reports breaking in Bangor, Maine, and some areas in western Massachusetts (MA) and Connecticut. Labov, Ash, and Boberg's discussion of the nasal system focuses on eastern New England, although the system is noted to have a widespread distribution. Furthermore, one Boston speaker is discussed in connection with a remnant of the British broad-a system. Labov, Ash, and Boberg (2006), then, report at least three short-a systems in New England, breaking, broad-a, and nasal, but only the latter two are specifically discussed.

Laferriere analyzed variation in the pronunciation of short-a in Boston over thirty years ago, and her results are worth reviewing in some detail, since they can be rather straightforwardly compared with those of the present study, allowing us to look further back in time than we would otherwise be able to. Laferriere describes three realizations of short-a. The low-front lax vowel [æ] is taken to be basic. The second is the broad-a system, which involves a low-back [a]. Laferriere found [a] to be lexically restricted and to occur in syllables closed with [f] (*after*), interdentals (*bath*), [s] (*ask*), and [n] (*can't*).[6] Laferriere explains the restrictions on broad-a, both lexical and phonological, by historical considerations; it was productive as far back as the end of the eighteenth century and later became restricted to certain lexical items only.[7]

The third realization is described as raising to a midfront position, which Laferriere (1977:100) describes as [ɛ], with "concomitant muscular tenseness which results in a [ə] off-glide when [æ] is raised as high as [ɛ]." To avoid confusion in using the IPA symbol for the lax midfront vowel even though the variant is described as tense, I instead use [e] in this article. This raising, in contrast to broad-a, was highly productive

Table 1. Realization of Short-a in Laferriere (1977)

	Original backing words				Original nonbacking words				
	half	*path*	*ask*	*can't*	*craft*	*math*	*gas*	*hand*	*bad*
Younger than 25 (56)	B–R	B–R	B–R	B–R	R	R	R	R	R
25–49 (56–80)	B	B	B–R	B–R	—	—	(R)	R	(R)
Older than 50 (81)	B	B	B	B	—	—	—	R	—

Source: Laferriere (1977).

and yet shared some of the same phonological contexts as broad-a, namely before voiceless fricatives and nasals.

Breaking as a short-a realization distinct from tensing and off-gliding was not discovered until the pilot work for the *Atlas of North American English* (ANAE; Labov, Ash, and Boberg 2006:177; credited to Sherry Ash and Charles Boberg). Laferriere's description of raising is compatible with the results presented below, if we assume that speakers who exhibited raising and off-gliding were actually exhibiting breaking in nonnasal contexts. Table 1, from Laferriere (1977:104), describes the short-a systems of her informants. The left column shows four words that are part of the lexical set affected by broad-a, and the right words that are not. To easily compare with the present study, I have put in parentheses how old these speakers would be today. A <B> represents a word that speakers realize as broad-a, and an <R> raising/breaking. Parentheses indicate variability and the cells with both indicate variability between the two.

Laferriere (1977:104) notes that "while [broad-a] is virtually a nonproductive process, Raising is just the opposite, its growing productivity reflected in its distribution across age groups." She further notes its existence in unexpected contexts: "The two teenagers in my sample even have tensing and a slight Raising before the voiceless stops [t] and [k] in *rat*, *back*." She explains the variation as a result of two rules competing for the same context, although voiceless stops are not usually a context for raising.[8] Given this, both raising/breaking and broad-a acquire a certain social salience. Broad-a is associated with local Boston identity, older speakers, and, perhaps as a consequence of the latter, a "hypercorrect indication of erudition" (Laferriere 1977:106), while raising/breaking is associated with young people.

In the context of the ANAE typology, Laferriere's work documents the initial move away from the broad-a system toward the system presented here. A highly productive process reminiscent of the NYC split system moved in on the territory occupied by the very local and already nonproductive broad-a. Notice in Table 1 that strictly raising contexts include voiceless fricatives (*math*), voiced stops (*bad*), and nasals (*hand*), all contexts for raising in the NYC split system. Raising first moved to words not in the broad-a set and later generalized to words that were. Laferriere's observation that the productive raising process was coming to replace broad-a was genuinely insightful

Table 2. Number of Speakers by Age and City

	Manchester	Dover	Boston
Younger than 30	7	3	2
31–50	2	2	2
51 or older	—	2	6

since in my sample, only one speaker shows any signs of maintaining the broad-a system, and she would have been forty-six years old at the time of Laferriere's study—just the right age to have had broad-a in some tokens.

The present study continues the story of this change, although I exclusively refer to the raising system adopted by the young speakers in Laferriere's study as the breaking system since I argue that breaking is distinct from raising. This system was adopted with a great deal of variation from the start (as seen in Laferriere 1977) and, as shown below, has yet to take hold fully; it continues to be a variable system—there is no guarantee, for any particular token, that it will be either lax or broken (though, as shown below, some phonological contexts make one variant much more likely than the other). The same system appears to have been adopted by NH speakers in Manchester and Dover, perhaps unsurprising given the close proximity of those cities to Boston and well-known processes whereby changes spread from influential metropolises to smaller nearby cities (Trudgill 1974; Labov 2003). However, an important finding in this study is that younger NH speakers, but not Boston speakers, have moved away from the breaking system in favor of a nasal system. Before discussing this finding in detail, I turn to the methods of the present study, followed by an acoustic analysis.

Method

The data for this study come from ongoing work documenting how English is spoken in New England. Twenty-six recordings of New England natives were used, gathered by me, Tricia Irwin, and Naomi Nagy. All speakers read aloud a three-page story about a 1978 blizzard. All were told to read casually, at a pace that was comfortable for them. The story was composed of two texts found online and was slightly edited (Urbanek 2003; Spina 2005). It was originally used in Irwin and Nagy (2007a). An Olympus DS-330 digital recorder with a Shure SM58 microphone was used. An uncompressed .wav file was then imported to a PC for analysis in Praat. A short demographic questionnaire was collected for each participant.[9] Of the twenty-six speakers, eleven were male and fifteen were female. Table 2 presents the age and geographic location of the speakers in this study.

The measurements for the acoustic analysis were taken in Praat. For each vowel, sixty equally spaced F1/F2 measurements were taken. From these, a series of data points were extracted, such as the mean frequency, mean deviation (MD; see next

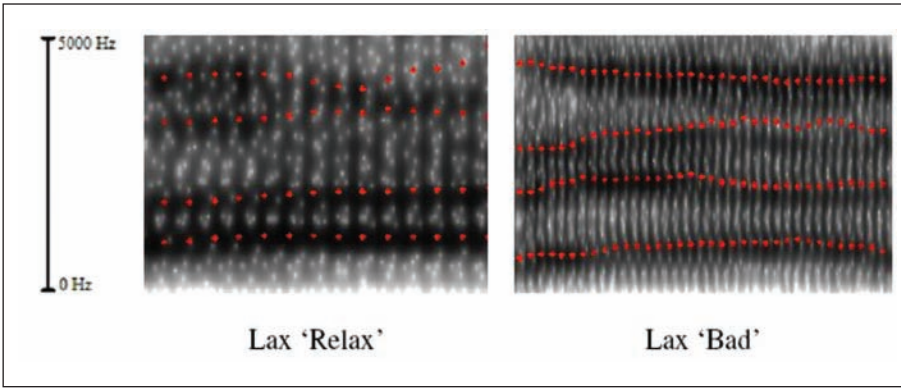

Figure 1. Spectrogram of *relax* and *bad* for a twenty-four-year-old female from Dover, NH

section), maximum (max) and minimum (min) values, and the difference between the max and min values. In addition, spectrographic images were extracted to complement these measurements visually.

Acoustic Analysis

The acoustic analysis in this section establishes two conclusions. First, New England speakers exhibit a short-a system quite unlike the nasal system discussed in ANAE. Second, there is a phonetic difference with respect to short-a raising in nonnasal and nasal contexts. For these speakers, this creates a three-way distinction: laxing, breaking, and raising.[10] Importantly, however, this three-way distinction does not hold for all speakers. I illustrate by contrasting a speaker with a three-way distinction (a breaking system) to one who has only a two-way distinction (a nasal system).

A twenty-four-year-old female from Dover (F24) illustrates the nasal system, and a forty-one-year-old female from Dover (F41) illustrates the breaking system. Figure 1 shows F24's realization of short-a in *relax* and *bad*. F2 in *bad* is slightly higher than in *relax*, and F1 is slightly lower. However, there is little movement of the formants in either, and auditorily they sound very much the same.

Figure 2 shows F41's realization of *relax* and *bad*. In *bad*, F2 starts at a higher frequency and then lowers to a second steady frequency. *Relax*, on the other hand, is realized much like F24's *relax*. There is relatively little movement, and what movement there is is actually a slight raising of F2 toward the end of the vowel. The distinction between F24 and F41 is in contour: unlike F24, F41 exhibits a change in vowel quality at the halfway point for *bad* but not *relax*.

Table 3 shows for F24 and F41 the F1/F2 values for *relax* and *bad*. These values were calculated by taking sixty measurements, evenly spaced over the duration of the vowel, and then extracting from each the mean, the MD, the highest formant value (max), the

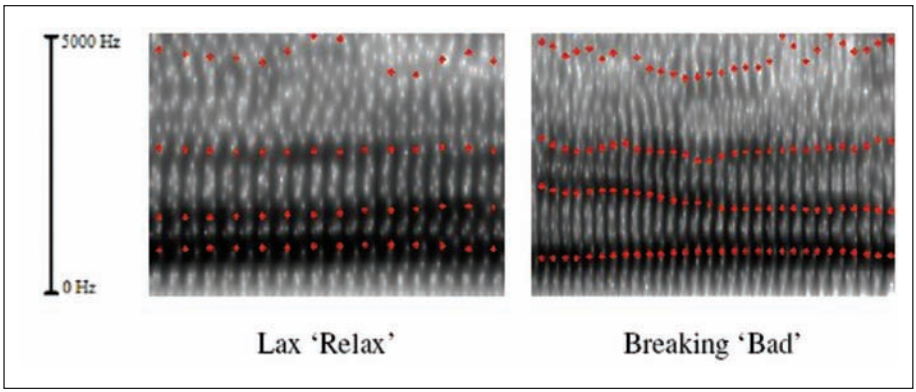

Figure 2. Spectrogram of *relax* and *bad* for a forty-one-year-old female from Dover, NH

Table 3. Acoustic Measures of Short-a in *Relax* and *Bad* for F24 and F41

	Relax				*Bad*			
	F24		F41		F24		F41	
	F1	F2	F1	F2	F1	F2	F1	F2
Mean	1005.43	1836.21	853.70	1518.62	876.55	2108.67	786.30	1749.57
Mean deviation	30.11	85.00	39.26	79.17	71.71	66.06	37.49	134.55
Max	1037.07	1987.87	922.03	1664.72	1009.50	2264.84	831.85	2000.76
Min	878.34	1647.69	752.32	1335.33	693.78	1912.87	694.63	1593.1
Difference	158.73	340.18	169.71	329.39	315.72	351.97	137.22	407.66
Duration (ms)	0.08		0.14		0.21		0.17	

lowest formant value (min), and the duration of the vowel. The difference between max and min is also shown. Table 3 shows that the mean F2 for *bad* is higher than for *relax*, and the F1 is lower. This was already seen visually in Figure 2. The MD is more useful; it is a measure of variability, measuring how far, on average, the formants get from the mean. It is calculated by taking the differences between each point and the overall mean; the mean of those differences composes the MD. The MDs of F2 for F24's *relax* and *bad* are fairly low, indicating relatively little movement in the formants.

The MD of F2 in *bad*, however, is higher for F41 than for F24. Furthermore, the difference between F2 max and min is higher. The MD is a measure of how far the formants get from the mean, on average. Since F41's realization of *bad* shows two distinct vowel qualities, the mean will be an average of both. This means that that on

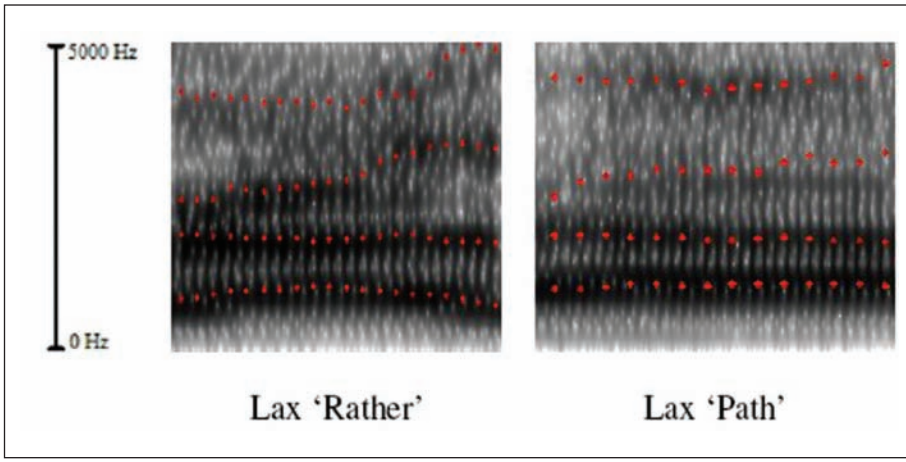

Figure 3. Spectrogram of *rather* and *path* for a twenty-four-year-old female from Dover, NH

either side, before or after the change in vowel quality, there will be a consistent difference between the mean and the formant. This consistent difference results in a higher MD. The different MDs as well as the visual distinction showing movement to a second steady-state vowel quality (Figure 2) indicate that F41's realization of short-a in *relax* is distinct from *bad*. This distinction in vowel quality is not shared by F24.

A similar, if not slightly more drastic, difference is seen between *rather* and *bath*/*path*. Figure 3 shows F24's realization of *rather* and *path*. There is only a slight amount of wavering in the formants of either token, and there is no permanent second steady state.

Figure 4 shows F41's realization of *rather* and *bath*.[11] F2 begins much higher and, as with *bad*, moves to a second steady state halfway through the vowel.

Table 4 shows the F1/F2 values for each, as before. This table verifies the similarity between F24's realization of *rather* and *path*. The mean F2 values are very similar, and both have a very low MD, indicating little variability and no second steady state.

In contrast, there is a large difference between the F1/F2 values for F41. The MD of F2 in F41's realization of *bath* is considerably larger than that of *rather*, unlike the situation with F24. The spectrographic image shows that this is underlain by the two different vowel qualities that are roughly equal in duration. Furthermore, the difference between F2 max and min in *bath* is much larger than in *rather*.

The data so far reveal two distinct short-a realizations for F41, but only one for F24. Some short-a tokens, for F41, exhibit breaking (*bath, bad*), while others are lax (*rather, relax*). For F24, all of these tokens are lax. There are no qualitative auditory differences among her realizations of short-a, and the spectrograms and F1/F2 measurements show no consistent differences either.

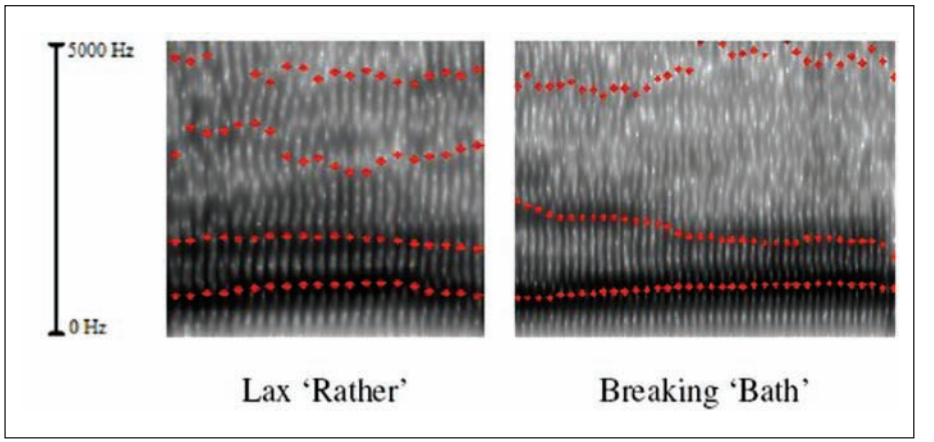

Figure 4. Spectrogram of *rather* and *bath* for a forty-one-year-old female from Dover, NH

Table 4. Acoustic Measures of Short-a in *Path/Bath* and *Rather* for F24 and F41

	Path/bath				*Rather*			
	F24 (*path*)		F41 (*bath*)		F24		F41	
	F1	F2	F1	F2	F1	F2	F1	F2
Mean	1011.01	1761.07	817.72	1850.14	911.56	1790.32	799.18	1607.92
Mean deviation	30.68	31.07	87.30	213.02	59.97	30.59	54.83	48.21
Max	1049.21	1815.66	919.49	2193.82	1006.98	1857.54	874.35	1685.56
Min	941.84	1683.79	621.85	1553.93	733.93	1728.83	677.66	1477.94
Difference	107.37	131.87	297.64	639.89	273.05	128.72	196.68	207.62
Duration (ms)	0.11		0.23		0.8		0.11	

An analysis of prenasal short-a, however, reveals yet another realization for both F24 and F41. Figure 5 shows F24's realization of *pants* and *camera*. In both tokens, F2 is much higher than any of the variants seen yet, and though there is no movement of F2 to a second steady state, there is an off-glide. Toward the very end of each vowel, F2 drops. Unlike with breaking, this drop is late and never constitutes a second steady state. F41 exhibits much the same phenomenon for *pants* and *camera*, as seen in Figure 6.

The formant values in Table 5 verify the higher mean F2 values and generally larger differences between F2 max and min. The F2 MDs vary from as low as 78.32 for F41's *pants* to 280.09 for F24's *camera*.

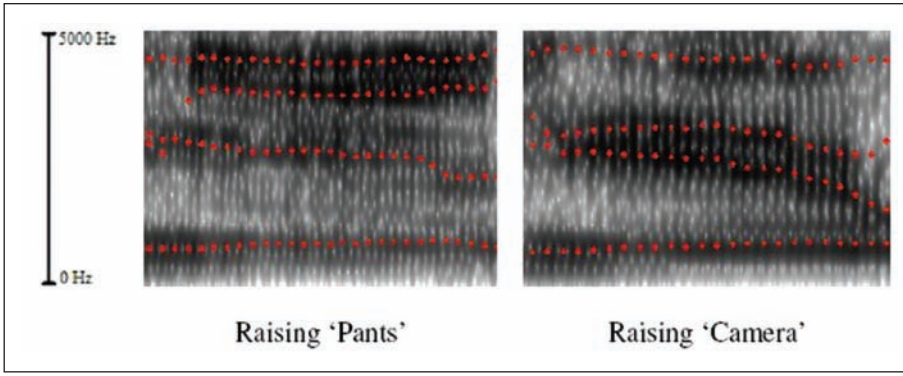

Figure 5. Spectrogram of *pants* and *camera* for a twenty-four-year-old female from Dover, NH

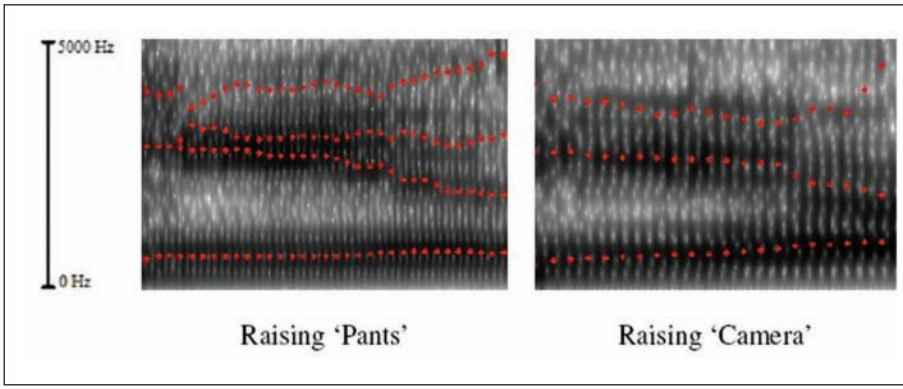

Figure 6. Spectrogram of *pants* and *camera* for a forty-one-year-old female from Dover, NH

The tables, spectrographic images, and auditory examination reveal that prenasal raising is distinct from breaking and laxing. F41 exhibits all three variants, while F24 exhibits only a distinction between prenasal raising and lax short-a.

Full Token Analysis

This section examines the distribution of these three variants (breaking, laxing, and prenasal raising) across the dimensions of age, city, and following consonant type. The latter is usually, as discussed above, the most important phonological factor conditioning short-a realization. I do not discuss sex since I found no sex-related patterns in the data set. The tokens were coded visually and auditorily in Praat. Breaking was distinguished visually by lowering of F2 to a second steady state and auditorily by

Table 5. Acoustic Measures of Short-a in *Pants* and *Camera* for F24 and F41

	Pants				*Camera*			
	F24		F41		F24		F41	
	F1	F2	F1	F2	F1	F2	F1	F2
Mean	745.64	2544.85	689.94	2684.78	728.70	2285.69	732.30	2472.22
Mean deviation	54.93	170.58	32.69	78.32	55.95	280.09	86.43	170.03
Max	850.86	2951.81	774.70	2795.01	815.04	2861.16	925.53	2736.72
Min	586.58	2064.64	645.56	2379.51	581.52	1445.15	574.88	2008.33
Difference	264.28	887.18	129.14	415.50	233.52	1416.01	350.65	728.38
Duration (ms)	0.19		0.13		0.15		0.11	

identifying a diphthong-like realization. Raising was distinguished visually by a much higher F2 with an off-glide at the end and auditorily by identifying the [e] realization and an audible off-glide. Laxing, as the elsewhere case, was identified visually by a lower F2 with little movement and auditorily by identifying a steady [æ] realization.

The tables in this section should be understood as follows. The number reported under "*n*" is the total number of tokens for that category. The percentage column indicates the percentage of those tokens that exhibit the variant in question. In some cases, there are apparent inconsistencies in the data. There are two reasons for this. First, some speakers read an earlier version of the story, which had fewer short-a tokens. Second, some tokens had to be thrown out if they were mispronounced, misunderstood, inadvertently skipped, and so on by some speakers. In principle, the number of tokens would be the number of speakers multiplied by the number of tokens in the story, but in actuality that is not what the data in these tables show.

Breaking is clearly more prevalent in northern New England than the ANAE maps would suggest. Table 6 captures the overall frequency of short-a breaking and raising, divided up by city and following consonant type. In all three cities, breaking is most frequent with voiceless fricatives, followed by voiced stops, laterals, voiceless stops, and voiced fricatives. The frequencies in Manchester in this table are more similar to those in Boston than those in Dover, although below we see important differences between the two cities, when age and phonological context are taken into account. As mentioned earlier, raising is only found in prenasal contexts. There were no tokens of prenasal breaking in my sample.

For all ages, prenasal short-a consistently raises with high frequency (Table 7). Manchester speakers exhibit a lower frequency of prenasal raising. Most of this difference can be attributed to two factors. First, one speaker, a twenty-six-year-old male, exhibits prenasal raising in only one token (*camera*). Second, there is a strong tendency in the Manchester sample toward a lax short-a in the word *grandparents*;

Table 6. Frequency of Short-a Realization

	Dover			Manchester			Boston			Total		
	Breaking	Raising	*n*	Breaking	Raising	*n*	Breaking	Raising	*n*	Breaking	Raising	*n*
Voiceless fricatives	40.0	—	55	46.3	—	54	50.0	—	50	45.3	—	159
Voiced stops	21.4	—	28	34.3	—	35	35.3	—	34	30.9	—	97
Laterals	7.1	—	14	16.7	—	18	21.4	—	14	15.2	—	46
Voiceless stops	4.1	—	49	13.5	—	52	14.0	—	50	10.6	—	151
Voiced fricatives	—	—	20	5.6	—	18	5.9	—	17	3.6	—	55
Nasals	—	93.7	63	—	68.1	72	—	83.1	71	—	81.1	206
Total	13.5	25.8	229	19.3	19.7	249	20.3	25.0	236	17.8	23.4	714

Table 7. Frequency of Prenasal Raising by Age and City

	Dover		Manchester		Boston	
	%	*n*	%	*n*	%	*n*
Younger than 30	96.3	27	69.6	56	92.3	13
31–50	100.0	18	62.5	16	81.3	16
51 or older	83.3	18	—	—	81.0	42

only two Manchester speakers, both sixteen-year-old females, have raised short-a in this word. Overall, the strong tendency is toward raising. Interestingly, there seems to be a trend in all three cities for younger speakers to raise prenasal short-a with greater frequency. While it is a relatively weak effect, it does in fact correlate to some extent with the overall abandonment of the breaking short-a system in NH (although not in Boston).

Table 8 shows the frequency of breaking by age, city, and following consonant type. Since breaking before voiced fricatives was so infrequent, voiced fricatives are not included in this table. Division by age reveals a more complex situation than was apparent in Table 6. NH speakers older than thirty have a complicated system. They have a significant amount of breaking in a number of contexts, the highest across the board being before voiceless fricatives. They are also fairly uniform in exhibiting some breaking before voiced stops. In other environments, the situation is more variable, which makes it difficult to get a clear picture of what is going on. Speakers in the thirty-one to fifty range exhibit breaking before voiceless stops, more so in Manchester than in Dover. There is only one token of prelateral breaking among NH speakers. The situation with speakers older than fifty-one is similar: a fair amount of breaking before voiceless fricatives and voiced stops, but little breaking elsewhere. One notable difference is that in Dover, there is no breaking before voiceless stops among this age group, in contrast to the speakers between thirty-one and fifty. The system of NH speakers older than thirty can be summarized as follows: they exhibit consistent, but variable breaking before voiceless fricatives and voiced stops, with occasional breaking elsewhere and a high frequency of prenasal raising.

Dover and Manchester speakers younger than thirty, in contrast, exhibit almost no breaking. Furthermore, breaking for these speakers is restricted to two contexts: before voiced stops and voiceless fricatives. Even there, the frequency of breaking is far lower than the other age groups. Where it is most frequent, in Manchester before voiced stops (14.8 percent), the word *bad* is responsible for most of the breaking.[12] For these speakers, the low frequency of breaking revealed in Table 7, along with the high frequency of prenasal raising shown in Table 8, indicates that these speakers exhibit a pure nasal system with a few scattered lexical exceptions, left over from a system possessed by older speakers. This kind of clear age grading suggests a change in progress: NH is moving from a variable breaking system to a nasal system.

Table 8. Frequency of Breaking by Age and City

		Dover		Manchester		Boston	
	Age	%	*n*	%	*n*	%	*n*
Voiceless fricatives	Younger than 30	4.3	23	2.4	42	100.0	9
	31–50	68.8	16	91.7	12	0.0	12
	51 or older	62.5	16	—	—	55.2	29
Voiced stops	Younger than 30	8.3	12	14.8	27	33.3	6
	31–50	25.0	8	25.0	8	0.0	8
	51 or older	37.5	8	—	—	50.0	20
Voiceless stops	Younger than 30	0.0	21	0.0	42	33.3	9
	31–50	14.3	14	60.0	10	0.0	12
	51 or older	0.0	14	—	—	13.8	29
Laterals	Younger than 30	0.0	6	0.0	14	0.0	2
	31–50	0.0	4	25.0	4	25.0	4
	51 or older	25.0	4	—	—	25.0	8

This situation in Boston is more complicated. Boston speakers in the thirty-one to fifty age group exhibit almost no breaking; where they do, it is prelateral. While prelateral raising/breaking is neither common nor unattested (see, e.g., Labov 1989), it is unusual to see speakers exhibit breaking only in this environment. With only two speakers in this cell, it is not possible to draw any strong conclusions about Boston speakers in this age group generally.

However, the fact that Boston speakers younger than thirty exhibit categorical breaking before voiceless fricatives indicates that Boston is probably not undergoing the change we see in NH. Thus, breaking is generally prevalent in Boston, among older speakers as well as younger ones. More work would have to be done to elucidate the situation in Boston as well as the constraints on this variation, but there are no straightforward indications of any change in progress in the present sample.

In the NH sample, in contrast, the younger speakers do share a system: a nasal system. Table 7 shows that the youngest speakers (as well as the older speakers) exhibit prenasal raising with very high frequency. Almost all other short-a tokens are lax. Exceptions are high-frequency words scattered in environments where breaking is prevalent in older NH speakers. For example, only one NH speaker older than thirty exhibits lax *bad*, and this, as mentioned, is the most frequent exception among the speakers younger than thirty. This pattern is reminiscent of Laferriere's (1977) discussion of broad-a, which became restricted to certain lexical items as the more productive breaking system moved in. The phonological contexts and age-grading considerations for NH speakers older than thirty is unclear, much as the situation in Boston among all age groups is unclear. But what is clear is that younger NH speakers have abandoned this complex system in favor of the simpler nasal system.

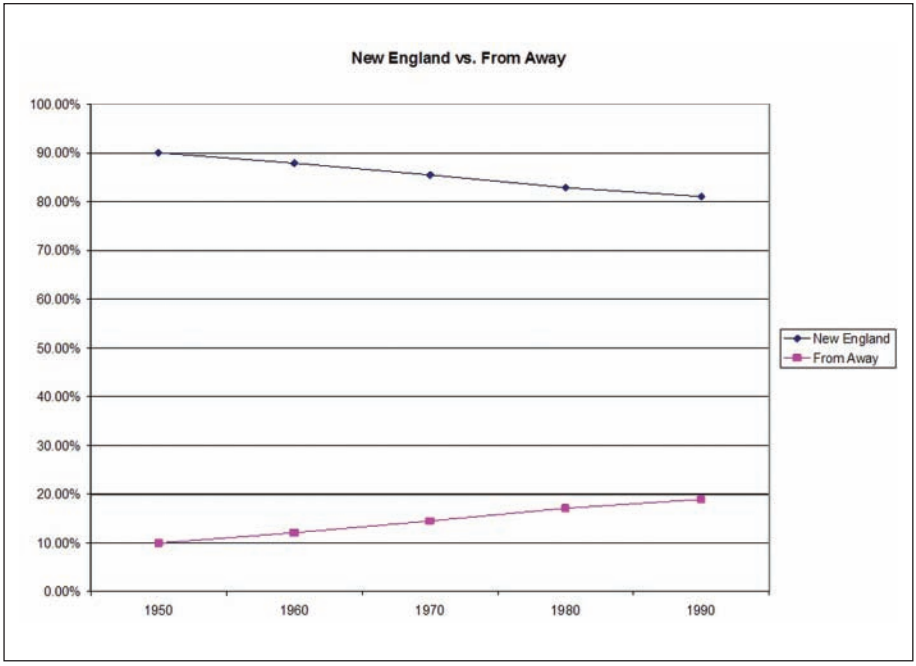

Figure 7. Percentage of New England residents born in New England versus elsewhere

Migration and Population Change in New England

Population change in New England, and in NH in particular, has a notable history. Northern New England, including NH, experienced relatively little growth before 1960, and it was during this time that southern New England tended to have rather high growth rates. After 1960, this trend began to flip and did so most dramatically between 1970 and 1980, when NH became one of the fastest growing states as a result of massive in-migration. The result of this was that NH had the highest proportion of nonnative residents in New England and at the same time the second smallest overall population. This population change coincides with the shift from a breaking system to a nasal system in NH: speakers younger than thirty, who grew up in the time period immediately following the in-migration, adopted the nasal system.

In the latter half of the twentieth century, New England as a whole became more and more "nonnative." To use traditional New England parlance, more people were coming "from away" (see, e.g., Associated Press 1993). This general trend for all of New England is shown in Figure 7 (data for Figures 7 and 8 based on census data presented in Ferrie 2006a).

Over half the in-migrants were coming from the Middle Atlantic states during this time (New York, New Jersey, and Pennsylvania), although an increase in the number

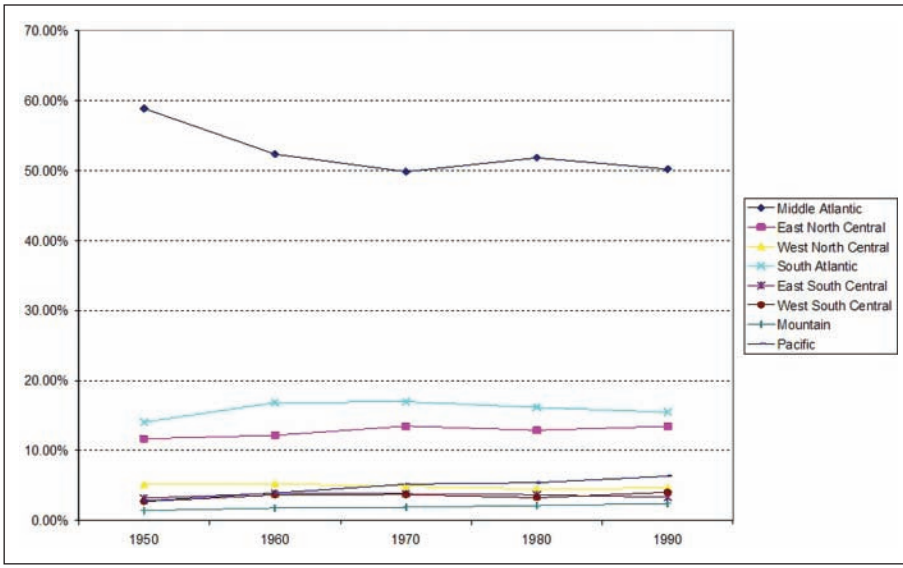

Figure 8. Percentage of nonnative New England residents from various regions of the United States

coming from other places, such as the Pacific and the South Atlantic, meant that this proportion became lower over the years. The South Atlantic had the second highest portion of in-migrants (17 percent in 1970 and 15 percent in 1990). Still, by 1990, the overall percentage of people living in New England who had been born in the Middle Atlantic states increased from 5.9 to 9.5 percent. Figure 9 shows the relative percentages of people living in New England who were born elsewhere.[13]

Figure 8 provides a general sense of where people moving into New England were coming from. However, this was a period in which many improvements in transportation and mobility developed, so one might question whether there was anything noteworthy going on in New England at all, given that we should expect a general reduction in homogeneity in many parts of the country during this time (see Berry & Dahmann 1977). However, some dramatic internal population changes took place in New England during the latter half of the twentieth century.

For most of the twentieth century, northern New England (NH, Maine, and Vermont) stayed well below the national growth rate. Southern New England (Connecticut, MA, and Rhode Island) had a much higher growth rate, sometimes exceeding the national average. This trend flipped dramatically in the decade of 1970–1980, when northern New England came to far exceed the national growth rate, as shown in Figure 9 (adapted from Brown & Zuiches 1985:23).

Sociological research has concluded that the primary component of change between 1970 and 1980 was in-migration (Brown & Zuiches 1985; Wallace 1995).

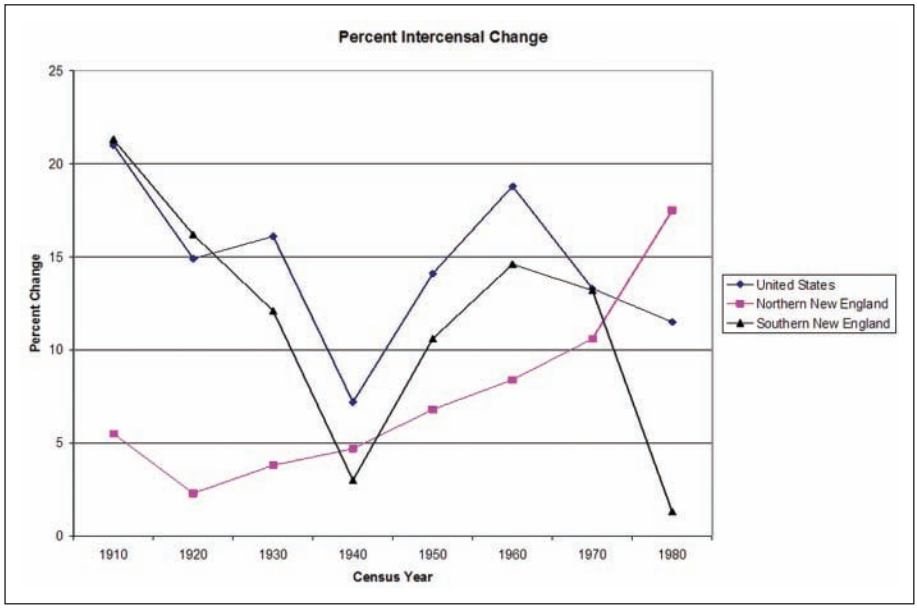

Figure 9. Population growth in New England and the United States

Wallace (1995:12) observes that "for New Hampshire as a whole, inmigration accounted for two-thirds of population growth during the period 1970-1990." While northern New England experienced an enormous amount of in-migration, southern New England actually experienced a net migration loss (Brown & Zuiches 1985:28). Table 9 shows that NH and MA underwent a complementary change in population between 1970 and 1980 (table taken from Ferrie 2006b). NH gained 136,000 people, the same number that MA lost.

This is more dramatic than it appears since NH had such a small general population—737,681 in 1970. Furthermore, most of the increase was concentrated in southern NH, as discussed below. MA, on the other hand, had a population of 5,737,037, almost half of all of New England combined (Luloff & Steahr 1985:12). While the Northeast as a whole experienced a net loss in population during the 1970s, NH itself was the most rapidly growing state north of Virginia and east of Colorado (Ilvento & Luloff 1982).[14] Some NH communities, such as Litchfield, increased by as much as 192 percent in this decade and eventually had to enact ordinances limiting housing development permits to curb in-migration (Pokorny 1982). In fact, this trend was not restricted to the 1970s. Luloff and Ilvento (1981:3) report that since the 1950s, the population had increased "by approximately 72% (from 533,000 to 919,000)" with an annual average growth rate of 2.3 percent, more than double the national average of 1.14 percent.

Table 9. Net Intercensal Migration—Components of Change Method

	New England					
	Maine	New Hampshire	Vermont	Massachusetts	Rhode Island	Connecticut
	Ac53	Ac54	Ac55	Ac56	Ac57	Ac58
Period	Thousand	Thousand	Thousand	Thousand	Thousand	Thousand
1940–1950	–27	(Z)	–19	23	11	113
1950–1960	–67	12	–38	–96	–26	234
1960–1970	–69	69	15	74	13	214
1970–1980	76	136	38	–136	–33	–52
1980–1990	45	117	17	19	20	18

Source: Ferrie (2006b).

The result of this in-migration was that by 1980, according to Berney (1982), NH was the second least populated New England state, but the only state in all of the Northeast where more than 50 percent of the population was born outside of the state. NH, Vermont, and Wyoming had the highest percentage of growth because of in-migration. The national average for nonnative population at the time was 36.2 percent, and New England as a whole had an average of 34.3 percent nonnative residents (Berney 1982).

In sum, the second half of the twentieth century saw an increasingly more heterogeneous New England because of increased migration from several regions in the United States, most notably the Middle Atlantic and South Atlantic states. By 1980, New England consisted of a little over one-third nonnative residents. Within New England, the northern states (NH, Maine, Vermont) grew rapidly because of in-migration, while the southern states (MA, Connecticut, Rhode Island) endured a net migration loss. For NH, this led to a population that was over one-half nonnative in 1980, significantly higher than the New England average. To get a better sense of how these internal population changes interacted with the language change which occurred during this time, the next section looks closely at the movement into NH: where migrants were coming from, where in NH they were going to, and why they were moving into NH in the first place.

Movement into NH

In this section, I address the question of where the in-migrants were coming from, where they were going to, and why they were coming to NH more than the other New England states. The answers to these questions bear striking resemblance to previous hypotheses regarding geographic attitudes and language change in NH. People came

Table 10. Out-of-State Licenses Surrendered to the NH Department of Motor Vehicles 1977–1978

State	*n*	%
Massachusetts	1,543	61.3
New York	211	8.4
Connecticut	146	5.8
Maine	134	5.3
New Jersey	119	4.7
Vermont	84	3.3
California	79	3.1
Florida	76	3.0
Pennsylvania	73	2.9
Rhode Island	53	2.1
Total	2,518	

Source: Luloff and Ilvento (1981).

to NH because improved transportation allowed people who disliked city life to live in rural areas but still have access to urban luxuries. Such access was limited in other areas, such as Maine, and most of MA was too urban to be a candidate for such a move. The effect this had on language was to create a situation of dialect contact, similar to New Town phenomena studied by Kerswill (1996a, 1996b, 2002). The impact was greater in NH because its significantly smaller population size left it especially susceptible to the effects of dialect contact.

To get a sense for where in-migrants were coming from, Luloff and Ilvento (1981) studied 2,979 out-of-state driver's licenses surrendered to the NH Department of Motor Vehicles between February 1977 and January 1978. Table 10 shows the number of licenses from each of the ten highest states. We see that most of the in-migration was coming from within the Northeast.

By region, 79.32 percent of the in-migration, by this measure, came from the Northeast. The other 20.68 percent broke down by region as follows: North Central 6.14 percent, South 9.23 percent, West 5.3 percent (Luloff & Ilvento 1981). Adding to this the fact that New England itself already had a heterogeneous population (see Figures 8 and 9), it is clear that there was substantial variation in the regional origins of the in-migrants, although the majority were from within the Northeast.

By the early 1990s, migrants were coming in larger numbers from some of the states that are lower on the list in Table 10. Statistician Joseph Habib, studying data from ten major moving companies, reported that most in-migrants were coming from the following five states: California (12.3 percent), Florida (8.9 percent), MA (8.1 percent), New York (7.9 percent), and Pennsylvania (5.0 percent; Morris 1995). All along, then, the source of NH's in-migration has been only partially local. Middle Atlantic states such as New York and Pennsylvania have consistently played a role, as have California and Florida.

These data are possibly biased, in the sense that the close proximity of MA to NH means that many movers probably did not use moving companies. After all, 61.3 percent to 8.1 percent is an enormous drop. However, recall that in Table 9, it is only during the 1970s that the NH population grew by the same number that the MA population decreased. In the 1980s, the MA population actually grew. Possibly, this suggests a smaller role for MA in NH growth during the 1980s. Moreover, 61.3 percent seems to be the anomaly: the second largest source of in-migration in the 1970s was New York at 8.4 percent. That is, it is not the drop from 61.3 to 8.1 that is odd, but rather it is the fact that the percentage of in-migrants from MA ever reached 61.3 in the first place that is odd. Finally, Wallace (1995:16) notes that the initial population growth contributed by Boston was followed by "independent growth based in southeastern New Hampshire [which] has stimulated migration." While it is probably true that Habib's data underestimate the contribution of MA to NH population growth in the early 1990s, they likely do not do so by much, as 8.1 percent is not an unusually low proportion for intraregional migration.

Turning to the question of why people came to NH and not, say, MA or Maine, there are strong indications that increased transportation, especially with respect to the development of highways in the 1960s, allowed people to live in less populated areas (Lewis 1972). Ilvento and Luloff (1982) surveyed 1,750 newcomers to NH in the 1970s. Their results showed that prorural, antiurban attitudes played a clear role in the decision to move to NH. Population density is indeed a major difference between northern and southern New England. Brown and Zuiches (1985:27-28) observe that many people within New England in the 1970s moved to nonmetro areas, which were more prevalent in the northern states than the southern states:

> Only about one-third of the population in the three northern states lived in metro counties while almost 95 percent of the population in southern states are so classified. . . . There was an internal population transfer between northern and southern New England and from New England metro areas to nonmetro areas during the 1970s.

That the desire to live in a nonmetro area could be contributing to increased movement to northern New England was noticed as early as the 1960s. According to Lewis (1972:308), "[New Hampshire] became an area sought out by tourists, campers, hunters, fishermen, and genealogists, to be followed in more recent years by skiers, land speculators, and snow-mobilers." However, it was also sought out by people who needed or wanted to be near metropolitan areas. As Wallace (1995:8) discusses, most of the growth in NH occurred near metropolitan areas:

> In general, growth has been most rapid and massive in the southeastern part of the state. Not in the cities but in rural towns close to cities. Isolates of rapid growth occurred elsewhere, usually in high amenity areas accessible to water recreation as for example, Moultonborough, or skiing, as in Waterville.

Wallace (1995:19) further notes that "non-metropolitan growth in rural New Hampshire is not a true rural revival. The newcomers to rural New Hampshire have urban occupations." According to Ilvento and Luloff (1982:229), "Major growth areas are within commuting distances of Boston and Lawrence-Lowell-Haverhill [standard metropolitan statistical areas]."

In sum, the in-migrants came mostly from areas in the Northeast, such as MA, New York, New Jersey, and Pennsylvania, but also from Florida and California, among other places.

The survey results in Ilvento and Luloff (1982) show that people moved to NH in part because of prorural, antiurban attitudes. Moreover, many, when possible, moved to areas close to rural recreational activities. However, they mostly had urban jobs and lived within commuting distance to urban areas.

Language Change in New England

Short-a is not the only linguistic variable that is changing in NH. Recent research has provided strong evidence that NH is currently in the process of diverging linguistically from neighboring Boston, despite the fact that the latter is often construed as the cultural and linguistic center of the region. Nagy (2001) used questionnaire data to show that younger NH speakers exhibit a merger of the vowels in *father* and *bother* with much higher frequency than their counterparts in MA. Age grading suggests a change in progress in NH, with little change in MA, though there is a much less drastic move toward the merger in Boston (as opposed to other areas of MA).

In addition, NH speakers have come to exhibit a merger of the prerhotic vowels in *merry*, *Mary*, and *marry* with much greater frequency than Boston speakers; and Nagy's (2001) data suggest that this is a case of stable variation rather than a change in progress. However, Dinkin (2005) has shown that in the 1930s, most of NH was not distinct from Boston with respect to these vowels. This suggests that NH has been diverging from MA for some time but that different variables have spread at different rates. It is not known, however, exactly when NH began to diverge from MA with respect to the *merry/Mary/marry* merger.

Irwin and Nagy (2007b) have shown that a similar divergence is taking place with respect to postvocalic /r/. NH speakers are much more likely to retain postvocalic /r/ than Boston speakers. Subtle phonological constraints differ as well: NH speakers retain more tokens of /r/ after front vowels whereas Boston speakers retain more tokens of /r/ after back vowels. Moreover, as with the previous results, younger speakers are more likely to retain /r/ than older speakers, although this change appears to be affecting Boston as well as NH. Other indications that NH speakers form a speech community distinct from Boston can be found in Ryback-Soucy and Nagy (2000) as well as Nagy and Roberts (2004).

Nagy (2001) argues that the motivation for this change is cultural: NH speakers no longer identify culturally with Bostonians. New Hampshirites, she argues, celebrate aspects of NH life that cannot be enjoyed in a large city such as Boston. In fact,

she suggests that New Hampshirites' linguistic divergence is a way for them to distinguish themselves unambiguously from their Bostonian neighbors. It is the speakers who are geographically closest to Boston, and thus have the greatest opportunity for regular contact, who diverge the most. It is, therefore, primarily NH speakers who are in regular contact with Bostonians who exploit linguistic means to distinguish themselves. Nagy (2001:40) notes, "Frequent scornful reference to *Taxachusetts* and *Massholes* and subconscious use of linguistic features demonstrate their independence from the nearby metropolis."

In light of the hypothesis pursued here, namely, that migration patterns have played a major role in facilitating language change, it is interesting to note the similarity between Nagy's (2001) hypothesis regarding the cultural motivation for linguistic change and the hypothesis in the above-cited sociological literature on the motivation to migrate to NH in the first place. Specifically, in-migrants wanted to be close enough to the city to enjoy its benefits without actually having to live in the city. Improved opportunity for transportation facilitated this, and geographically NH was the most likely target. Most of southern NH is about a one-hour drive from Boston. There is no other state that is so close to urban MA and is at the same time so sparsely populated.

Two independent lines of research have, then, made very similar claims. One line of research has argued that migration into NH was driven by the desire to avoid living in the city (Wallace 1995; Ilvento & Luloff 1982; Luloff & Steahr 1985). Another line of research (Nagy 2001 and the other references cited above) has argued that anticity values in NH have been a primary motivation for linguistic divergence. All the while, children growing up since 1980 have lived in an area where more than half the population is nonnative (Berney 1982). Likely, this created a dialect contact situation in the 1970s and early 1980s. Multiple dialects came into contact in a rapidly growing community, and the cultural unity that cut across those dialects, for the migrants, was the desire to stay out of the city. This is a sentiment that natives probably shared and would set the stage for dialect leveling in the sense of Kerswill (1996a, 1996b, 2002).

Dialect Leveling

Kerswill (1996a, 2002) and Kerswill and Williams (2000) have studied the process of koine evolution. A "koine" is a dialect shaped by extensive dialect contact. Children growing up in a community where many dialects are spoken acquire a dialect that is distinct from all of them. This is most evident in the "New Town" phenomenon, where new towns in post–World War II England were settled by people from very different dialect regions. Kerswill (1996b) has argued that koineization is related to regional dialect leveling, a phenomenon whereby supraregional variants come to replace local ones in adjacent regional dialects. He refers to koineization in the new town of Milton Keynes as "accelerated dialect levelling" (Kerswill 1996b:245).

During the time period of the language change studied in this article, NH was in the rather exceptional position of having a small population where the majority was

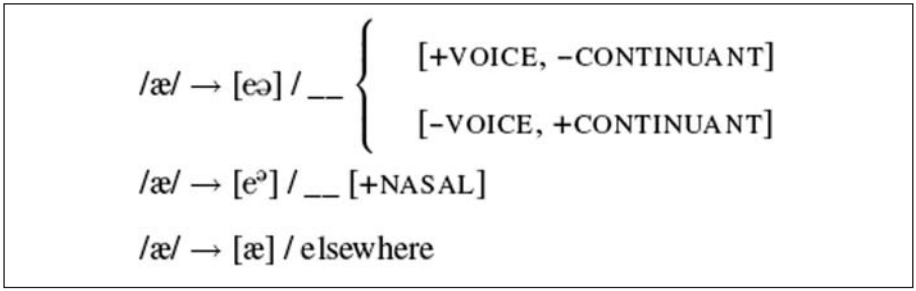

Figure 10. The breaking system rule

nonnative. Given this, it is worth considering the possibility that the same principles that underlie koineization and dialect leveling might have been responsible for the shift from the breaking system to the nasal system in NH but not Boston. Many of the states that fed the population increase in NH have short-a systems similar to the system of older NH speakers. Northern New York has several NCS areas. NYC and nearby parts of New Jersey exhibit variations of the NYC split system, and Philadelphia has a split system that is similar to the NYC split system, with slightly different phonological contexts (see Labov 1989; Henderson 1996). Even heavy migration into NH from within New England would lead to dialect contact since there is considerable dialectal variation within New England itself. Isoglosses often identify at least three distinct regional dialects: eastern New England, western New England, and a separate region for urban parts of Rhode Island. I refer to the variable breaking dialect of the older NH speakers as the "contact dialect" and the nasal system of the younger NH speakers as the "post-contact" dialect.

Kerswill and Williams (2000:84) argue that there are three principles which affect the outcome of a post-contact variety. First, "majority forms found in the mix, rather than minority forms, win out." Of the three variants in the contact dialect, lax [æ] is the elsewhere case (i.e., occurs the majority of the time). Other variants occur variably in specific contexts. When the other variants do not occur, either because the phonological context is not met or because the variable rule has not applied in a particular case, it is lax [æ] which is realized. The contact system might be stated roughly in rule form as in Figure 10.[15]

Breaking [eə] is not a majority form in the contact dialect; it occurs only variably and is conditioned by specific phonological contexts. In the post-contact system, [æ] is realized virtually everywhere. The sole exception is prenasal environments, where raising [eᵊ] is the majority form. The post-contact system is stated in rule form as in Figure 11.

Adoption of the nasal system is consistent with this first principle: the nonmajority form is lost, and the two variants that are left are carried over to a simplified system.

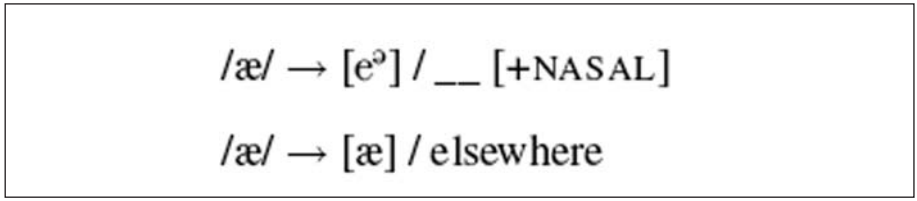

Figure 11. The nasal system rule

The second principle related to the outcome in post-contact varieties states that "marked regional forms are disfavored" (Kerswill & Williams 2000:85). This effect is seen in the present data, and apparently in other variables. In the present data, breaking is a marked regional form, and it is disfavored in the post-contact dialect. The nasal system, however, has acquired a supraregional status, having spread to many areas of the country. Consider the following quote from ANAE:

> [The nasal system predominates] in New England, with a further concentration in northern New Jersey outside of the New York City area. A second striking area of concentration . . . is found in the Midland, especially in the large cities of Pittsburgh, Columbus, and Indianapolis (but not Cincinnati). (Labov, Ash, and Boberg 2006:181)

However, in Cincinnati, Boberg and Strassel (2000) also report a change in progress from something similar to a simplified NYC split system to a nasal system. Furthermore, an examination of the map of short-a systems in Labov, Ash, and Boberg (2006:182) reveals the presence of nasal systems across most of the United States.

The move toward supraregional forms is seen in other variants as well. Irwin and Nagy (2007b) show that younger speakers pronounce postvocalic /r/ with much higher frequency, in line with the general observation that /r/ pronunciation has become a supraregional feature of American English. Nagy (2001:40) notes that "the changes that NH is undergoing bring it more in line with other American varieties." The divergence reported here shows younger NH speakers adopting what might be described as a supraregional variety, as would be expected if dialect leveling were occurring.

Finally, according to Kerswill and Williams (2000:89), "Phonologically and lexically simple features are more often adopted than complex ones." One of the examples they provide is particularly relevant here. They cite the "tensing and raising of short-a in Philadelphia English (Payne 1980), which is both phonologically conditioned and lexically irregular." The Philadelphia system is similar to the NYC split system, except the phonological contexts are slightly different. Clearly, the breaking system of older NH speakers would also constitute a complex phonological system. In fact, the nasal system is, in some sense, a proper subset of the breaking system reported here. That is, speakers with a breaking system and speakers with a nasal system both have the

prenasal raising rule. But in addition, speakers with a breaking system have a contextually conditioned breaking rule in nonnasal environments. It is as though one system is superimposed over the other. Speakers have abandoned this system, which is consistent with this third principle of post-contact varieties. Since the system is both complex and variable, the move toward the nasal system is perhaps not surprising.

In sum, there is strong evidence of extensive contact between speakers with different short-a systems. The migration patterns show that these speakers came from areas known to have the more complex systems, and the initial result (among older speakers) was a variable system that was about equally complex.[16] The speakers growing up in the post-1979 period acquired a dialect in a manner consistent with the principles of post-contact dialects elucidated in Kerswill and Williams (2000). I do not want to take a stand as to whether the term *koine* is appropriate in the present case. However, I do think the evidence points toward a change driven by dialect contact, the latter a manifestation of extensive in-migration resulting in a demographic with a nonnative majority.

Conclusion

This article contributes to the documentation of English in New England by showing that short-a in northern New England is not as simple as previously thought. A change in progress in NH shows another dimension wherein NH speakers distinguish themselves from Boston speakers. The variable breaking system of Boston and older NH speakers somewhat resembles the NYC split system, and its variability suggests diffusion of the latter through years of dialect contact. Extensive migration into NH from MA and elsewhere coincides with the adoption of a nasal system among speakers who grew up in a NH which was over 50 percent nonnative. This is consistent with the principles of post-contact dialects espoused in Kerswill and Williams (2000).

Since the nasal system has become so widespread throughout the United States, it is worth asking whether migration and dialect contact have been behind its adoption elsewhere. Of course, there are many mechanisms that can drive linguistic change, and the move toward nasal systems may have different explanations in different areas. As Labov, Ash, and Boberg (2006:175) point out, nasality itself has an effect on formant frequency, and this might contribute to the spread of the nasal system (though one should not overestimate this effect).[17] Nevertheless, the present results suggest that migration patterns and dialect contact provide a potentially revealing avenue for investigation of change. In fact, the growth of rural NH was part of a larger, nationwide trend of increased migration out of urban areas and into rural areas (Wallace 1995).

Still, there must be more to the story than that since urban areas such as Cincinnati, Pittsburgh, Columbus, and Indianapolis have also shown a move toward nasal short-a systems. It remains to be understood exactly what drives all of these areas toward a nasal system, but the fact that it appears in many distinct regions does suggest something systematic. Since the change in NH is consistent with the principles of post-contact varieties, a reasonable working hypothesis would be that dialect contact phenomena are behind many of the nasal systems in the United States.

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Notes

1. This hypothesis also explains why the same change occurred in many geographically separated areas. Boberg (2001), for example, has suggested that the conditions for the shift were once present in Vermont. Then, emigrants moved to the various "Northern Cities," all carrying with them a phonological system ripe for the shift. The shift never completely took hold in Vermont, Boberg suggests, because contact with eastern New England caused the spread of the *caught/cot* merger and thus the loss of one crucial pivot point.
2. There are other systems described in Labov, Ash, and Boberg (2006) and elsewhere that are not relevant here. One that warrants a brief mention is called "southern breaking" (Labov, Ash, and Boberg 2006:178-180), where short-a is broken essentially into three pieces; the first is a low-front position, which moves upward until reaching a high-front glide [j] before moving back in the direction from which it came. See Labov, Ash, and Boberg for a description of this, along with spectrographic evidence of its differentiation from Northern breaking.
3. Thus, as pointed out by an anonymous reviewer, the underlying nasal system seems very much in place even in speakers who exhibit a great deal of breaking in nonnasal environments since raising is found only in nasal contexts, where breaking is never found. This, therefore, suggests the possibility that raising and breaking are subclasses of a more general class, say, "tensing." The complementary distribution of breaking and raising in my sample is indeed striking, and it may be that the acoustic differences discussed here can be reduced to the acoustic effect of nasality on what would otherwise be a breaking token since nasality does have an effect on formant frequency. Labov, Ash, and Boberg (2006:175) discuss this possibility with respect to the nasal system: "Although the initial effect of nasality may be triggered by such acoustic interaction, there is no doubt that nasal allophony has been translated to the phonological level, and the wide variation in the

degree of pre-nasal raising across dialects is a linguistic fact of considerable consequence." The same reasoning applies here. The difference between breaking and raising is not fully understood, and it is not clear such a difference can be reduced to acoustic side effects. Complementary distribution might not be present in all dialects, although it remains to be seen whether any cases of free intracontextual variation exist. Since one of the purposes of this study is to describe the difference between breaking and raising, I continue to make a distinction.

4. For this reason, Malcah Yaeger-Dror (pers. comm.) suggests that I use the term *diphthongization* instead of breaking. Her point is well taken, but I have chosen to continue to use the term *breaking* since the research here is based on that reported in Labov, Ash, and Boberg (2006). I use the terminology employed there to maintain this continuity and to avoid confusion with respect to the phenomenon at hand. Note also that breaking can sometimes sound like an off-glide, even if it is a second steady state acoustically. This is probably part of the reason that breaking was not discovered as distinct from off-gliding before the *Atlas of North American English* research, and William Labov (pers. comm.) was originally surprised by this auditory-acoustic discrepancy. Possibly, one reason for it is that diphthongs with a schwa component are not as common as other kinds of diphthongs in "Standard" American English, although the former are certainly present in nonrhotic dialects of British English and, I believe, in many dialects of American English as well.
5. I thank an anonymous reviewer for pointing me toward Laferriere's work, which seems to document the introduction of breaking in Boston.
6. Laferriere (1977) used the term *backing* for broad-a and *raising* for what appears to be breaking. For ease of exposition, I maintain the terms *broad-a* and *breaking*. Probably, prenasal short-a in Laferriere's sample was not qualitatively distinct from prenasal short-a in the present sample, although there is no way to know with certainty.
7. In this article, I use the term *productive* in the following way. If we understand the grammatical factors that condition one variant over another, the choice of which variant we see in any particular lexical item will be predictable, based on those factors and subject to lexical exceptions. A productive system has predictable properties that can be extended to novel lexical items, but a productive system need not be spreading in terms of speakers or phonological contexts. If some (hypothetical) rule forced the insertion of a schwa between every instance [ŋ] followed by, say, [z], that rule would be considered productive even if the context ([ŋ]#__#[z]) were very rare. In this sense, the NYC split system is productive, although it is not, to my knowledge, spreading among speakers or changing in its conditioning factors. For example, open syllables are not tense, but morphemes such as agentive *-er* close syllable boundaries (Labov 2007). Thus, the /a/ in the word *banner* meaning "large sign" is pronounced with the lax variant, but if *banner* is understood as "one who bans things," the /a/ is pronounced as tense. This obtains even for speakers who have never heard *banner* used in this sense before, indicating that these constraints on short-a realization are productive.
8. Of course, voiceless stops are a context for raising in the Northern Cities Shift, as pointed out by an anonymous reviewer.
9. The description in the preceding paragraph is mostly adapted from the original description in Irwin and Nagy (2007a).

10. Here, I follow the tradition of using the term *lax* in opposition to *tense*, so breaking and raising could be seen as two distinct kinds of tense variants. However, I do not provide any evidence for or against tenseness or laxness in any of the three variants. The relationship between phonological tensing and phonetic tensing is not always straightforward (Labov 1991), and the distinction does not affect the main points in this article.
11. F41's realization of *path* was somewhat distorted but also exhibited breaking. The use of *bath* for F41 and *path* for F24 makes for a clearer exposition.
12. Interestingly, an anonymous reviewer reports that *bad* is one of the lexical exceptions for tense short-a in Philadelphia.
13. The state divisions in Ferrie (2006a) are as follows. *Middle Atlantic*: New York, New Jersey, Pennsylvania; *East North Central*: Ohio, Indiana, Illinois, Michigan, Wisconsin; *West North Central*: Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas; *South Atlantic*: Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida; *East South Central*: Kentucky, Tennessee, Alabama, Mississippi; *West South Central*: Arkansas, Louisiana, Oklahoma, Texas; *Mountain*: Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada; *Pacific*: Washington, Oregon, California, Alaska, Hawai'i.
14. Adding the raw numbers in Table 9 in the decade of 1970–1980 does not reveal a population loss. There are two reasons for this. First, the data in Table 9 were obtained using the "survival rate" method of migration estimation, where an estimated mortality rate is taken into account. Presumably, Ilvento and Luloff (1982) were referring to raw data. Also, Ilvento and Luloff use the term *Northeast*, and based on their earlier work (Luloff & Ilvento 1981), this includes New York, New Jersey, and Pennsylvania as well. The general point in the text, however, is unaffected by these considerations.
15. This is only a rough approximation since the rule in Figure 10 attempts to capture some core properties of a complex variable system. I have left out, for example, voiceless stops and laterals since these had very low frequency of breaking. In addition, this does not capture the fact that short-a is never raised before [ŋ]. The text point would be the same, though, even if every minute detail were formalized: the breaking system has all the components of the nasal system and more.
16. Note that there is something resembling the phonemic split of the NYC split system in the data here. Breaking occurs mostly before voiceless fricatives and voiced stops, both of which are environments for tensing in the NYC system. In addition, speakers of this system have the added complexity of a variable system, where the NYC split system is more consistent.
17. See note 3.

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Bio

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