STABILITY AND CHANGE ALONG A DIALECT BOUNDARY:

THE LOW VOWELS OF SOUTHEASTERN NEW ENGLAND

Daniel Ezra Johnson

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William Labov, Dissertation Supervisor

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Eugene Buckley, Graduate Group Chair

This dissertation is dedicated to my parents:

Nicholas Johnson (3-D) and Susan Bienen Johnson (MAIN)

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ABSTRACT

STABILITY AND CHANGE ALONG A DIALECT BOUNDARY:

THE LOW VOWELS OF SOUTHEASTERN NEW ENGLAND

Daniel Ezra Johnson

Supervisor: William Labov

This dissertation focuses on the low vowels in the area between Boston MA and Providence RI. Providence has a low central /ah = o/ in *father* and *bother,* and a distinct raised back /oh/ in *daughter.* This will be called the Mid-Atlantic / Inland North system (MAIN). Boston has a fronter /ah/, and /o = oh/ merged in low back position: the Eastern New England system (ENE).

The 'geographic study' located the boundary between the two dialects by interviewing senior citizens and young adults in 40 communities. For the older group, there was a sharp boundary between the MAIN and ENE systems, generally matching colonial settlement patterns. Most young adults agreed with their senior citizen counterparts. Some were unclear or had merged all three categories, but in general, during the twentieth century, mergers did not "expand at the expense of distinctions.

In the 'family study', several MAIN communities which had appeared stable showed sudden /o/∼/oh/ merger among children. Interviews with families revealed this especially in South Attleboro MA (under 18 merged) and in Seekonk MA (under 10 merged). These age-based changes divided some families between siblings. Children initially acquire their parents' systems, then reorganize them upon forming peer groups, but are fairly stable from then on. To explain why the mergers happened in this order, the 'migration hypothesis' proposed that when a certain proportion of merged young children enter a peer group, those from distinct backgrounds abandon their distinction.

This hypothesis was evaluated with data from the U.S. Census and the 'school survey', which focused on the factors affecting individuals acquisition of the low vowels. A questionnaire was administered to some 1500 schoolchildren, and analyzed by mixed-model logistic regression. Subjects' histories consistently affected their responses. In ENE, students who had moved from MAIN areas – even years earlier – marked more /o/$\sim$/oh/ pairs "different" than natives did. And even for 12th graders, parents played an important role, if they were from other dialect areas. Mothers had a greater effect overall, especially on their daughters, while fathers' smaller effect was primarily on their sons.

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Chapter 1

Vowel Merger

1.1 Introduction

This dissertation deals with questions of dialect geography, acquisition, stability and change. The specific linguistic features used to examine these topics are the low vowels of southeastern New England (Massachusetts and Rhode Island). As these low vowel word classes – /ah/ as in *father,* /o/ as in *bother,* and /oh/ as in *daughter* – display several possible mergers, a review is in order of the nature, mechanisms, and causes of vowel merger.

Standard textbooks of historical linguistics do not make a theoretical distinction between mergers of consonants and of vowels (Hock 1986; Campbell 2004: 21). Nor, taking as they do a longer-scale temporal perspective, do they distinguish between the different mechanisms by which similar phonemes sometimes fall together as the same sound, thus producing a merger of two word classes, and almost always creating homonymy between pairs of previously distinct words.

The vowels have been less stable than the consonants in the modern periods of some well-studied languages – English, French, German, and Yiddish, for example – and the vocalic changes in the standard languages are exceeded by the multitudinous developments in their dialects. These have provided many classic examples of vowel mergers, and perhaps revealed particularities that have elevated their study into a separate one from investigations into the merger of consonants.

A general reason offered for why phonemes should not merge, or do not always do so, is *functional* in nature: the homonymy created by merger would presumably make comprehension of a language more difficult, thus hindering communication. On the other hand, the relative ease of pronouncing a language with fewer speech sounds could constitute a functional argument in favor of merger.[1]

But there is little clear evidence that such functional factors are in play. Certainly, in the history of Greek, there has been a tremendous amount of vowel merger, and consequent loss of contrast between words. Through fronting, raising, unrounding, and the loss of glides and length distinctions, nine distinct phonemes of Ancient Greek[2] – $\breve{\iota}$ /i/, $\bar{\iota}$ /iː/, $\epsilon\iota$ /eː/, η /ɛː/, $\bar{\alpha}$ /aː/, $o\iota$ /oi/, $\upsilon\iota$ /yi/, $\breve{\upsilon}$ /y<u/, $\bar{\upsilon}$ /yː<uː/ – eventually all merged as Modern Greek /i/, in "the most spectacular example" of multiple merger into a single target (Labov 1994: 229).

The Greek example was of several processes happening at different points in time, aided by the fact that general principles of vowel shifting (Labov 1994: 116) make the high front monophthong /i/ a point of stability.[3]

In other cases, multiple vowel merger can occur as a single process, as the result of a single cause. For example, when the Classical Latin system of distinctive vowel length collapsed in the transition to Vulgar Latin, regular mergers took place in all varieties, though their number and location differed by geographical area, as shown in Table 1.1 Hall (1950); Leonard (1978).

Though the details of these two- and three-way Vulgar Latin vowel mergers are differ-

[1] The tension is between the communicative function(s) of language (Jakobson 1960), and a version of the principle of least effort (Bloomfield 1933; Zipf 1949).

[2] Note that the diacritics used to indicate long and short vowels were not used in ancient times.

[3] There are no length contrasts in the Modern Greek vowel system, so /i/ is neither properly short, and so liable to falling, nor long, and so susceptible to diphthongization and falling of the nucleus (Labov 1994).

CLASSICAL LATIN	WESTERN ROMANCE	ROMANIAN	SICILIAN	SARDINIAN
iː	i	i	i	i
i̞	e	e	i	i
eː	e	e	i	e
e̞	ɛ	ɛ	e	e
a	a	a	a	a
aː	a	a	a	a
o̞	ɔ	o	o	o
oː	o	o	u	o
u̞	o	u	u	u
uː	u	u	u	u
10 distinct vowels	7 distinct vowels	6 d.v.	5 d.v.	5 d.v.

Table 1.1: Vulgar Latin mergers following loss of Classical Latin vowel length

ent, they were all caused by the fact that after the loss of Classical Latin's distinctive vowel length, there were simply too many vowels (both front and back), in too small a phonetic space, for them all to remain distinct.[4]

Thinking about vowels in terms of their position and potential *crowding* in a kind of space – related, but not exactly equivalent, to the physical space available for the tongue's movements in the mouth – is due to the work of Martinet (1955). This is also a functional approach, one that focuses on the constraints on vowel production for the speaker, as well as ease of comprehension for the hearer.

For Martinet, many vowel shifts – especially *chain shifts,* which involve several vowels at once – are seen as a way of avoiding merger and its functional consequences. From this point of view, the many mergers that do nevertheless occur are exceptional (Labov 1994: 266). However, another fundamental principle according to Martinet is the pressure to achieve *symmetry* in phonological (sub)systems. In many cases, this desire for symmetry can be fulfilled by vowel merger. And sometimes, a merger not only creates a more

[4]Merger was not the only option, however. Boston MA, for example, has six distinct front vowel phonemes with approximately the following phonetics: [ɩi], [ɩ], [ɛi], [ɛ], [æ], [aː]. In this case, a tense/lax distinction, accompanied by diphthongization, serves to keep the vowels apart. In the Vulgar Latin case(s), on the other hand, mergers were the result.

symmetrical system, but relieves articulatory crowding at the same time.

Most, if not all, of the vowel mergers mentioned above are of the type known as *merger-by-approximation* (Trudgill and Foxcroft 1978). These are regular sound changes which occur below the level of conscious awareness. They are *lexically abrupt,* affecting all members of the relevant word classes at the same time, and phonetically gradual. In the terms of (Guy 1990), these are “spontaneous”, “internally induced” changes, which stem from language-internal pressures such as those mentioned above.

In merger-by-approximation, two vowels can move toward each other, ending up merged in an intermediate phonetic position, or one can move while the other remains in place, resulting in a merger with the quality of the stationary vowel (Labov 1994: 321).[5]

Although the outcome may be the same, and even indistinguishable after the fact, a quite different mechanism of merger is *merger-by-transfer,* a term that was also introduced by Trudgill and Foxcroft (1978). Here, the primary cause is contact with another variety of the language, and the change occurs above the level of conscious awareness (Labov 1994: 321). In short, it is a type of “borrowing” (Guy 1990). The merger proceeds gradually through the relevant subset of the lexicon (lexical diffusion), but is phonetically abrupt: no intermediate, approximate phonetic forms are observed.[6]

1.2 Merger-by-expansion: Herold (1990)

A third mechanism of merger was proposed in the detailed investigation of Herold (1990). As it is the most relevant for the findings of subsequent chapters, this work will be described in depth. Herold discovered an area of low back merger – of the /o/ in *cot* and the /oh/ in *caught* – that was previously unknown, in northeast Pennsylvania. Along with documenting

[5] In the Greek example, /i/ stayed put while numerous other vowels approximated and then merged with it, over a period of many centuries.

[6] In Boston, an example of transfer is the replacement of ‘broad-*a*’ words by the mainstream ‘short-*a*’. The word [ask] could be replaced by [æsk], without intermediate stages; [haf] and [kant] may remain unaffected.

it, she convincingly attributed its origin to a period of heavy foreign immigration.

Specifically, foreigners who came to work in the local anthracite coal-mining industry failed to acquire the low back distinction from the native population, who were in a minority. The immigrants' numbers were great enough that they passed the merger on to their children, and the children of natives adopted it as well, making it general in mining towns.[7]

This process happened – apparently independently – in most of the anthracite mining towns, one of which Herold studied in particular detail: Tamaqua PA, population 8000. Interviewing some thirty natives of that town, Herold found that speakers 74 and older (in 1988) maintained the low back distinction, while speakers younger than 65 had lost it.

Under the simplest apparent-time interpretation, merger occurred community-wide *circa* 1920, and was complete in no more than ten years' time. Figure 1.1 shows the ten speakers acoustically analyzed in Tamaqua, who span the entire age range of the population.

Herold developed the following theory of individual development to accompany this community-level observation of rapid change. When speakers with the distinction interact with those with the merger, those with the distinction stop relying on it to distinguish words, since the usual phonetic cues are useless (or worse) in the speech of their merged interlocutors.[8] And before long, they stop producing the distinction as well.

Herold noted that after this mechanism had ostensibly been at work, the acoustic range of the merged phoneme of the younger Tamaqua speakers was very wide. The combined vowel ranged phonetically over the combined ranges of both original phonemes.

Such an outcome would not have resulted from either of two previously attested merger types: not if one of the two sounds had gradually encroached on the other until complete

[7]The period of heaviest immigration was at the beginning of the early 20th century, and a large proportion of the foreign miners were from Slavic-speaking countries. Herold suggests that this Slavic connection is possibly relevant to the merger, but acknowledges that few European immigrants of any language background would have had something similar to the low back vowel distinction in their first languages.

[8]"...a distinction ceases to be useful for making semantic distinctions when one is in contact with people who do not reliably produce it. The truth of this proposition is obvious..." (Herold 1990: 92).

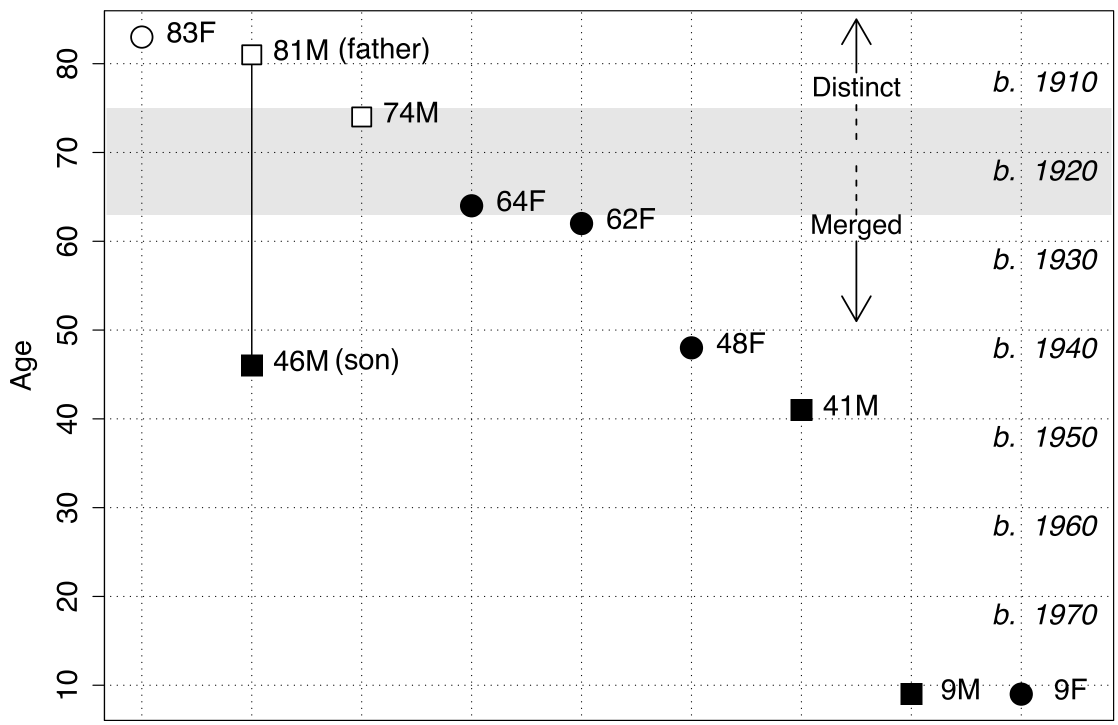

Figure 1.1: Low back vowel status of ten natives of Tamaqua PA; unfilled symbols: /o/≠/oh/; filled symbols: /o=oh/; circles: females; squares: males (from Herold 1990)

overlap occurred (merger-by-approximation) nor if items from one category had jumped to the other category one by one (merger-by-transfer).

Herold coined the term *merger-by-expansion* to describe the type of change seen in Tamaqua, and most likely in other similar communities nearby. It was considered a *change from below* (i.e. from below the level of conscious awareness), unlike merger-by-transfer, and it was phonetically abrupt, unlike the gradual merger-by-approximation. Since people who did not speak the local variety natively were crucial in the genesis of the change, it belongs under "imposition" in the typology of Guy (1990).

Figure 1.2 displays the vowels of a Tamaqua father and son (aged 81 and 46), who display the distinct and merged patterns, respectively.[9] Their similar vocal tract dimensions makes the comparison of formant plots on the same scale possible. Note that the original /o/ and /oh/ clouds were not far separated even before the change, but are clearly completely intermingled afterward.[10]

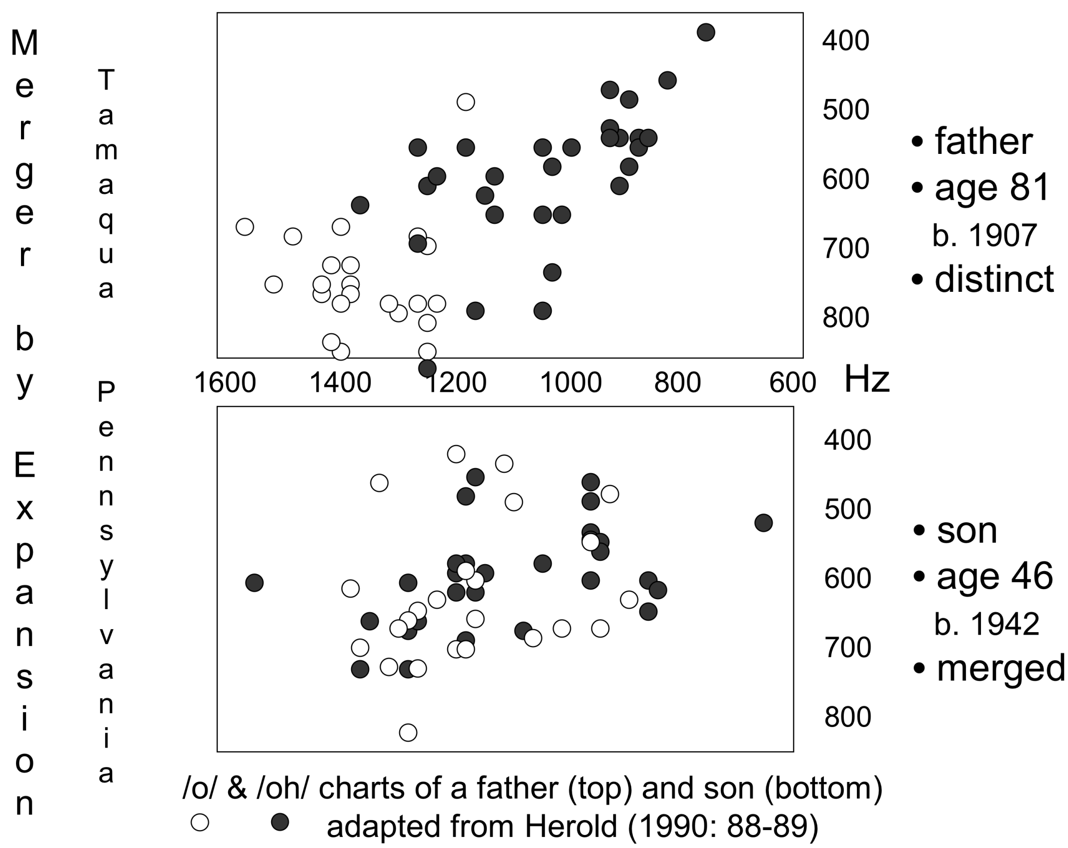

Figure 1.2

Despite the achievements of this analysis, several things raise questions for it. The first

[9]On Figure 1.1, the symbols for this father and son are aligned vertically, a convention that will be followed for members of the same family on subsequent plots.

[10]It is probably also fair to say that the most extreme phonetic positions of the original phonemes are no longer being used by the merged vowel. Herold does not label the tokens, making a discussion of the changing influence of phonetic environment impossible.

is that in some non-mining communities surveyed by Herold, younger speakers (mainly those born after 1960) also display the low back merger. So without the same cause – heavy foreign immigration – these places now display the same effect.

While it is easy enough to propose that the merger has recently spread from the mining towns to the non-mining towns, this sets up a tale of two eras, one of independent foreign-triggered mergers in mining towns, giving way to another of merger spread from mining towns to non-mining towns.

To her credit, Herold provides some demographic support for the more recent shift:

> That the merger is beginning to spread to nonmining towns in the anthracite region is not surprising: many natives of towns that were economically self-sufficient before the demise of the anthracite industry [around mid-century] must now work and/or live in nonmining towns. (Herold 1997: 188)

Herold usually refers to "people" or "speakers" in contact, but I am proposing that it was specifically the *children* of such outmovers from mining towns, growing up in non-mining towns – their parents merged, their peers mainly unmerged – who had sufficient influence and numbers to spread the merger generally to those communities (Herold 1990: 91-99).

Seeing children as the agents of change is crucial, even apart from these issues of migration and spread, because of a neglected aspect of the situation in places like Tamaqua.

To review, Herold found all Tamaquans born before 1920 to be distinct and all those born afterward to be merged. Because of this, the merger is said to have been "completed within a single generation" (Herold 1997: 185).

But such a 'completed' change actually left the community divided, not unified. Although the circumstances triggering merger apparently fell into place around 1920, they did not affect people who had by then already acquired the distinction. Nor have years of subsequent contact with younger speakers – such as the 40-plus years the distinct father, introduced above, has presumably talked to his merged son – had any noticeable effect.

Herold never specifies that it is mainly children who participate in the merger-by-expansion mechanism she outlines. But by proposing that it is, we resolve the tension between merger as something that spreads readily – among young enough speakers within mining towns, and in later decades to non-mining towns – and the same merger as something that does not spread at all, regardless of heavy contact, such as from younger to older speakers in mining towns like Tamaqua.

The revised proposal is that children from a distinct linguistic background are susceptible to abandoning their distinction upon exposure to (enough) merged speakers, thus undergoing merger-by-expansion. Older people, perhaps all those who have already acquired a vowel distinction before they encounter significant evidence of merger, will likely retain the distinct pattern for their entire lives.[11]

1.3 Fundamental principles of merger: Garde (1961) and Herzog (1965)

One of the most well-known and important statements about mergers is known as Garde's Principle: "mergers are irreversible by linguistic means" (Labov 1994: 311). This is Labov's generalization based on Garde's statement, "Si deux mots ont été rendus identiques par un changement phonétique quelconque, ils ne peuvent plus jamais devenir différents par voie phonétique"[12] (Garde 1961: 38-9).

If it is true that homonymy between a single pair of words is irreversible, then the merger of word classes must be at least as much so, leading Labov to state that "once

[11]We should be careful to distinguish between merger-by-expansion itself and the proposal that it is triggered by misunderstandings and other communicative difficulties from the point of view of distinct speakers. While the latter hypothesis is logical and appealing, Herold (1990) does not test it directly. Indeed, it is not clear if children experience these difficulties (Labov, p.c.).

[12]"If two words have been made identical by some phonetic change, they can never become different by a phonetic route."

two word classes have merged, they cannot be distinguished by any linguistic process" (Labov 1994: 144). This means that once a speech community has completely merged two historically-distinct word classes, the usual subconscious processes of sound change will not separate them later.

Many apparent exceptions to Garde's Principle are built into its formulation.[13] When two word classes appear to be merged, but are actually not, their later separation is no threat to the principle. The reversal of several cases of falsely-believed merger is discussed in Herold (1990: Ch. 4) and Labov (1994: Ch. 10).

A less commonly attested situation is where a true merger *is* reversed, but the reversal does not occur 'by linguistic means'. So if the population of a speech community were drastically disrupted by large-scale immigration (or even invasion), the outcome could be a variety that distinguished two phonemes which the original variety did not.[14]

If less drastic forms of dialect contact, and/or the influence of prestigious norms, were to reverse a merger in a speech community, it would hardly be fair to call it a reversal by non-linguistic means, since such processes are entirely normal and operate in most communities at most times. But Garde makes it clear that this is the type of reversibility he has in mind: "Si l'on rencontre des exceptions à cette irréversibilité, ce ne peut être que dans le cas de la forte influence d'une langue littéraire sur un parler"[15] (Garde 1961: 39).

It may be that Garde's phrase "par voie phonétique" is best translated as "by sound change", with that term undersood as the Neogrammarian type of change from below. A type of change that is blind to everything but phonetics seemingly could not affect each member of a pair of homonyms differently.

[13]This is reminiscent of the famous Neogrammarian statement: "Every sound change, inasmuch as it occurs mechanically, takes place according to laws that admit no exception" (Osthoff and Brugmann 1878, translated in Lehmann 1967: 204, quoted in Labov 1994: 422). As Labov notes, the phrase "inasmuch as it proceeds mechanically" excludes the important types of exceptions to the law: analogy and borrowing.

[14]In this extreme case, the new population might be considered a different speech community, anyway.

[15]"If we do find exceptions to this irreversibility, it can only be in the case of the strong influence of a literary language on a local dialect."

Although we are not in the realm of morphology or syntax (Labov 1994: 311), translating "phonétique" as broadly as "linguistic" may be misleading, because changes from above with the potential to reverse a merger, "favorisés par l'école et l'orthographe",[16] at least in the several Slavic examples given by Garde, are still linguistic in nature.

An approximation in English of the reversal of a merger – whether or not we wish to call it an exception to Garde's Principle – is the separation of /ʌ/ and /ʊ/ in parts of northern England. One of the premier shibboleths of Northern speech, the merger has huge social significance, and apparently it is on the retreat. The merger once reached closer to London, but "the southern six-vowel system is gradually spreading northwards [at the expense of the northern system of five short vowels]" (Trudgill 1986: 29).[17]

A recent investigation of the speech of Charleston SC (Baranowski 2006) has revealed the reversal of a *conditioned merger,* one where two or more vowels fall together, but only in certain phonetic environments.[18] In Charleston, /iyr/ as in *beer,* and /eyr/ as in *bear* were pronounced alike by older speakers, but distinguished starting around the time of WWII.

Noting that the case "appears to be a counterexample to the generalization about mergers known as Garde's Principle" (120), Baranowski first considers that perhaps the sounds were never truly merged, making their later separation much less problematic. However, some speakers do show a complete merger under acoustic analysis. A second suggestion is that the change happened through "extra-linguistic means" (120), namely the in-migration of many people bearing the standard distinction between /iyr/ and /eyr/. But it is noted that

[16]"favored by school and spelling"

[17]However, in this case the five-vowel northern system had never really undergone a merger, but had rather failed to undergo the split which had created the southern six-vowel system centuries earlier. For an individual, learning this split is equivalent to reversing a merger. Such an un-merging is possible for speakers who grew up in northern England and then moved to the south (Sankoff 2004). A study in the transition zone between the two regions of England, Britain (2002), has shown the development of an intermediate phonetic form in /ʌ/-words, but does not deal with the evolution from a phonological point of view.

[18]The confounding in many American dialects among *Mary, marry,* and *merry* is a good example of conditioned merger, in this case before intervocalic /r/. The same logic would make conditioned mergers just as irreversible as unconditioned mergers of entire phonemes.

the chronology does not quite line up, as the merger seems to have begun reversing itself a decade or more before a large number of migrants arrived (Baranowski 2006: 121).

Regardless of these possible exceptions, we note that the irreversibility of merger within a speech community would arise naturally enough from the great difficulty *individuals* have acquiring distinctions (Kerswill 1996). If only the rare individual separates a merged word class when exposed to the opposition, then presumably the opposition would never take hold community-wide, barring truly massive demographic change.[19]

Garde's principle of the irreversibility of merger within the community leads easily to Herzog's Principle, which has been called a corollary to it: "mergers expand at the expense of distinctions" (Labov 1994: 313). Indeed, Herzog's original formulation – "if no extra-linguistic factors interfere, only the merger can expand geographically at the expense of the differentiation" (Herzog 1965: 211) – is not meant as more than a summary of Garde.

Labov's formulation of the principle seems to imply that a merger *will* expand at the expense of an adjacent distinction. Herzog himself is more circumspect, saying that "only the merger *can* expand". Garde is even more agnostic, concerning the isogloss between a distinction in Russian and a merger in Ukrainian: "l'isoglosse limitant cette homonymie n'a pu se déplacer dans le passé que sur le territoire de l'Ukraine; *dans l'avenir, elle peut rester immobile,* mais, si elle se déplace, ce ne peut être que sur le territoire de la Russie"[20] (Garde 1961: 39; italics mine).

So there is agreement that the isogloss or limit of merger will not retreat; the merged territory will not contract. This follows directly from Garde's Principle, because such a movement could only happen by the reversal of the merger. This implies that for a community with a merger, contact with an adjacent community with the distinction will

[19]Note, however, that this account is naive as to the relative importance of different groups within the community – particularly children – with respect to the propagation of linguistic change.

[20]"the isogloss that is the limit of this merger could not have shifted in the past except from Ukraine; in the future, it may remain stable, but if it shifts, it can only shift towards Russia"

have no effect. But there may be an effect in the opposite direction, whereby the merger spreads to the formerly-distinct community. If this happens repeatedly along the length of the isogloss, the entire area of merger will expand.

The question of when mergers can be expected to spread in this contagious manner, as opposed to "remaining motionless", is a matter of some disagreement. For Herzog, "the most significant linguistic factor to limit [the] diffusion [of a change] is the nature of the phonological system with which it comes into contact. If changes emanating from opposite directions are structurally compatible they may overlap..." (Herzog 1965: 211).[21]

Herzog's premier example of such overlapping mergers is in Yiddish, where the loss of vowel length in the Northeastern dialect – /i = iː/, /u = uː/ (Herzog 1965: 167) – converges with the fronting and unrounding of high back vowels in the Central dialect – /u = i/, /uː = iː/ (197). Each process caused merger in its own area, and the two overlapped in the intermediate North Central zone, where only one vowel remains of the original four: /i/. Apparently, these two changes were 'structurally compatible', although this concept is left fairly vaguely defined. The New England mergers discussed below may be less compatible.

For Garde, studying the differences between the Slavic languages (rather than dialects within them), there is less of an expectation that mergers will spread and overlap each other. Instead, he finds that "sur chaque frontière linguistique important paraissent courir des isoglosses distinctives *de sens contraire,* c-à-d. que la limite d'un groupe d'homonymies réalisées d'un côté de la frontière correspond à la limite d'un autre groupe d'homonymies réalisées de l'autre côté" [22] (Garde 1961: 58; italics original).

It is clear that Garde does not simply view this 'equilibrium' as a matter of waves of change stopping at the boundary of structurally incompatible areas. He ultimately attributes

[21] Herzog continues: "...with the result that a third system will emerge which may, in turn, determine the fate of the two adjoining systems, provided all three remain in relatively unimpeded contact."

[22] "along every important linguistic boundary run distinctive isoglosses oriented in opposite directions; that is, the limit of a group of mergers that have occurred on one side of the boundary corresponds to the limit of another group of mergers that have occurred on the other side"

the bundling of oppositely-oriented isoglosses of merger[23] to “résistance à l’homonymie, autrement dit le besoin de clarté”[25] (Garde 1961: 62), noting that the mergers on one side of a boundary are compensated for by a different group of mergers on the other side.[26]

For example, Garde notes that Polish and Lusatian (Sorbian) are the most conservative Slavic languages in terms of their segmental phonology, but have conversely undergone the most simplification of their prosodic systems (accent and intonation). But if it were true that two changes like the loss of distinctive syllable accent, spreading from the Polish territory, and the simplification of /tl/ and /dl/ clusters, spreading from the Russian territory, stopped where they met to form part of an isogloss bundle – eventually a language boundary – this could hardly be attributed to structural incompatibility between the two changes, because they are completely unrelated. The equilibrium of distinctions suggested by Garde, if valid, must operate on a higher level.[27]

In both these views, especially Garde’s, there is an assumption that the reason an isogloss is found in a certain position is that it spread there from somewhere else. While this is certainly justified when it is known that the isogloss was in a different position at an earlier time, the assumption may be overused. Especially when a common settlement history underlies a dialect area, we should consider the possibility of parallel internal developments, even if the mechanism that enables them is not well understood.[28]

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[23]The bundling of structural isoglosses is opposed to the isoglosses limiting non-phonemic changes, which “passent n’importe où”[24] (Garde 1961: 62).

[25]“resistance to merger, otherwise known as the desire for clarity”

[26]This seems to imply that more than a certain number of mergers is unacceptable to dialects, so they refuse to accept any of Group A if they already have enough of Group B. This particular part of Garde’s argument does not seem well thought-out.

[27]Indeed, Garde stresses the importance of the consciousness of the speakers of two neighboring languages or dialects. The perception of difference may block the spread of change, regardless of true structural incompatibility. Boberg (2000) considers this among several factors accounting for the surprising non-influence of Detroit speech on the neighboring Canadian city of Windsor, although he ultimately relies most on a version of structural incompatibility.

[28]I mean to raise a question that goes beyond the related issue of the *Stammbaum* vs. wave theories of language change. Neither of these perspectives stresses the possibility of parallel innovations within a dialect or language that are independent of contact between communities.

Whether a merger affects a place by spreading to it from an adjacent place (*contagious diffusion;* Hägerstrand 1953), by the longer-distance influence of some populous center (*hierarchical diffusion;* ibid.), or by parallel, internal, structurally-motivated evolution, the question still arises as to why it occurs there when it does.

Why mergers affect speech communities when they do – sometimes fairly suddenly, and under circumstances which seem quite similar to ones associated with vowel system stability in previous generations – is a difficult question. As we shall see, what look like stable boundaries between speech communities can collapse; individuals with distinct parents and older siblings can grow up merged.

1.4 Selected studies of low back merger in the United States

In the United States, the early *Linguistic Atlas* projects identified two areas where /o/ and /oh/ – the vowels of *cot* and *caught,* respectively – were merged: eastern New England and western Pennsylvania (Kurath and McDavid 1961). These areas are structurally different, though, in that the eastern New England area has a distinct /ah/ vowel, as in *ca(r)t,* while the three original low vowels are all merged as one in western Pennsylvania.[29]

A survey of long-distance telephone operators conducted by Labov in 1966 yielded a national picture of the low back vowels that confirmed the merger in eastern New England, the details of which will be discussed in Chapter 2 (Labov 1991; Labov *et al.* 2006). The western Pennsylvania merger was found to extend further east in that state, as well as into Ohio to the west.[30] More significantly perhaps, a vast area of merger was revealed in the western United States, including the Great Plains but excluding San Francisco and Los

[29] In general, references to 'the low back merger' or 'the merger of /o/ and /oh/' should be understood to include /ah/ as well, unless the reference is to eastern New England. And the term 'low vowel' is always to be understood to exclude /ae/.

[30] However, the area covered by Kurath and McDavid (1961) barely extended into Ohio, so the earlier study could not have shown merger there.

Angeles, where the distinction was still prevalent.[31]

Many local studies have since been conducted in areas near the edges of this western area of low back merger, and they almost uniformly report the expansion of the merger. Terrell (1976) interviewed more than a hundred children and teenagers in Orange County CA (near Los Angeles) and found none of the natives had a /o/∼/oh/ contrast,[32] and that few of the non-natives did.[33] Many who had moved from areas of distinction had apparently acquired the merger, "most in less than two years" in California (Terrell 1976: 355).[34]

The state of Minnesota was on the eastern edge of the western merged area, and Allen (1976) anecdotally reports the expansion of the merger there: "During the past thirty years I have observed in my classes at the University of Minnesota a steadily increasing proportion of students who have no low-back rounded vowel except before /r/ . . . and hence lack any distinction between, for example, *caller* and *collar, tot* and *taught,* and *don* and *dawn*" (Allen 1976: 24, quoted in Wells 1982: 475).

Lusk (1976) is another report of similar vintage in which younger speakers are more merged, in this case in Kansas City, right on the telephone survey's merger boundary. As summarized in Majors (2005: 165), Lusk found that "the speech of most subjects from Kansas City born after 1956 is characterized by the low back vowel merger, but the merger is largely absent from the oldest segment of the population."

And Gordon (2006) finds that the low back merger is not limited to Kansas City at the western edge of Missouri, but is in progress among younger speakers in most parts of that

[31] The telephone survey elicited the low back vowels in *Hock* and *Hawk.* Later work would show that the environment before /k/ is one that disfavors the merger (Labov *et al.* 2006: 65).

[32] This was among white subjects. The black informants, native and non-native, all retained the distinction. Fridland (2004) reports a similar difference. In general, the speakers being reviewed in this section are white.

[33] Only 2 of 36 non-native informants (6%) were said to "contrast", but an additional 11 (36%) sometimes used rounded allophones in contrastive contexts (minimal pairs, it appears). The presentation is somewhat unclear, but it does seem that Terrell was able to observe a group of children in transition from their original two-phoneme system, to the one-phoneme system of their native peers.

[34] For example, a boy who had moved from New Jersey at the age of ten, and when interviewed three years later "was completely indistinguishable from native Californians by his speech" (Terrell 1976: 354).

state. Only the area around St. Louis, in the east, retains the distinction.[35]

Bailey *et al.* (1993) is a study covering all of Oklahoma, another state divided by the eastern boundary of the western merged area. Comparing speakers born before and after 1945, Bailey *et al.* show that the low back merger has diffused hierarchically. In the older group, substantial merger is mainly restricted to Oklahoma City and Tulsa, the largest cities in the state, while in the younger group it has spread to most parts of Oklahoma, except those areas "far removed from major metropolitan centers" (Bailey *et al.* 1993: 370).[36]

All of the above instances of merger proceed phonetically by the unrounding of /oh/, so that the merged vowel is approximately [ɑ].[37] Though geographically distant, yet another report of the same phenomenon comes from Charleston SC, where "speakers over 50 almost uniformly distinguish between *cot* and *caught,* whereas for speakers below that age, the merger progresses at a fast rate. For children and teenagers, then, the two phonemes are almost completely merged." (Baranowski 2006: 123).[38]

A recent publication (Irons 2007) deals with the complex situation found in Kentucky, a state located fairly far from the western merged area, but only separated from western Pennsylvania by West Virginia – and, as will be seen in §1.5, the low back merger is now found throughout West Virginia.

[35]As reviewed in (Labov *et al.* 2006: Ch. 19.5), the dialect of St. Louis has in many respects departed from its Midland origins and become more like an Inland North dialect. As such, it participates to some extent in the Northern Cities Shift, fronting /o/ to a degree that essentially precludes the low back merger.

[36]Other studies documenting the merger on the West Coast are Metcalf (1972) in Southern California and Mills (1980) in the Pacific Northwest. Others finding the advancement or spread of the merger are Bailey *et al.* (1991) in Texas and Fridland (1998) in Memphis TN, a city further from the known boundary of merger. These references, among others, are found in the review of the low back merger in Thomas (2001: 26-27).

[37]On the other hand, the earlier mergers in eastern New England (/o = oh/) and in Canada and western Pennsylvania (/ah = o = oh/) resulted in merged vowels that are noticeably rounded, roughly [ɒ]. I have also observed rounded phones in Northern California, at least in some phonetic environments.

[38]Baranowski (2006: 125) also notes that all social class groups in Charleston, as well as both men and women, are progressing towards merger in parallel. To explain this, though, it is not enough to say that mergers take place below the level of conscious awareness, although they almost certainly do. Typical phonetic changes from below are led by women and originate in the interior socioeconomic classes (Labov 2001). If mergers in progress tend to escape such gender and class differentiation, as they seem to do, it may be that these phonological restructurings occur, in some sense, *even further below* the level of conscious awareness than other changes such as vowel raising, fronting, etc.

Some decades ago, the low back distinction was found throughout Kentucky, although it took on a different character in the southern and eastern parts of the state, where /oh/ was pronounced [ɑɔ] or even [ao], with a back upglide characteristic of the South, rather than a monophthong or ingliding diphthong. For speakers with this type of /oh/, it is often the presence of the glide alone that distinguishes it from /o/, as the vowel nuclei are identical.

To summarize Irons (2007), there are now three different patterns found in Kentucky. In the area around Louisville, the distinction is intact, although it is not clear why this should be the case. Near Lexington and in northeastern part of the state, where major transportation corridors connect to West Virginia, merger is found, and this is viewed as an unsurprising expansion of the merged area to the east. But in most other parts of Kentucky, as well, at least some younger speakers show total merger, despite older members of the same communities exhibiting the distinction with the back upgliding /oh/.

Irons (2007) offers two lines of argument that the low back merger observed in these communities is not an expansion of the Pennsylvania-West Virginia merger. One, which appears less convincing, is that it must be a different process – *merger by glide loss* – because of its phonetics. This might be more defensible if there were a more general process of glide loss in the variety, or if intermediate stages of glide loss were observed. Put simply, prior to the change, these communities showed a back upgliding /oh/, so there is no way merger could have occurred *without* glide loss. From a theoretical perspective, then, the sudden merger in Kentucky does not seem different from Herold's merger-by-expansion, although that term does imply an expansion in phonetic space that would not even be expected in Kentucky, where the vowel nuclei were already the same. But the observation that "the geographic patterns in the distribution of the merger across the state do not follow general predictions of a standard model for the diffusion of linguistic innovation and change" (Irons 2007: 165-166) is much more pointed. Most areas where glide loss was found have low population densities and are far from major transportation routes, which challenges traditional explanations involving either contagious or hierarchical diffusion.[39]

1.5 A comprehensive look at merger: Labov *et al.* (2006)

The publication of the *Atlas of North American English,* abbreviated *ANAE* (Labov *et al.* 2006), considerably advanced the understanding of the geographic distribution of the low back merger and its dynamics in the United States.[40] Based on telephone interviews with 762 speakers, it traces anew the boundaries of the three main areas of low back merger: eastern New England, western Pennsylvania, and the West. Of these three, the merger in the West is still in progress; that is, not all speakers in the area exhibit it.[41] And the 'western Pennsylvania' area was seen to now include West Virginia and adjacent parts of Kentucky (Labov *et al.* 2006: 59).

The merger was found to be most advanced in the environment before /n/ (*Don*∼*dawn*), and least advanced in the environment before /k/ (*sock*∼*talk*).[42] A fair number of speakers, particularly in the South, showed the merger only before /n/. However, these speakers were not clustered geographically in a way that would suggest that the merger expands *spatially* on an environment-by-environment basis (ibid.).

Although the major dialect areas were not defined on the basis of the low back merger,

[39]While the same explanation may not hold everywhere, merger via the loss of the /oh/ upglide has been reported more widely in the South. Feagin (1993) reported it among middle-class younger speakers in Anniston AL, in the heart of the Southern dialect area. The merger was also observed in Roswell GA (an outer suburb north of Atlanta), where Anderson (2005) attributed it to heavy in-migration from other dialect areas. But in Griffin GA (further from Atlanta, and to the south), McNair (2005) finds glide loss *without merger* among younger speakers, casting further doubt on the concept of 'merger by glide loss'.

[40]The low back merger is essentially complete throughout all of Canada. Why Canadian English developed this way is an interesting question, though beyond the scope of this work. In fact, one rarely reads speculations on why a particular area developed the merger, while another did not. Perhaps the Scotch-Irish element in western Pennsylvania, or the generally dialectally-mixed settlement history of the West (and Canada?), contributed to eventual merger. Eastern New England may be the most puzzling case; see Chapter 2.

[41]The eastern New England merger is also said to be "progressing toward completion" (Labov *et al.* 2006: 59). This somewhat conflicts with data to be presented in Chapter 4, where most eastern New England informants of all ages showed a total /o/∼/oh/ merger.

[42]The other pairs elicited were *hot*∼*caught* and *dollar*∼*caller.*

each one was unified in its behavior with respect to it. The South and Midland are outside the isogloss of regular low back merger, but the merger is in progress in both areas, even if the progress is only a change (in producing and/or labeling the pairs) from "different" to "close", not "same". In the Mid-Atlantic and Inland North, characterized by a raised /oh/ and a fronted /o/, respectively, complete maintenance of the distinction is not universal, but it is widespread, with no sign of progress toward the merger in apparent time (ibid.).

ANAE compared the production results – whether the analyst judged the /o/ and /oh/ vowels of a pair to be the same – with the perception results – whether subjects thought the words sounded the same (or rhymed). In most cases, the two agreed with each other. Within the areas of general merger, among speakers who deviated from this norm, it was equally common for production to lead perception as vice versa. But in the transitional and mainly-distinct dialect areas, it was about three times as common for perception to lead production: in the extreme case, for a speaker to pronounce a pair clearly differently but judge it to be the same (Labov *et al.* 2006: 62).

The speakers whose perceptions led their productions were concentrated in the areas where merger is an active process, which include parts of the West and South, and essentially the entire Midland dialect area.

The Midland cities of Indianapolis and Columbus OH were examined in particular detail. Indianapolis showed a transition whereby two of five speakers aged 40-49 were fully distinct – in both perception and production, on all four pairs – while one of three aged 10-19 was fully merged. Eleven others were transitional in one way or another.[43]

In Columbus, only one speaker in her sixties was fully distinct, while another fourteen speakers, the youngest three being in their twenties, all showed an intermediate pattern. In both cities, *Don*∼*dawn* favored the merger and *sock*∼*talk* the distinction. There was no overall difference between men and women, and perception led production four to one

[43] In nearby Cincinnati OH, Boberg and Strassel (1995) had found a similar pattern of change.

among asymmetrical subjects (Labov *et al.* 2006: 64).[44]

With respect to the earlier attempts to map the merger – *PEAS* (Kurath and McDavid 1961) and Labov's 1966 telephone survey – the data of *ANAE* serve to correct or update the picture, though it is not always clear which. The report in *PEAS* of the merger being found in Rhode Island will be discussed extensively in Chapter 2; *ANAE* finds the distinction in Providence. The expansion from western Pennsylvania into West Virginia and Kentucky has been mentioned (Labov *et al.* 2006; Irons 2007), but the telephone survey showed it having expanded east and west into central Pennsylvania and much of northern Ohio; *ANAE* finds the distinction in these areas. Rather than suggesting an actual retreat of the merger, it may be that the larger *ANAE* sample is more trustworthy than the smaller selection of telephone operators.[45]

Another area where *ANAE* shows less expansion of the merger than might have been expected is in the Upper Midwest. In fact, the eastern boundary of the western merged area is further *west* according to *ANAE* than it was in the telephone survey, in Minnesota, South Dakota, and Nebraska. This mismatch is puzzling, and (Labov *et al.* 2006) do not offer an explanation, nor do they emphasize this as an apparent reversal of Herzog's Principle. It is at least clear, though, that the merger has not expanded to the east.

Summarizing the research on the low back merger, we find that in the dialect areas where it was already characteristic – eastern New England, western Pennsylvania, and the West – it has continued towards completion, and in the case of western Pennsylvania, expanded into an adjacent area of the Midland with which it already had much in common.

[44] *ANAE* adopts Herold's explanation (see §1.2) that originally-distinct speakers, when they communicate with merged ones, find their distinction counterproductive and stop relying on it in perception, perhaps eventually abandoning it in production as well. But clearly, in the Midland at least, communities are not adopting the merger in the sudden and total fashion that Herold observed in Tamaqua, and that will be seen in Chapter 5. Instead, heterogeneity is found within age groups, and transitional patterns last for decades.

[45] For central Pennsylvania, however, another set of telephone interviews conducted by Herold in 1987-1988 showed a regular solidification and eastward movement . . . the isogloss reached the Susquehanna River" (Labov 1991: 32). Part of the difference may be in the treatment of places with mixed patterns. Some studies tend to include these in their isoglosses of merger, while *ANAE* tends to exclude them.

On the other hand, expansion across dialect boundaries is not usual, with areas like the Upper Midwest, central Pennsylvania, most of Ohio, and Rhode Island remaining distinct. However, the merger's definite presence in Vermont, and its possible appearance in western Massachusetts may be an exception, if the merger spread there from eastern New England.

In the Midland and the South, the merger is a newer phenomenon. It appears to be developing in parallel across the entire Midland, replacing more heterogeneous patterns (Labov 2006). In the South, it is less advanced, but advancing more quickly than in any other region (Labov *et al.* 2006: 59). As in the Midland, the Southern merger is not spreading from any particular point(s) of origin, but appearing roughly simultaneously in several states.

In most of the South, the merger can only proceed by displacing a prior system with a back upgliding /oh/. In the past, before it began to prove so unstable, this variety of /oh/ might have been pointed out as a structural factor giving the South resistance to the low back merger, just as the raised /oh/ is still thought to be one in the Mid-Atlantic area, and the fronted /o/ in the Inland North.

Since this dissertation will show that communities on the edge of the Mid-Atlantic area – complete with raised, ingliding /oh/ – can yield to the low back merger within a generation (see Chapter 5), it may be worth questioning whether the Mid-Atlantic and Inland North low vowel patterns will really provide any more resistance to the merger, if it really arrives, than the traditional Southern pattern recently seems to have done.

A chronological argument might be available: if, for example, the disappearance of one of the three 'resistance patterns' could be shown to have preceded the appearance of the merger, this might bolster the case for saying these patterns are resisting the low back merger, rather than merely being incompatible with it. On the other hand, one could also argue that a gradual erosion of the Southern back upglide – note that Irons (2007) mentions no such thing – or lowering of the Mid-Atlantic raised /oh/ towards /o/ – which *is* seen to precede merger in Chapter 5 – is actually the first sign of the merger itself.

Extrapolating from these issues, two general questions can be raised. The one which has been treated more often in the literature is the question of when we can expect a merger (or other change) to diffuse from one dialect area to another. The amount and type of contact, whether the contact is primarily between adults – as Labov (2007) suggests – or also involves the migration of children, and the structural compatibility between the dialects are all relevant here. A related concern, in interpreting the past, is how to know whether a change diffused from dialect area A to dialect area B, or whether it 'simply' developed in area A at one time, and in area B at a later time, for reasons of the same type.

This brings us to the second general question, which concerns a different kind of structural compatibility: what is it about all the dialects within a dialect area that cause them to undergo the same changes in parallel? Although it has received less attention, this is perhaps a more important topic, as parallel phonological evolution within dialects – *transmission* and *incrementation,* in the terms of Labov (2007) – is "the primary source of diversity" in language (Labov 2007: 5).

The original *Stammbaum* model of linguistic diversification assumes that (small) populations of speakers inherit and pass down the majority of their language faithfully, but that innovations come to distinguish populations that are no longer in contact with each other, eventually creating a tree-like relationship between languages or dialects. The implication is that *within* each population, innovations diffuse more or less completely. Bloomfield's 'density principle' is a refinement of this: "When any innovation in the way of speaking spreads over a district, the limit of this spread is sure to be along some lines of weakness in the network of oral communication . . . " (Bloomfield 1933: 476).

However, the Midland and Southern low back mergers, and more impressively the Northern Cities Shift (Labov *et al.* 2006: 14.2), and the Southern Shift (Labov *et al.* 2006: Ch. 18.3) show that this essentially diffusionist model is seriously insufficient.

Even if the boundaries of these large areas *are* "lines of weakness in the network of oral communication", which they may or may not be,[46] the practically simultaneous and nearly identical development of these complex shifts across dialect areas that are hundreds of miles wide simply precludes any explanation whereby innovations spread throughout a dialect area but not outside it. Innovation and incrementation must be internal processes.[47]

1.6 The study of merger on three levels

This dissertation will report on the results of three studies related to merger among the low vowels. The school survey (Chapter 3) will examine constraints on *individuals* acquiring the low back vowels, as revealed by their evaluation of minimal pairs on a questionnaire. The geographic study (Chapter 4) will look at the relationship, in space and time, of *dialects* with different patterns of merger. And the family study (Chapter 5) will explore the process of merger as it affects *speech communities,* looking at a small number of places where the low back merger is ongoing.

When Kerswill (1996: 200) ranks different phenomena in a "difficulty hierarchy" with respect to their ease of acquisition when people encounter them with exposure to a second dialect – finding that mergers are much easier to acquire than distinctions – the focus is on the *individual* level. Chapter 3 tests this conclusion (among other hypotheses) and

[46]"The tight bundle of isoglosses that defines the southern limit of the N[orthern] C[ities] S[hift] coincides with the North/Midland settlement line, and cuts across high concentrations of population density and high levels of communication" (Labov 2003). Perhaps the levels of communication across the line are lower than they are within each settlement area – this would be my expectation from studying New England – but they are clearly not weak enough to account for the linguistic divide. If we accept the proposition that "[w]hen two groups are in continuous communication, linguistic convergence is expected and any degree of divergence requires an explanation" (Labov 2002), then we are led towards relying on a structural incompatibility account (Labov 2003). However, the more nuanced perspective of Labov (2007) would not expect diffusion of a complex structural shift. That the limit of the shift matches the settlement boundary becomes almost expected.

[47]Another question is whether the process of incrementation is mainly social or mainly structural. Do children learn the direction and speed of changes from observing older members of their communities – presumably this is what Labov (2007: *3*) means by "inherited age vectors" – or are changes somehow more 'built-in' than that, and even potentially predictable, if the laws they obey were better known?

essentially supports it.

When Labov (1994: 313) states Herzog's Principle that "mergers expand at the expense of distinctions" – that is, areas of merger expand geographically over time – this is a generalization on the *dialect* level. Chapter 4 will not provide evidence for any regular or wholesale expansion, but rather a period of stability accompanied by some expansion in particular areas.

What connects these two levels – the micro-level of the individual speaker and the macro-level of the dialect area – is an account of merger on an intermediate level: the level of the *speech community*. Chapter 4 will describe sudden merger (merger-by-expansion) among children in several speech communities, and offer an explanation for why and when the mergers took place, based on changing demographics in those communities.

Chapter 2 gives background on the study area – southeastern New England – and the results of previous linguistic research on the low vowels in New England more generally.

Chapter 2

The Low Vowels of New England: History and Development

2.1 Introduction

To summarize the entire history of New England, or just of southeastern New England, even if it could be done efficiently, would not be maximally relevant for the linguistic topics under consideration here. Instead, following Zelinsky's Doctrine of First Effective Settlement,[1] §2.2 will outline the earliest and, for our purposes, the most important period

[1] "Whenever an empty territory undergoes settlement, or an earlier population is dislodged by invaders, the specific characteristics of the first group able to effect a viable, self-perpetuating society are of crucial significance for the later social and cultural geography of the area, no matter how tiny the initial band of settlers may have been. As an obvious corollary to this statement, we can ignore nonviable experiments, for example, the Raleigh group in North Carolina or some ephemeral shore parties in pre-Puritan New England and elsewhere. Thus, in terms of lasting impact, activities of a few hundred, or even a few score, initial colonizers can mean much more for the cultural geography of a place than the contributions of tens of thousands of new immigrants a few generations later" (Zelinsky 1973: 13-14).

Mufwene's similar Founder Principle is language-specific: "Well, the founder principle means that the people who settle the earliest in a new territory exert a large influence on the development of the new variety, and this influence can be disproportionate to their size, because every new installment of newcomers will find it more practical to speak like the locals than to speak like outsiders. Adults don't succeed, but children do it very quickly, because they want to be associated with the new language, with the new system, and they learn everything local, including the way of speaking. In the vast majority of cases, the founder principle prevails; but there are other cases where it will not prevail because the new layers of immigrants are suddenly much more numerous, or they are socio-economically more powerful or more prestigious..." (Collins 2005: 453).

of New England history, paying particular attention to the origins of the English settlers. It will also discuss what is known, and what can reasonably be concluded, about the status of the low vowels in that period.

In §2.3, the contributions of the *Linguistic Atlas of New England* (Kurath 1939-1943) will be reviewed, along with studies based on it (and some which preceded it), with respect to the low vowels. The best-known publication derived from *LANE,* Kurath and McDavid (1961), tended to oversimplify matters, and rather infamously placed the low back merger in Rhode Island and eastern Connecticut. The explanation of this error, and the literature correcting it, will be reviewed.

More recent scholarship, as it pertains to the low back vowels of New England, is reviewed in §2.4. Most of this section is devoted to the findings of Labov *et al.* (2006), and where these agree with or differ from earlier results.

§2.5 presents the results of an auditory and acoustic analysis of the 'Hanley recordings' (Hall *et al.* 2002) from southeastern New England. These are recordings made just after *LANE,* of some of the same informants, who were almost all born in the 19th century.

All these sources of data suggest a certain interpretation of the development of the low vowels in New England, from settlement in the 17th century up into the 20th century, and this account is given in §2.6.

By 1900, two principal dialect areas had mainly solidified in southeastern New England, with the two largest cities on either side. Boston MA showed the merger of /o/ and /oh/, while Providence RI retained the low back distinction. §2.7 describes the pilot study carried out to locate the border area between these two dialects. The studies of Chapter 4 and Chapter 5 were carried out in this study area along the border. Much of the data for Chapter 3 also comes from there.

2.2 The settlement history of (southeastern) New England

There are two major ways in which settlement history can be important to the linguistic geography of a territory. One concerns *retentions,* that is to say, current features whose distribution can be associated with the origins of the settlers of different parts of the territory. A commonly-offered example is the hypothesis is that eastern New England speech is non-rhotic because its first settlers mainly came from southern and eastern regions of England, where the loss of post-vocalic /r/ was advanced. On the other hand, the settlers of Appalachia, for example, mainly came from places where post-vocalic /r/ is either still preserved (Scotland, Northern Ireland) or was likely still preserved at the time of emigration (Northern England).[2]

But New England settlement history is not only important if we can use it to make "trans-Atlantic connections", a phrase associated in sociolinguistics with the work of Tagliamonte,[3] and as a more general concept in cultural history, associated with Fischer (1989).

Some linguists, such as Montgomery (2001), take issue with the over-simplifications and mismatched comparisons made within this tradition, while remaining sympathetic to the overall endeavor.

Others are more deeply critical, viewing the history of American English much more in terms of *divergence* than retention. According to Dillard (1995: 6), not only is there evidence that emigrants already spoke a standardized form of English, rather than broad regional dialects, there is also reason to believe that the differences that did get imported were "very strikingly leveled" by the 18th century, when British travelers noted "how the Americans spoke English of amazing uniformity".[4]

[2]This was meant as a simple example, but it is not an uncontroversial one. Another theory holds that the settlers were rhotic, or variably rhotic, and that non-rhoticity diffused later through contact between coastal areas and England. Downes (1998) reviews both positions, which are perhaps not irreconcilable in any case.

[3]A recent collection of work in this tradition, treating "transported dialects" world-wide, is Hickey (2004).

[4]Dillard also places a strong emphasis on the role of language contact and contact languages (pidgins).

But even if British regional differences were largely leveled within early American settlements, and most American regional differences developed later on American soil, it is still important to trace settlement patterns. This is because areas with a common settlement history share origins – the output of the same leveling processes – and lasting ties, and innovations are likely to have developed in parallel within such settlement areas, or to have diffused within them.

In the case of New England settlement, there are a number of intersecting unknowns. In the first place, it is simply not fully known where in England the settlers came from.[5] Our knowledge of 17th century English regional dialects – assuming they were spoken by some of the settlers – is very scant. Furthermore, it does not appear that any of this information sheds much light on the low back vowels, in particular. The various low vowel mergers that will be described in later chapters appear to be indigenous American developments.

Better recorded are the patterns in which the land of southeastern New England was taken up by the colonists in the 17th and early 18th centuries, as they fanned out from earlier coastal settlements and founded new ones in the interior. In many cases, new towns were populated largely from particular older ones, and larger towns would be divided as the population grew, so a sort of family tree of the settlements within each colony could be constructed. At the same time, however, there was continued immigration from England, as well as mobility within and between colonies.

[5] As noted by Banks (1930: 12), "In Bradford's 'History of Plymouth Plantation', where he gives a detailed list of the passengers of the *Mayflower,* there is not one reference to the family origin or home parish of any one of the Pilgrims. Winthrop's 'Journal' has a few casual references to the residences of emigrants, but nowhere does he make allusion to the definite area whence were drawn the hundreds who came with him in 1630 in the great fleet to plant this Commonwealth. The inference is inevitable that they were not interested in preserving this information, which we now have to seek out at the cost of so much labor and money for the coming generations."

Figure 2.1: Counties of England and Wales

2.2.1 The origins of the first English settlers

Figure **??** shows the counties of England and Wales, referred to in this section in the discussion of settlers' origins. Figure **??** shows the modern state and county boundaries of all six New England states, while Figure **??** and **??** show the county and town boundaries of eastern Massachusetts and Rhode Island, respectively. These divisions will be referred to extensively in the discussion below.

The original New England colonies, along with their dates of first settlement, were: Plymouth (1620), New Hampshire (1623), Massachusetts Bay (1628), Saybrook (1635), Connecticut (1636), Rhode Island (1636), and New Haven (1638). As this dissertation concerns southeastern New England, we will be chiefly concerned with the development of three of these: Plymouth, Massachusetts Bay, and Rhode Island. Of these, Massachusetts Bay grew the largest, and it also contributed to the settlement of the other two colonies.

2.2.1.1 Plymouth Colony

The original Pilgrims were a congregation from Scrooby, Nottinghamshire, in the East Midlands of England. Most of them were originally from that county or nearby South Yorkshire (Richards 2004: 42). After leaving England and spending twelve years in the Netherlands, they sailed to found Plymouth in 1620. However, the Pilgrims comprised only 41 of the 102 passengers aboard the *Mayflower;* most of the others whose origins are known came from London, Essex, and Norfolk.[6]

Richards' (1989: 56) contention that East Anglians were the largest group aboard the Mayflower appears to be incorrect, and it foreshadows Fischer's exaggerated claims for the pre-eminence of East Anglia in the settlement of Massachusetts Bay.[7]

[6]Banks (1930) researched the origins mainly of male heads of households. Of the *Mayflower* passengers, the 28 whose origins are given break down as follows: London, 11; Essex, 4; Norfolk, 3; Worcestershire, 3; Kent, 2; Yorkshire, 2; Nottinghamshire, 1; Gloucestershire, 1; Surrey, 1 (Banks 1930: 47-50).

[7]The term 'East Anglia' refers historically, and most precisely, to the counties of Norfolk and Suffolk in eastern England. More loosely speaking, East Anglia may encompass parts of Cambridgeshire, Essex,

Especially since the mortality of the *Mayflower* passengers was so high, it is worth reviewing what is known of the next few ships that brought settlers to Plymouth. The *Fortune,* which arrived in 1621, brought 35 passengers; seven were Pilgrims, the rest from London (Banks 1930: 50-52, Howe 1960: 33). In 1622 the ship *Anne* arrived with 60 settlers and the *Little James* with at least ten; of this group, more than half were from London, the rest largely from the eastern counties (Banks 1930: 52-55, Howe 1960: 37). The next few years brought several ships, of whose passengers little is known; at least one family came from Ireland (Banks 1930: 57). In 1629 the *Mayflower* called again, bringing 35 more of the Pilgrims from Holland (Banks 1930: 64).

By this point an effective settlement had certainly been made at Plymouth, and the colony expanded along the shore, onto Cape Cod, and to the west, into the area that will be the focus of this dissertation. We can conclude that the settlers were a mix of Londoners, Pilgrims from the East Midlands, and some from the eastern counties. This eastern component would have been enhanced over the next decades, as Plymouth Colony attracted immigration from the new Massachusetts Bay colony to the north (Kurath *et al.* 1939: 68). Eventually, in 1691, Plymouth was absorbed politically by Massachusetts.

2.2.1.2 Massachusetts Bay Colony

Though several other Massachusetts Bay settlements preceded it, the founding of Boston in 1630 began a wave of emigration so significant that it has come to be called "The Great Migration". Some 21,000 English settlers, mainly Puritans, came to Massachusetts Bay before the outbreak of the English Civil War in 1640.[8]

Huntingdonshire, and Lincolnshire (Banks 1930: 14, Anderson 1991: 232). But in Fischer (1989), the term often seems to refer to a larger eastern area of nine counties stretching from Lincolnshire to Kent, a region that would have been much more diverse, linguistically as well as culturally.

[8]Most sources, including Kurath *et al.* (1939: 62) and Fischer (1989: 17), agree on the reliability of this number, which is an estimate made in 1654.

Fischer (1989) argues that emigration from 'East Anglia' (see note 7) was the dominant element in the settlement of Massachusetts Bay, and that it effected a kind of cultural transplant that was crucial for New England's history as a whole (not to mention other American regions settled from there).[9] However, in the opinion of Hall (1990: 659), Fischer's thesis "has to be qualified in so many ways that its meaning becomes tenuous", while Anderson (1991: 235) refers to the "procrustean nature of Fischer's argument" and the "masses of evidence that do not fit" it.[10]

Fischer (1989: 33) describes 60% of the Great Migration settlers as coming from a nine-county area in the east of England. He says that less than 10% came from London, and 40% from the rest of England, including a admitted "secondary center" in the west of England. As pointed out by Anderson (1991: 232), only 19% of colonists came from Norfolk and Suffolk, that is, from East Anglia proper. This is no more than came from Devon, Dorset, Somerset and Wiltshire in the West Country.[11]

Both Fischer (1989) and Anderson (1991) report figures from Banks, who himself divided up the regions of origin slightly differently, but in a way that again shows no great eastern predominance: Norfolk, Suffolk, and Essex, 21.5%; London, Middlesex, Sussex, and Kent: 20%; Cornwall, Devon, Dorset, and Somerset, 16%; other counties surrounding London, 11%; Midlands counties, 9% (Banks 1930: 14). The other 22.5% came from other parts of England, or elsewhere.

But Banks acknowledges, in a way that his successors have not always done, the insufficiency of this sample for making too concrete a set of conclusions about emigrants' origins as a whole. Of the estimated 21,000 settlers of the Great Migration, only 3600 were

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[9]As its subtitle suggests, *Mobility and migration: East Anglian founders of New England, 1629-1940* (Thompson 1994) takes a similar perspective; however, it is less extreme.

[10]Zelinsky (1991) is an even more strongly negative review of Fischer (1989), although the section linking East Anglia to New England is rated more highly than the other sections of the book.

[11]Banks (1930: 15-16) states that many of the emigrants from the West Country eventually settled in New Hampshire and Maine, while the East Anglians tended to remain in Massachusetts, or later move on to Connecticut. Fischer, naturally, makes much of this.

identified at all by Banks, and the above percentages are out of 2646 whose origins he was able to trace; in his view, "[i]t would require double this number of emigrants to reach a final conclusion as to the relative county contribution" (ibid.).

This is especially true because the emigrants whose origins could be identified were not a random subset of the total, but tended to come from different areas than those who could not be traced. For a Plymouth example, of the five servants on the *Mayflower* whose origins are given Banks (1930: 47-50), four were from London. Of 23 non-servants whose origins are given, 7 were from London. While this difference – 80% of servants were from London, 30% of non-servants – is significant only at p = 0.07 (Fisher's Exact Test), it is certainly compatible with the Pilgrims' having had to "fill out the passenger list" (Howe 1960: 26) at a late date. It also seems commonsensical that emigrants from the metropolis, especially of lower-class backgrounds, would be harder to trace than most provincials.

This would point to an overestimate of provincial emigration, including from the eastern counties. However, the bias among servants and other lower-class settlers might be offset by the records' undercounting of women and children. According to Fischer (1991: 266), "both women and children came from the East of England in larger proportions than men".

In a response to Anderson (1991) and other critics, Fischer (1991) vigorously defends his thesis that East Anglian and/or eastern settlers were the most important element in the population of early Massachusetts Bay. He claims that the earlier historian Banks "detested Puritanism, associated that religious movement with East Anglia, and argued that both were untypical of the Great Migration . . . As a consequence Banks did not study East Anglian materials as thoroughly as other scholars have done" (Fischer 1991: 264-265).

A table of "twenty tests of English regional origin for the Massachusetts Bay Colony" (Fischer 1991: 265-267) shows that Banks' estimates of the eastern contribution are the lowest of all. A more complete accounting by Archer pins 49% of emigrants to the nine-county eastern area (including 31% from just Norfolk, Suffolk, and Essex), 32% to the

South and West, 10% to London and Middlesex, and 9% to the Midlands and North.[12]

At this point, we find ourselves caught up in an argument among historians, and one which is perhaps being made outdated by a newer project designed to "compile comprehensive genealogical and biographical accounts of every person who settled in New England between 1620 and 1643" (Anderson 1993). But though the Great Migration Study Project has published its complete findings from 1620-1633 (Anderson 1995), and those from 1634-1635 – the period of heaviest migration – through surnames starting with P, these volumes are designed for accessing information about individuals. It would be a major task to analyze them by English county of origin and New England point of destination.

And overall percentages cloud the issue, because it is clear that the regional origins of groups of settlers were strongly correlated with their specific destinations in Massachusetts Bay. Fischer (1991: 270) presents another table, based on a different estimate of regional origins, broken down between the earliest towns founded in Massachusetts. We see extreme variation in the proportion of eastern English origins, ranging from less than 15% in towns such as Gloucester and Weymouth, to over 70% in Dedham, Hingham, and Watertown. The average for 27 towns is 55%.

Settlers with origins in the South and West of England were also rare in some places – less than 15% in Boston, Charlestown, and Roxbury – while being a decided majority in others – greater than 60% in Dorchester, Gloucester, and Weymouth. And the proportion from London, though never high, reached 20% in Boston and Cambridge, while being estimated at zero in Gloucester and Hingham. The average for all towns is 27% from the South and West, 9% from London.

Assuming that the settlers from different areas spoke differently – which is very likely even if they did not speak broad regional dialects – there must have been a great deal of

[12] Fischer (1991: 266) finds even "Archer's correction of Banks . . . incomplete in at least five ways", all of which – unsurprisingly – would tend to understate the eastern-origin element in the Great Migration, which Fischer would make a majority.

dialect leveling early in the history of Massachusetts. Differences between nearby towns like Boston, Dedham, and Dorchester – the latter now part of Boston – did not persist.

Of course, Fischer (1991: 271) has an additional set of reasons why the eastern settlers were even more important than their numbers indicate, but these are not all reliable. For instance, he says that the most important "seed towns" for expansion were predominantly East Anglian: Boston, Dedham, Hingham, and Roxbury. But in fact Dorchester, with its West Country settlers, was also a seed town; at least ten other municipalities were eventually formed from Dorchester's territory (Wilkie and Tager 1991: 4-5). Weymouth, with an even greater predominance of West Country settlers, stayed within its small original area, but it sent settlers to start new communities (Kurath *et al.* 1939).

The dialects that formed in Massachusetts and the other colonies may have been influenced by the regional origins of the first speakers, but as later sections will demonstrate, there seems to have been leveling within each colony, or within the major areas of each colony. Regardless of exactly how large it was, the group of emigrants with origins in the east of England was clearly a plurality in Massachusetts, and it may have contributed some eastern features to Massachusetts speech. But Rhode Island and Connecticut were partially settled from Massachusetts, and partially by a similar mixture of settlers from England, and they emerged with fairly different speech patterns. This undercuts the logic of making a trans-Atlantic connection for Massachusetts.[13]

[13]For Fischer (1991: 275), however, "hearing is believing. Nobody who listens carefully to the Suffolk dialect on [the BBC cassette called "English With a Dialect"] can maintain a doubt that a strong kinship existed between the speech of Massachusetts and the east of England." After listening carefully to Suffolk speakers on the BBC Voices website (e.g. http://www.bbc.co.uk/voices/recordings/group/suffolk-aldeburgh.shtml), I disagree that there is much affinity. The diphthongs /ay/ and /aw/ are particularly unlike Massachusetts, their nuclei being practically reversed. Nearly 400 years have passed since the Great Migration, so differences are to be expected, but my point is that advocates for similarities will probably hear what they want to.

2.2.1.3 Rhode Island Colony

The settlers of Rhode Island were a more diverse group, both because the colony was an amalgamation of several settlements, and because the liberal policies of the Rhode Island government attracted and tolerated a much wider spectrum of people than was the case in Plymouth, and especially in Massachusetts Bay.

Roger Williams had lived for a time in Boston and in Plymouth before becoming the pastor in Salem in 1634. For his evolving religious beliefs, in particular the conviction that the civil authorities had no right to compel religious worship, he was banished from Massachusetts. In 1636, he founded Providence at the head of Narragansett Bay. The settlement – "a free community of seekers after Truth and a haven for those persecuted elsewhere for their conscientious beliefs" – grew slowly, with settlers from Massachusetts, Plymouth, Connecticut, and directly from England (McLoughlin 1978: 3-17).

In 1638, Anne Hutchinson and a group of allies were banished from Boston for challenging the established teachings of the church.[14] Nineteen families settled on the northern end of Aquidneck Island (later called Rhode Island), where they began a settlement that would be called Portsmouth. The next year, one faction of this group moved to the other end of the island and settled Newport. These settlements, especially Newport, grew faster than Providence, though not as quickly as Massachusetts Bay (McLoughlin 1978: 18-25).

There was from the start a rivalry and boundary dispute with Massachusetts Bay – it was not fully settled until 1862 – and at the height of it, the Providence and Rhode Island settlements united, beginning in 1647.[15] During this earliest period, the eastern shore of Narragansett Bay was disputed, but officially it was Plymouth Colony territory.

Though it had a population of Catholics and Jews, Rhode Island's diversity significantly increased with the arrival in the 1650's of a new Protestant sect: the Quakers. Along with

[14]Hutchinson's heresy was *antinomianism;* an explanation is beyond the purview of secular linguistics.

[15]The settlement at Pawtuxet, in present-day Warwick, claimed allegiance to Massachusetts until 1658 (McLoughlin 1978: 34).

banning – and in extreme cases, hanging – Quakers who preached there, "Massachusetts also persuaded Plymouth and Connecticut to enact severe laws against Quakers and repeatedly urged Rhode Island to do the same" (McLoughlin 1978: 36). But the tradition of toleration in Rhode Island meant that no such law was passed, and the Quakers were welcomed. Since the early flourishing of the Quaker movement took place in the north of England, this must have brought to Rhode Island some varieties of Northern speech. That region of England, as has been seen, was very poorly represented in Plymouth and Massachusetts Bay.

But referring to the earliest settlers – unlike the Rhode Island Quakers, who arrived after the first effective settlement was made – Fischer (1991: 272) says something striking:

> ... Connecticut and Rhode Island were broadly similar (not identical) to the Bay Colony in the English origins of their founders. So also were early settlements in the upper Connecticut Valley.[16] But immigrants from the west of England were more numerous in the new towns of Plymouth Colony, Nantucket, coastal New Hampshire, and Maine.

If this is true, it could support Fischer's larger thesis that an East Anglian Puritan culture became characteristic of much of New England, not just Massachusetts. But this north-south division of New England according to the founders' English regional origins is completely different from the one reconstructed according to the internal *settlement patterns* of New England, ignoring original English origins (Kurath *et al.* 1939). From settlement patterns, an east-west division clearly emerges. And though it is unsurprising, given that the settlement analysis was published in a work of linguistic geography,[17] it is

[16]For example, according to Fischer's (1991: 270) calculations, Springfield in western Massachusetts received almost the same regional proportions of English immigration as Boston.

[17]The historical sections of Kurath *et al.* (1939) were the work of a prominent historian, Hansen, so it should not be thought that the historical description was subordinated to the linguistic data. In fact, Kurath was an advocate of the view that American regional dialect differences – at least on a national scale –

this division that corresponds best to the linguistic differences within New England.[18]

2.2.2 The settlement patterns of southeastern New England

For New England as a whole, the main patterns of internal settlement were as follows (Kurath *et al.* 1939: Plate 1, following p. 240):

(1) From Plymouth: first north and south along the coast, including onto Cape Cod, then westward into the interior;

(2) From Massachusetts Bay: westward into much of the present state of Massachusetts (and northeastern Connecticut), and then north into the upper Connecticut Valley of New Hampshire and (present) Vermont;

(3) From Rhode Island: westward into the interior of the present state; also eastward into original Plymouth territory;

(4) From New London: north into the interior of eastern Connecticut;

(5) From Essex County MA (e.g. Salem): northeast into coastal New Hampshire, and especially northwest up the Merrimack Valley into central New Hampshire[19] and the upper Connecticut Valley;

(6) From coastal New Hampshire (e.g. Portsmouth) and the Great Bay (e.g. Dover): north into eastern New Hampshire.

(7) From coastal Maine (part of Massachusetts Bay): further into Maine.

The migrations listed above are from the "early eastern settlements", a classification

correspond to and derive from British ones (Kurath 1928; Kurath and McDavid 1961). Nevertheless, when it came to delineating the areas *within* New England, it was internal settlement patterns, rather than patterns of British origin, that Kurath *et al.* (1939) referred to. Likewise, Bloch (1935) reconstructs the original rhoticity status of eleven New England settlement areas, but does not attempt to correlate this with the regional origins of the English settlers.

[18]So, in the analysis of *LANE,* Maine is seen as the offshoot of Massachusetts, following the historical patterns *since* settlement. If the founders of Maine were more highly skewed towards west-of-England *origins,* as Fischer attests – and thus perhaps akin to those of the "new towns of Plymouth Colony" – this does not seem to be preserved in the dialects of these places.

[19]There was also a concentration of Scots-Irish settlement in this area.

made in (Kurath *et al.* 1939) at least partly on linguistic as well as geographic grounds.[20] The movements stemming from the "early western settlements" are:

(8) From the Connecticut Valley (e.g. Hartford, Springfield): in all directions into Connecticut, and north up the valley into New Hampshire and Vermont;

(9) From Saybrook: a short distance north into the interior.

(10) From New Haven: a short distance north into the interior.

(11) From west coastal Connecticut (e.g. Stamford, Stratford, Milford): north into western Connecticut, far western Massachusetts, and western Vermont.[21]

Virtually the entire coastline, from the New York border to Casco Bay in Maine, was settled by 1675. By 1725, almost all of Connecticut was settled, as was central Massachusetts and southern New Hampshire. The settlement of western Massachusetts (outside the Connecticut Valley), Vermont, and most of interior New Hampshire and Maine was accomplished during the remainder of the 18th century (Kurath *et al.* 1939: Plate 2, following p. 240).

New communities were founded by a combination of three main processes: a) the subdivision of a previously existing community, as its population grew; b) the longer-distance migration of a group to found a new settlement; c) the settlement of a place by a group more or less directly from England.

What makes the situation more complicated is that the first settlers of a future town did not necessarily come from the same place, or even the same colony, from which political authorization to found that town came. For example, present-day Vermont was claimed

[20]As well as considering many lexical isoglosses, Kurath *et al.* (1939: 8-9, 30) associate the east-west division with: loss (east) vs. preservation (west) of post-vocalic /r/ (though Bloch (1935) had shown the situation to be much more complex), presence (east) vs. absence (west) of broad-*a* (e.g. [kaf] *calf*), and (in the east) the vowel [ɒ] in e.g. *rod,* implying the likely merger of /o/ and /oh/. In this last matter they would prove to be mistaken with respect to eastern Connecticut and Rhode Island, eastern settlements that distinguish – and therefore, by Garde's Principle, always distinguished – /o/ and /oh/, thus patterning with the western settlements on this point.

[21]There was also an eastward settlement pattern from New York into Vermont, a disputed territory.

by New Hampshire, New York, and Massachusetts, and land grants were issued by all three governments. Nevertheless, in western Vermont, it was settlers from a fourth colony, Connecticut, who ended up predominating (Kurath *et al.* 1939: 104).[22]

For southeastern New England, a detailed description of the settlement patterns necessarily involves an understanding of the political boundaries in the region during the colonial period. As in Vermont, where boundaries were unclear or disputed, a more complex pattern of settlement resulted.

The boundary line between Plymouth Colony and the newer Massachusetts Bay colony was laid out in 1640. It is a diagonal line, mostly straight, running from the ocean at the northeast end to the Rhode Island border to the southwest. By 1691, when Plymouth was incorporated into Massachusetts, all the territory on both sides had been settled by the respective original colonies. The line can still be seen on modern maps, such as Figure **??**, as it is the boundary between Norfolk County and Plymouth County.

Although the northern boundary of Rhode Island – the east-west line running between it and Massachusetts – was involved in a long dispute, for practical purposes it has always been in approximately the same location. On the other hand, the eastern boundary of Rhode Island – at first the boundary with Plymouth, later with Massachusetts – has undergone significant changes as a result of a similar controversy.

The first and more important change occurred in 1746, when Rhode Island was awarded the town of Cumberland (previously known as Attleborough Gore), in the northeast corner of the present state, and the towns of Bristol, Warren,[23] Tiverton, and Little Compton, on the eastern shore of Narragansett Bay. These places had all been settled under the auspices of Plymouth, though not all their settlers had come from there. In 1747, they were reincorporated in Rhode Island.

[22]When it declared independence in 1777, Vermont was officially "The Republic of New Connecticut" for several months, before the French toponym was adopted.

[23]At that point, Warren also included the present-day town of Barrington.

In 1862, another adjustment occurred, when the state of Massachusetts received the northern end of Tiverton back from Rhode Island, amalagmating it with the city of Fall River, and in exchange the western half of Seekonk MA – originally settled as Rehoboth in Plymouth Colony – was given to Rhode Island, where it became East Providence. At the same time, the city of Pawtucket MA – which had been a part of Seekonk until 1828 – was also transferred to Rhode Island, where it later combined with the Rhode Island community of the same name, across the Blackstone River.

The principal thrusts of settlement occurred within the original boundaries of the three colonies: west from Plymouth, west and south from Massachusetts Bay, west and north within Rhode Island, and also to the east. Since it is along the modern Massachusetts-Rhode Island boundary that the studies described below were conducted, it is important to understand how these three settlement currents came together near the borders of their respective territories.

Table 2.1 details the settlements and divisions that led to the 'study area' of Chapter 4, as shown on Figure 4.1. There are 40 communities: 29 in present-day Massachusetts, 11 in Rhode Island. The leftmost columns of the table show the political evolution of the area, as new towns were incorporated from parts of older ones. Original towns are in bold, towns that split from them are in normal type, and further divisions are shown in italic and small type. Comparing the dates of settlement and incorporation, we can see that some places were settled much earlier than they were incorporated, sometimes just as early as their parent towns.

The rightmost column of the gives information, when it is known, on the origins of the first settlers of each place. Here we see that two early settlements that eventually produced many daughter towns in the study area – Taunton and Rehoboth – did not have predominantly Plymouth settlers, despite being located in Plymouth Colony. Taunton was settled by a group mainly from Devon and Somerset (including the original Taunton) in

COLONY	TOWN OR CITY	INCORP.	SETTLED	SETTLERS FROM
Massachusetts	**Mendon**	1667	1660	Mass. (Braintree, Weymouth)
”	Bellingham (part)	1719	1713	
”	Uxbridge	1727	1662	
”	Blackstone	1845	1662	
”	*Millville*	1916	1662	
”	**Wrentham**	1673	1669	Mass. (Dedham)
”	Bellingham (part)	1719	1713	
”	Foxborough (part)	1778	1704	Mass. (Dorchester)
”	Franklin	1778	1660	Mass. (Dedham)
”	Plainville	1905	1661	
”	**Douglas**	1775	1721	Mass. (Sherborn, Natick)
Plymouth	**Taunton**	1639	1638	England (Taunton) via Ply. & Mass.
(Massachusetts	Norton	1711	1669	*Taunton North Precinct*
after 1691)	*Mansfield*	1775	1659	
”	Dighton	1712	1678	*Taunton South Purchase*
”	Berkley	1735	1638	
”	**Rehoboth**	1645	*1644*	Mass. (Weymouth, etc.), Plymouth
”	Swansea	1667	1667	
”	*Warren*	1717	*1676*	
”	Barrington	1770	1676	
”	*Somerset*	1790	1677	
”	Attleboro	1694	*1662*	*Rehoboth North Purchase*
”	*Cumberland*	1747	*1662*	
”	Woonsocket (part)	1867	1695	
”	*N. Attleborough*	1887	1669	
”	Seekonk	1812	*1644*	
”	*Pawtucket (part)*	1828	*1644*	
”	*East Providence*	1862	1644	
”	**Dartmouth**	1664	1650	Plymouth, Rhode Island
”	Little Compton	1682	1675	
”	Tiverton	1694	*?*	
”	Westport	1787	1670	Plymouth, Rhode Island (Portsmouth)
”	New Bedford	1787	1640	
”	*Fairhaven*	1812	1670	
”	Acushnet	1860	1659	
”	**Middleborough**	1669	1660	Plymouth
”	Lakeville	1853	1717	
”	**Freetown**	1683	1659	Plymouth (Scituate, Marshfield, Ply.)
”	Fall River	1803	1670	
Providence	**(Glocester)**	1731	1706	Providence
(Rhode Island	Burrillville	1806	*1706*	
after 1647)	**(Smithfield)**	1731	*1636*	Providence
”	North Smithfield	1871	*1672*	
”	Woonsocket (part)	1871	1695	
”	(Lincoln)	1871	*1650*	
”	*Central Falls*	1895	*?*	
”	**(North Providence)**	1765	*1636*	Providence
”	Pawtucket (part)	1874	1655	

Table 2.1: Settlement history of the study area of 40 cities and towns (Kurath *et al.* (1939), most dates from Mass. CIS)

England, who had lived for a few years in Dorchester (Baylies 1830: 143). Rehoboth, which is the parent town of several of the communities which will be investigated in detail in Chapter 5, was settled by a group from several Massachusetts and Plymouth towns, but largely from Weymouth, one of the Massachusetts Bay settlements with a very high proportion of West Country settlers (the original Weymouth is in Dorset).[24]

For the most part, later-incorporated towns drew their population from their parent towns. So Taunton grew and spawned Norton, Dighton, and Berkley; Swansea, Attleboro, and (much later) Seekonk were set off from Rehoboth;[25] and similarly with Dartmouth and the Rhode Island settlements deriving from Providence. With the Mendon and Wrentham settlements, as can be seen, there is less of a family-tree structure; Uxbridge, Blackstone, and Millville, for example, were just equivalent parts of Mendon, settled around the same time. They were later detached politically, but they were not secondary settlements in the manner of the towns surrounding Taunton and Rehoboth.

If the linguistic divisions in the study area were to closely correspond to the settlement patterns, we would expect the clearest boundary to follow the northern boundary of Rhode Island, where settlements derived from Providence (Burrillville, North Smithfield) abut ones split off from Mendon in Massachusetts Bay (Uxbridge, Blackstone, Millville).

Unless leveling had eliminated it, we might also see a difference between the towns derived from Dedham, a strongly east-of-England settlement, and those derived from Taunton, Rehoboth, and Dorchester, which had more West Country settlers. This would be a line between Wrentham and Plainville on the west, Foxborough and Mansfield on the east.

[24] Baylies (1830: 143), but not Kurath *et al.* (1939: 179), stresses Hingham, adjacent to Weymouth on Massachusetts Bay, as a major source of Rehoboth settlers. Unlike Weymouth, Hingham was an East Anglian settlement, with many settlers from old Hingham, in Norfolk. One of the daughter towns of Rehoboth, Attleboro, is also named after a town in Norfolk, where two of its first settlers were from (Daggett 1894: 87). Despite examples like Taunton and Hingham, it is important not to instinctively assume that a place name reflects the origin of most settlers. Swansea apparently had some Welsh settlers, but not many; New Bedford was not named after the county in England.

[25] Rehoboth is an interesting case in that the original settlement is now in East Providence, not in the rural town now bearing the name Rehoboth. Usually, the most central and populous place retained the old name.

Another potential boundary would run between towns settled originally from Plymouth – Fall River, Freetown, and Lakeville – and ones split off from Rehoboth and Taunton, originally settled from Massachusetts and England – Somerset, Berkley, and Taunton itself.

An area where boundaries might be unclear is along the eastern shore of Narragansett Bay. Here, we have some communities with a Plymouth settlement history, but also some known settlement from Rhode Island. Dartmouth is one of these (Kilpatrick 1937: 49-50), and Kurath *et al.* (1939: 179) says the same about Westport, suggesting that at least Little Compton and Tiverton would have experienced settlement from both colonies. Given their location further up Narragansett Bay, other communities like Somerset, Swansea, and Seekonk might have originally had some Rhode Island settlers, beside the majority derived from Rehoboth.[26]

For Barrington, Warren, and Cumberland (as well as Little Compton and Tiverton), the possible consequences of some original Rhode Island settlement are compounded by these towns' having actually been part of Rhode Island for more than 250 years. If after such a long time, Cumberland were still like its parent town of Attleboro, it would truly be a testament to the Doctrine of First Effective Settlement.

As will be seen in Chapter 4, the current linguistic boundaries only match up well with these predictions in the northern area, where a phonological boundary does run along the settlement (and state) boundary. To the east, the line runs further into Massachusetts (formerly Plymouth) than we have been imagining it might. And instead of always dividing settlement sub-areas, it cuts through two of them (Dartmouth and Rehoboth).

[26] Kilpatrick (1937: 39-40) says that the settlers of the East Bay came from both Rhode Island and Plymouth Colony, and that a culture distinct from the rest of Rhode Island developed due to the "stabilizing influences" of Plymouth and Massachusetts (49): the highly developed community organization of the Plymouth and Massachusetts Bay settlements encountered the pronounced individuality of the Rhode Islanders (42)."

2.2.3 The low vowels of English in the 17th century

The discussions above of settlers' origins and settlement history could have relevance for any aspect of the dialectal situation in New England. This dissertation only examines the low vowels, so it is necessary to examine the development of those vowels at the time of settlement. It seems likely that at least some New England settlers spoke broad English regional dialects, but might have approximated more of a standard in the dialect contact situation in which they now found themselves in America. Others, due to their geographical or social origins, probably spoke something closer to the standard as their native variety. From the point of view of the developing standard pronunciation in England, we will review Dobson (1957). For regional dialects, the earliest comprehesive authority is Wright (1905).

2.2.3.1 The low vowels in the development of British Standard English: Dobson

The low vowels were undergoing substantial change in England during the seventeenth century; they had not yet arrived at the configuration /ah/ [ɑː], /o/ [ɒ], /oh/ [ɔː] found in present-day southern British English, including RP (Wells 1982: 119). What follows is only a partial recapitulation of the complex changes described in Dobson (1957), focusing on the most important phonetic developments.[27]

Some words which now have /ah/, /o/, and /oh/ in New England had the Middle English vowels *ă, ŏ,* and *au,* but the correspondence is not always one-to-one, as will be seen in the following paragraphs.

ME *ă* was always [a], but by the 17th century it was involved in a split. The usual development of *ă,* in words like *pad, cat,* and *barrow,* was as follows:

> The evidence is slight, but is, I think, sufficient to show that in the sixteenth and

[27]Wells (1982) covers the relevant word classes with seven "lexical sets" – BATH, PALM, START, LOT, CLOTH, NORTH, and THOUGHT. In some, the words have diverse historical origins, shown in Dobson (1957).

> seventeenth centuries there were two pronunciations of ME *ă* in use in StE:[28] a more conservative [a], generally used by careful speakers until 1600 and probably still the more usual pronunciation among such speakers until 1650, which may have continued in occasional use until the end of the century; and a more advanced [æ], vulgar or popular in the sixteenth century, gradually winning wider acceptance in the first part of the seventeenth century, and generally accepted by careful speakers about 1670 (Dobson 1957: 548).

But ME *ă* took a different path in syllables closed by /r/ and the front voiceless fricatives /f/, /s/, and /θ/. In words like *car, laugh, ask,* and *path,* there was no fronting to [æ], but instead lengthening, also in the 17th century, to [aː]. In RP, this eventually became [ɑː].

The lengthening before /r/ may have come first, and it is more widespread in modern varieties of English than lengthening before the fricatives. Northern British dialects and all American ones outside of eastern New England show "Pre-R Lengthening" but not the "TRAP-BATH Split", in the terminology of Wells (1982: 199-206).[29]

As in the discussion of non-rhoticity in §2.2, it is initially puzzling that one of the earliest-settled regions of the United States should share an innovation with England, here the TRAP-BATH Split. The explanation that it came to New England only later, through contact with the mother country, is the one chosen by Wells (1982: 205, 220) for both the loss of /r/ and the appearance of /ah/ before voiceless fricatives in this one American region.

A different explanation is suggested by Dobson (1957: 526), who notes that "[t]he lengthening was not uniformly carried through, and the old unlengthened vowel continued to exist beside the new lengthened one. Considerable fluctuation in usage resulted".[30] In

[28] It will be seen from this quotation that Dobson considers lower-class speech (of London, presumably) to be a part of S[tandard] E[nglish], in that its innovations were often adopted by higher-class speakers. StE excludes (regional) dialectal developments never taken up by the standard, as are found in Wright (1905).

[29] Most American dialects have [ɑː] before /r/, which may have occurred independently from the same backing of the vowel in England. On the other hand, eastern New England still has [aː] in *ca(r), ask.*

[30] In another class of words, before a nasal consonant cluster often derived from French – *dance, branch,*

other words, we are free to suggest that eastern New England was settled by fairly early adopters of the TRAP-BATH Split, while other parts of the country were not.

ME *ă* was also lengthened in several other environments. The most common word affected was *father,* which lengthened in almost all dialects of English; the preceding labial and following syllabic /r/ favored lengthening (Dobson 1957: 531). But the similar word *rather* is another case where eastern New England tends to agree with the mother country, by lengthening, and disagree with the rest of the United States.[31]

In a given dialect, whatever words contain the same vowel as the one derived from lengthened ME *ă* are considered to form the /ah/-class. This typically includes many words borrowed from foreign languages, containing an original [a]: *Osama, Obama,* etc.[32]

The changes undergone by ME *ă* were essentially paralleled by its back counterpart, ME *ŏ,* which was originally pronounced [ɔ]. The usual development was lowering to [ɒ], a pronunciation that was "vulgar and dialectal in the sixteenth century, gradually entered StE during the first part of the seventeenth century, and became normal among educated speakers about 1670" (Dobson 1957: 577).[33]

The main lengthening environments, again, were tautosyllabic /r/ and /f/, /s/, /θ/. In these cases, lowering and unrounding to [ɒ] was blocked, and lengthening to [ɔː][34] occurred instead. The result in StE, at least at first, was a very different sound in unlengthened *pod, cot,* and *sorrow,* from the one in lengthened *off, lost, moth,* and *storm.*

Lengthening before tautosyllabic /r/ was adopted everywhere.[35] The change before

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example – the difference between American [æ(ː)] and British [ɑː] is traced not to lengthening but to variation in ME between *ă* and *au,* which developed uncharacteristically in these environments. See below.

[31] Divergent developments occurred when ME *ă* was preceded by /w/. The normal development is to /ae/, but after /w/ it is to /o/ in the British standard, usually /o/ but sometimes to /oh/ in American dialects, e.g. *want, wash, watch;* lengthening of ME *ă* is to /oh/ instead of /ah/: *war* (regular lengthening before /r/), *water* (like *father*) (Dobson 1957: 532).

[32] Depending on the dialect, another potential component of the /ah/-class – *calf, palm,* etc. – derives from ME *au,* and will be discussed in that section.

[33] In most American dialects not affected by the low back merger, /o/ has become unrounded as well as lowered: [ɑ].

[34] Dobson uses the symbol [ɒː], which fails to signal the difference in height between the two vowels.

[35] In many American dialects today, the resulting sound has merged not only with that of ME *ŏ* before

voiceless fricatives – for Wells (1982: 204), the "LOT-CLOTH Split" – would spread to American English varieties, but eventually die out in England itself.[36]

For ME *ŏ,* like for ME *ă,* "the unlengthened pronunciation continued in use beside the new lengthened one . . . [and] remained common through the nineteenth century" (Dobson 1957: 528). In both cases, the north of England never adopted the change. Wells (1982: 234) suggests that the short vowel was readopted from the north, although this would involve the reversal of a merger, while Dobson implies that the unlengthened vowel never fell completely out of use in the standard.

Other words with *ŏ* also lengthened in more specific environments, such as *broad,* and in some dialects, *on* and/or *gone.* Lengthening before /ŋ/ has been almost universal in American dialects, while before /g/ it has been very irregular. In any dialect, the class of words derived from unlengthened ME *ŏ* forms the /o/ word class. Those descended from lengthened *ŏ* form a part of the /oh/-class.

The rest of the /oh/ class derives from ME *au,* a diphthong that arose in early Middle English principally from earlier English *ă* before /g/, /h/, or /w/ – as in *law, taught,* and *claw* – or from French *au* or *ao,* as in *laud, fawn.*

ME *au* was supplemented in late Middle English (c. 1400) from several different sources: (1) ME *ă* in syllables closed by /l/, such as *call, salt, calm,* and *half* (Dobson 1957: 553); (2) ME *ă* before /x/, as in *slaughter, daughter, bought,* and *thought* (555, 794); (3) in some words, mainly borrowed from French, before /m/ or /n/, such as *chance, sample, aunt, lawn* and *launch* (556).[37]

As can be seen from the example words in the previous paragraph, this vowel has

intervocalic /r/, but also with higher back vowels in that position. In such dialects, *sorrow, storm, soar, store,* and even *sure* would have the same vowel.

[36]Looked at another way, for CLOTH to unmerge with THOUGHT, and return to unite with LOT, as it did in RP, is not as difficult as it might appear. There are very few THOUGHT words before /f/ (*cough* is one) and perhaps none before /θ/. The readjustment would have been mainly predictable phonetically, with a few unpredictable items, e.g. *sauce.* Even there, spelling could perhaps have been an aid.

[37]Most American dialects show the effects of the first two of these diphthongizations, but not the third.

not evolved as a single unit into modern times, but in the development of the standard in England, all these words initially had [au], which by the 16th century was backed to [ɑu], continuing in the 17th century to [ɒu] (Dobson 1957: 783).

However, at the same time, a process of monophthongization was taking place, resulting in [ɔː]. This change occurred during the same two centuries as the lengthenings of the short vowels described above:

> In the sixteenth century careful speech seems only to have used the diphthongal pronunciations, though the monophthongal pronunciation had already developed . . . [D]iphthongal pronunciations, at least in some words, survived in conservative speech until late in the seventeenth century [but] the monophthongal pronunciation . . . is clearly the more common even in careful speech throughout that century (Dobson 1957: 783).

However, there was a major class of words in which the monophthongization led to a different outcome. Rather than leading to [ɔː], which merged most cases of *au* with the lengthened *ŏ,* in some environments it led to [aː], uniting it with the lengthened *ă* instead.[38]

This happened in syllables closed by /n/ and another consonant, and before the labial continuants /m/, /f/, and /v/. It seems the development to [aː] occurred first in vulgar London English or in eastern English dialects, during the 16th century, and was adopted by the standard only late in the 17th century (Dobson 1957: 790). Even then, in many words *spelled* with *au,* the pronunciation with [ɔː] eventually prevailed, which explains the difference in RP between *lance* [lɑːns] and *launch* [lɔːntʃ], both from the same French root.

We see that the situation was very complex, especially for some of these phonetic subclasses. For the French words before nasal clusters, there could even have been four

[38]For Dobson (1957: 536), only with this monopthongization did /ah/ became a separate phoneme, rather than an allophonic variant of /ae/ before voiceless fricatives and /r/. There were already partial minimal pairs like *father∼gather,* but the new development from *au* set up contrasts like *aunt∼ant, palm∼Pam.*

ă	*ŏ*	*au*
[a]	[ɔ]	[au]
TRAP	LOT	THOUGHT
BATH	CLOTH	PALM
father	broad	half
START	NORTH	dance

Table 2.2: Pronunciation of low vowel lexical sets: Middle English

[æ] ∼ [a]	[aː]	[ɔ] ∼ [ɒ]	[ɔː]	[au] ∼ [ɒu]
(BATH)	(BATH)	LOT	(THOUGHT)	(THOUGHT)
	(PALM)	(CLOTH)	(CLOTH)	(PALM)
TRAP	(half)		(half)	(half)
(dance)	(dance)		(dance)	(dance)
(father)	(father)	(broad)	(broad)	
	START		NORTH	

Table 2.3: Pronunciation of low vowel lexical sets: 17th century

[æ]	[ɑː]	[ɒ]	[ɔː]
TRAP	BATH	LOT	THOUGHT
	PALM	CLOTH	broad
	half		
	dance		
	father		
	START		NORTH

Table 2.4: Pronunciation of low vowel lexical sets: RP (modern)

/ae/	/ah/	/o = oh/
[æ]	[aː]	[ɒː]
TRAP	PALM	THOUGHT
(BATH)	(BATH)	broad
(half)	(half)	LOT
[ẽːə]	father	CLOTH
dance	START	NORTH

Table 2.5: Pronunciation of low vowel lexical sets: eastern New England (modern)

/ae/	/ah = o/	/oh/
[æ]	[ɑ]	[ɔ]
TRAP	LOT	THOUGHT
BATH	PALM	broad
half	FATHER	CLOTH
[ẽːə]	[ɑɹ]	[ɔ̞ɹ]
dance	START	NORTH

Table 2.6: Pronunciation of low vowel lexical sets: western New England (modern)

pronunciations in competition in the 17th century, when various dialects came into contact, if not in London. For e.g. *dance,* there would have been variability from long ago between [a]∼[æ] and [au]∼[ɒu], between the diphthong and its normal monophthongization outcome, [ɔː], and between that outcome and the more popular development, [aː].

In most American dialects, *dance* is pronounced with a vowel like [æː], which most likely derives from an un-diphthongized variant of the French borrowing, with [a] rather than [au] (Dobson 1957: 555). However, roughly the same sound in *calf* cannot have the same explanation; the contrast between *calf* and *calm* is problematic, because the diphthongization before /l/ long predated the departure of the American settlers, and should have applied to both words. In the words of Wells (1982: 143), "it has not been satisfactorily explained how Gen[eral] Am[erican] comes to have /ɑ/ in *father, palm,* etc., but not in *calf, halve,* and the other BATH words".[39]

In summary, we see that the /oh/ class, in the British standard, is descended mainly from words with ME *au,* which themselves have several sources. Most American dialects also have /oh/ as a reflex of lengthened ME *ŏ* before voiceless fricatives. But words with *au* before /nC/, /m/, /f/ and /v/ became /ah/-words in England, while in most American dialects they have reverted to /ae/, except before /m/.

Tables 2.2 to 2.6 summarize the developments from Middle English through the transitional stage described in Dobson (1957) and into the modern period, where the results are given for RP, eastern New England, and western New England (which has the same system as many conservative American dialects). The developments are shown for eight of the lexical sets of Wells (1982): TRAP, BATH, PALM, START, LOT, CLOTH, THOUGHT, and NORTH, and for the words *father, half, dance,* and *broad,* which are combined into larger classes by Wells but show different origins and/or evolutions.

[39]As noted, in eastern New England the BATH class does at least have the potential to contain all these words, but there are doubts as to whether this feature dates to the settlement period, or is a later importation.

With all the movements and crossings of vowel categories in Dobson's discussion, nowhere does he mention any of them fully merging together. Such a merger might have been expected in the back, where we have /o/ – the unlengthened *ŏ* – falling and moving past the position of /oh/ – the monophthongized *au* – during the time when the latter is developing. Because of this, the /o/∼/oh/ merger was phonetically conceivable at this early period; the two classes were close in terms of position, but were kept apart by length.

The lengthened *ă,* being originally [aː], was not close enough phonetically to /o/ for a merger to be plausible. Nor was a merger likely to have occurred between /o/ and the *calm, half* group. Those words developed from [au] directly to [aː] (Dobson 1957: 790) and, therefore, were never close to /o/ either.

Another factor probably inhibiting any merger in the 17th century was the pronunciation that each of these vowels retained in the speech of older or more conservative speakers. For /ah/, it was [a];[40] for /o/, it was [ɔ]; and for /oh/, it was [ɒu]. These three sounds are phonetically very far apart, even more than the innovative pronunciations [aː], [ɒ], and [ɔː].

Dobson (1957) is a reconstruction mainly of standard British English, but since it is based on the testimony of contemporary orthoepists, phoneticians, and spelling reformers – often the same people – one would expect some mention of a merger among these word classes if there had been any trend towards one, necessitating a prescriptive reaction. The next section will discuss whether evidence for merger can be found in regional dialects.

2.2.3.2 The low vowels in 19th century British dialects: Wright

The English Dialect Grammar (Wright 1905) published data, collected by various means, on the development of English sounds in all the counties of England, Wales, Scotland, and Ireland where English was spoken. We can therefore examine the phonetic combinations

[40]For words like *bath,* the conservative pronunciation was [a]; for words like *palm,* it was [ɔː] or [ɒu].

discussed in §2.2.3 to see if any mergers are indicated in the various regional dialects.[41] Following Garde's Principle, any mergers that had occurred by the 17th century would have still been present in the 19th century when the data of Wright (1905) was collected. But of course, a merger could be more recent in one of Wright's regional dialects – too recent to be relevant for American settlement – and there would be no way of knowing.

In many parts of Scotland, a likely /o/∼/oh/ merger is shown by the short vowel [ɒ][42] in the words *bought, brought* and *daughter,* which is recorded along with a final fricative, e.g. [bɒxt] (Wright 1905: 79). In these same Scots dialects, words like *talk, walk* and *claw, saw* developed to [ɑː] (32). Together, this indicates the absence of a distinct /oh/-class.

West Somerset is one of the only locations showing a wholesale lengthening of ME *ŏ,* with [ɔː] in the words *blot, cot, flock, crop, stop, strop, top, God, dog, broth, cross, frost,* and *lost;* (Wright 1905: 73-74).[43] In this same area the /oh/-class appears either as [ɔː], in *balk, chalk, talk, thought,* or as [ɑː], in *daughter, brought, claw, gnaw, saw;* the same [ɑː] is also found in *calf, half, cart, hard.* So for west Somerset, we have good evidence that there are only two categories where the standard has three, but the incidence of word classes – in particular, *claw* etc. appearing with /ah/ – might make it misleading to refer to this dialect as having the /o/∼/oh/ merger.

If we select the adjacent West Country county of Dorset for comparison,[44] we find considerable differences. There, a short /o/ category does remain, although *dog, lost, frost, shop, stop* and *top* are lengthened to /oh/. Like in west Somerset, *thought* has [ɔː] in Dorset, but *bought* has [ɒ]. Most notably, the words *balk, chalk, talk,* and *walk* join *daughter, brought, saw, calf,* and *cart* in the /ah/-class.

[41] Since Wright (1905) does not discuss matters in phonemic terms, similar words from different word classes must be compared in their phonetic outcomes. In some places, developments are quite different and must be treated as such; for example, where words like *talk* ended up in the /ah/-class, they say nothing about a possible merger between /o/ and /oh/.

[42] All phonetic transcriptions have been converted to IPA from Wright's phonetic alphabet.

[43] As noted in §2.2.2, the settlers of Taunton in Plymouth Colony were largely from this area.

[44] As noted in §2.2.2, the settlers of Dorchester in Massachusetts Bay were largely from this area.

Between west Somerset and Dorset, not only does the *inventory* of phonemes appear to be different, their *incidence* clearly is as well. It is possible that differences in phonemic incidence, by themselves, could lead to merger in a situation of dialect contact, although in the case of variation between /ah/ and /oh/, merger between the categories – unless /o/ is also involved – has never been reported.

Because a considerable proportion (or, in Fischer's view, a hegemonic majority) of settlers in Massachusetts Bay were from the eastern counties of England, we will review the records for northeast Norfolk and east Suffolk, the East Anglian localities with the most evidence in Wright (1905).

These two East Anglian dialects are closer to standard British English than the ones in the West Country. They both show clear evidence of three low vowel categories, /ah/, /o/, and /oh/. ME *ŏ* is lengthened rarely in northeast Norfolk and not at all in east Suffolk, being preserved as [ɒ]. The lengthened *ă* appears, as [ɑː], before /r/ in *arm, darn,* and the same sound arises from shortened *au* before a labial in *calf, half.* In all these cases, the basic development is as in RP.[45] The incidence of the /oh/ category is not totally standard. While *walk, law,* etc. have [ɔː] in both dialects, those words constitute the entire /oh/-class in E Suffolk, while in NE Norfolk *bought, thought* etc. variably contain /oh/.[46]

Table 2.7 summarizes the evidence of these dialects – and the standard – for the most common sources of the modern low vowels. Since all scholars agree that eastern and western emigrants were the most numerous of the settlers of early New England, and that a kind of early standard was probably also spoken, the table should give some idea of the possible components of the dialect mixture there, bearing in mind that Wright's data comes from more than three centuries after the time of settlement, and that these four localities do not match the origins of all settlers, even those from the same regions.

[45]In E Suffolk the same [ɑː] is also found in *claw, law,* while NE Norfolk has a similar vowel, [æː], in *claw.*

[46]In E Suffolk, words like *bought* and *thought* have either [oː] or the diphthong [ʌu]. In NE Norfolk, these words seem to vary between [ɔː] and [ʌu].

LEXICAL SET	START	HALF [a]	LOT	CLOTH	THOUGHT	TALK [a]	LAW [a]	# [b]
ME source	ă + r	au + f	ŏ + p	ŏ + s	ŏ + x	au + k	au + #	2
RP	ɑː	ɑː	ɒ	ɒ	ɔː	ɔː	ɔː	3
NE Norfolk	ɑː	ɑː	ɒ	ɒ	ɔː *or* ʌu	ɔː	ɔː	3
E Suffolk	ɑː	ɑː	ɒ	ɒ	oː *or* ʌu	ɔː	ɔː *or* ɑː	3
Dorset	ɑː	ɑː	ɒ	ɔː	ɔː	ɑː	ɑː	3
W Somerset	ɑː	ɑː	ɔː	ɔː	ɔː	ɔː	ɑː	2

[a]These words label subclasses within the BATH and THOUGHT classes of Wells (1982).
[b]These figures show the number of low monophthongs in each variety.

Table 2.7: Evolution of low vowel classes in West Country and East Anglian dialects (data from Wright 1905)

Table 2.7 somewhat oversimplifies the data, but gives a general idea of the evolution of each class. Again, it is interesting to note that the two classes between which there would be the most disagreement, /ah/ and /oh/, are the ones which have never fallen together.

There is no good evidence for a 17th-century /o/∼/oh/ merger outside of Scotland, except for the dialect examined in west Somerset. The ancestor of that dialect may have been a major contributor to the early speech of Taunton MA, and then transmitted to the towns split off from there. But this would not be enough to explain the /o/∼/oh/ merger found throughout eastern New England. In a contact situation between the dialects we have examined, the only disagreement is in the CLOTH set; no real motivation for an unconditioned low back merger has been found.

As far as the western New England, or General American merger of /ah/ and /o/ is concerned, it does not seem at all likely to have occurred as early as the seventeenth century, given the phonetic distance and length difference between the vowels. While eastern New England's arrangement of low vowels (Table 2.5) largely resembles an English one, the more usual American configuration (Table 2.6) requires some developments that are neither discussed in Dobson (1957) nor found in the two East Anglian and two West Country dialects examined above in Wright (1905).

2.3 *The Linguistic Atlas of New England* and other studies

2.3.1 Early evidence

There are three types of early evidence regarding New England phonology that will not be reviewed here: a) evidence found in early non-standard spellings, for example in town records (Orbeck 1927); b) observations made by travelers, whose description of sounds is often hard to interpret; c) manuals of correct spelling or pronunciation published in New England, whose degree of independence from an English standard is unknown.

That being said, the observation of Barton, a spelling reformer from Dutchess County, New York, is too directly relevant to be overlooked. As quoted in Labov (1994: 317), Barton "criticizes [English orthoepist] Walker 'in making the sound of *o* in *not,* and *a* in *far* to be different' ... [and] differentiates his own pronunciation in this respect from that of the New England orthographers." This is evidence for the 'General American' merger of /ah/, in *far,* and /o/, in *not,* around 1830, just outside of (western) New England. If the other orthographers in question were from western New England, where /o/ and /oh/ remained distinct, then Barton's remark suggests a further contrast, and hence a three-way distinction between /ah/, /o/, and /oh/, there.

Though they are somewhat earlier, the extensive descriptions of American speech made by Noah Webster, born in 1758 in Hartford CT (in western New England), also reflect a robust three-way low vowel distinction. Reviewing Webster's vowels, Pilch (1955) includes a fourth vowel, /ae/, in setting up two parallel short-long pairs, one in front, one in back: *g[æ]ther, f[æː]ther, b[ɒ]ther, d[ɒː]ghter.*

The continued existence of the three-way distinction can be seen from the self-reports of two linguists. Grandgent, born in 1861 and whose dialect "was formed in Boston and Cambridge" (1891: 199), uses three different symbols for the low vowels in a transcription of his own speech.[47] Moulton, born in Providence in 1914, describes his /ah/ and /o/ as "two low central vowels that are identical in quality and differ only in quantity", while his back rounded /oh/ is distinct from both (Moulton 1990: 126).[48]

This suggests that a three-way vowel distinction between /ah/, /o/, and /oh/, which §2.2.3 has shown was characteristic of the seventeenth century, survived among some American speakers into the late nineteenth century in both Boston and Providence. Allowing for differences of incidence, this is the same phonological configuration as is found in RP, as well as in English (but not Scottish) and southern hemisphere varieties (Wells 1982).

2.3.2 *The Linguistic Atlas of New England (LANE)*

In the early 1930's, the *Linguistic Atlas of New England* (Kurath 1939-1943) interviewed 413 subjects across New England, including 11 in the study area in southeastern New England. Most *LANE* informants were born between 1850 and 1875. The interviews were conducted by nine fieldworkers, who each worked in a different area, recording – manually – the phonetic form of 814 words and phrases (see Table 2.8 for the symbols used for the low vowels). There was no direct attempt to determine the inventory of vowel phonemes, using minimal pairs for example, so any attempt to reconstruct it depends on comparing similar words like *rod* and *taught.*

From the *LANE* data, Kurath *et al.* (1939: 8) make a primary division between Eastern and Western New England, a line which runs through Connecticut, Massachusetts, and Vermont, largely following the settlement boundary, but also coinciding with a "seam" of low population density.

[47] Grandgent thinks he may be atypical, and that others have the merger: "My ɔ is almost, and my *o* is quite unrounded; I think, however, that the rounded vowels are common in eastern Massachusetts" (1891: 199).

[48] "It seemed incredible [to a young Moulton and his friends] that people could pronounce *collar* and *caller* both as /ˈkɒːlə/ where we distinguished them as /ˈkɑlə/ vs. /ˈkɔːlə/ [i.e. by quantity and quality]" (1990: 130).

						ɔ˄
			ɐ		ɔ˂	ɔ
					ɔ˅˂	ɔ˅
			ɑ˄	ɑ˄˃	ɒ˄˂	ɒ˄
a	a˃	ɑ˂	ɑ	ɑ˃	ɒ˂	ɒ

Table 2.8: Symbols for the low vowels in the *Atlas* tradition (from Chase 1935: 5)

Rhode Island and eastern Massachusetts are both in Eastern New England. More specifically, all of Rhode Island is part of the Narragansett Bay Area, while the towns to the north fall into the Worcester Area (e.g. Mendon) or the Boston Area (e.g. Foxborough). Bristol County MA, which was once part of Plymouth Colony, and which now covers much of the study area, is considered to be in the Narragansett Bay Area (Kurath *et al.* 1939: 13), and also in the Plymouth Area (8). The maps of vocabulary items – such as *apple slump* 'deep apple pie' (a Narragansett Bay term) and *tilting board* 'seesaw' (a Plymouth term) – confirm that Bristol County belongs in both areas (Kurath *et al.* 1939: Charts 18 & 20).

Regarding the low back vowels, Kurath *et al.* (1939) make a statement which is surprising in light of Garde's Principle of the irreversibility of mergers (§1.3):

> The rounded vowel [ɒ] of Eastern New England in words like *45 rod, 286 johnnycake* and *124 crop* is losing ground. It is most consistently used in the northeast, but has been extensively replaced by an unrounded variety in the Eastern Margin and in such cities as 80 Providence in the Eastern Focal Area. The fully rounded and raised variety [ɔ] is now regarded as rustic. As a result of this trend, some Easterners now have distinct phonemes in *rod, crop* and in *724 off, 550 law, 291 salt.*(Kurath *et al.* 1939: 3)

This passage explicitly describes an ongoing reversal of the merger of /o/ and /oh/ in eastern New England, specifically calling attention to Providence.[49] If true, this would clearly contradict Garde's Principle. But it is believed that the above passage is incorrect in two different respects. First, in the parts of MA, NH, and VT alluded to, there was no progression from older merged speakers to younger distinct ones. This is known primarily because later work (§2.4) has found the merger to be intact in those areas.

In eastern Connecticut and Rhode Island, however, it is not that the merger was not reversed, but that it was never present there at all. This is known primarily because of the unreliability of the fieldworker for that area. All the communities in eastern Connecticut and Rhode Island (and all but one in Bristol County MA) were investigated by Harris (Kurath *et al.* 1939: 41), and the isogloss drawn for [ɒ] in *rod* follows the boundary between fieldworkers (Chart 8).

LANE community 42, Hebron CT, is especially important in this regard. Of three communities in Tolland County – settled from the western settlement stream – Hebron was the only one investigated by Harris, and it is also the only one inside the *rod* isogloss that indicates the low back merger. The isogloss takes a jog to the west, and into the western settlement region, just to include Hebron, which suggests that this is a fieldworker isogloss.

However, like most isoglosses, the one for *rod* represents some simplification on the editor's part. In Providence, where there were four informants, Harris actually recorded *rod* most frequently with a fronting symbol, [ɒ˂] or [ɔ˂]. The same phones were recorded in *crop,* another member of the /o/-class. On the other hand, when she recorded the /oh/-words *sauce* and *taught,* Harris most often used the symbols [ɔ] and [ɔˑ], and never with a fronting symbol. So it might seem as though the editors, Kurath *et al.,* failed to appreciate a distinction that Harris was indeed making, even if she was likely under-transcribing the

[49]The Eastern Margin refers to the western parts of Eastern New England: eastern CT, central MA, western NH, and eastern VT (Kurath *et al.* 1939: 8). Despite the above description of unrounding, the sound [ɒ] in *rod* is still described as being "in general use" in eastern CT and the Worcester area (11).

difference in sounds that she actually heard, compared to other fieldworkers.[50]

Harris was in the highest-rated group among the fieldworkers when it came to "avoidance of over-transcription (i.e., exaggeration of phonetic differences)" (Kurath *et al.* 1939: 53); with the low back vowels her problem is under-transcription, if anything. She was among the lowest-rated three for "minuteness in phonetic recording", and rated worst of all nine in "freedom of systematization according to the phonemic system of the field worker's own speech" (53).[51] Harris came from Haverhill, in Essex County MA, and she had the low back merger in her own speech (McDavid 1981: 23). Therefore, she may have had difficulty hearing the distinction in Rhode Island.

2.3.3 *The speech of Rhode Island . . .* (Kilpatrick 1937)

The controversy over Harris and the low vowels of Providence has been discussed in the literature (§2.3.6), but the doctoral dissertation written by Harris under her married name (Kilpatrick 1937) has received little attention. This thesis discusses the stressed vowels and diphthongs of Rhode Island and adjacent parts of Connecticut and Massachusetts as they appear in the records of *LANE:* in other words – though without saying so – she analyzed mainly those *LANE* records she herself had made.

Kilpatrick (1937) shows that regardless of the editorial handling of her records by Kurath *et al.* (1939), she herself was not aware of the low back distinction in Rhode Island. Even the title of her Chapter 7 suggests this: "[ɑ, ɒ, ɔ] as in *crop, hog, wall,"* which barely makes room for the possibility of the /o/-word *crop,* the variable word *hog,* and the /oh/-word *wall* being realized differently.

[50]Harris used [ɒ] for a wide range of vowels (Kurath *et al.* 1939: 127); the diacritic may be quite significant.

[51]It is interesting, given these ratings, that when plans were being made to continue the *Atlas* work in the South, Kurath named Harris third in a list of recommended fieldworkers, saying "Miss Harris's work is good. She should be encouraged to remain with the *Atlas."* Kurath's only worry, apparently, was "How will the Southerners take to a Yankee – and a woman?" (Kurath ms., quoted in O'Cain 1979) In McDavid (1981: 23), we learn that Harris's strengths were in being industrious and building rapport with informants.

Of 49 informants, seven "appear to use two phonemes regularly" in these words. For these speakers, there is supposedly a three-way contrast (this is not made explicit): /ah/ is [a], /o/ ranges from [ɑ] to [ɒ], and /oh/ ranges from [ɒ] to [ɔ]. Other than one from Fall River, the seven are "chiefly rural and uneducated" (Kilpatrick 1937: 76). One is from Oxford MA, where the merger is now found, and likely was already found then. If it was, Kilpatrick (1937) was capable of finding the merger in a distinct system, as well as finding the distinction in a merged system.

The majority of Rhode Island-area informants, according to Kilpatrick (1937: 76), use one phoneme that is either roughly [ɒ] or [ɔ], according to a "geographical distribution" that is in fact completely chaotic. Although Kilpatrick deserves credit for mapping which speakers have "the same phoneme in *lot* and *law"* and which have "distinct phonemes" (Kilpatrick 1937: Map 29) – forming a near-minimal pair and creating a phonological, rather than strictly phonetic, map from it was innovative for American dialectology in 1937 – and although the raw data is not totally useless, the interpretation of that data is not trustworthy.

This can best be shown by examining a speaker like 104.2 from East Providence.[52] In the speech of this 70-year-old housewife, the words *crop, fox, frog, John,* and *rods* appear with [ɑ], while *cloth, jaundice, launch, laundry, loft, long, loss* appear with [ɒ] (Kilpatrick 1937: Maps 30-36). This shows a perfectly ordinary 'General American' distinction between /o/ in the lexical set LOT and /oh/ in the sets CLOTH and THOUGHT. And yet, this speaker is shown as having the same phoneme in *lot* and *law* (Map 29).

The actual pronunciations of *lot* and *law* are not stated, but there is clearly no understanding that certain sets of words spelled with *o* almost always group together. Given Kilpatrick *née* Harris's merged upbringing, it is understandable that she would not intu-

[52]Kilpatrick (1937: 37) lists the speaker as 104.2 from Rehoboth, but it is clearly the same person who is listed as 81 from East Providence in Kurath *et al.* (1939: 178).

itively know which words belonged in which class. But it seems that her training was also insufficient for her to recognize a low back distinction when she heard one.

2.3.4 *Short* **o** *in the speech of New England* (Chase 1935)

In another little-known thesis based on *LANE* data, Chase (1935) analyzed the low vowels in eight areas, together covering about half the territory of New England. Despite its title, Chase takes account of all three low vowel word classes, examining many reflexes of /o/, but also /oh/-words such as *law* and *water,* and /ah/-words such as *barn* and *palm* (1935: 1).

Chase finds a clear system of two low vowels, where /ah/ ≠ /o = oh/ – phonetically, the categories are [a ∼ ɑ] vs. [ɒ ∼ ɔ] – in three areas: southern Maine, the New Hampshire coast, and Essex County MA (1935: 50-2).[53] This pattern will be called ENE (Eastern New England), referring to its present distribution.

In western Connecticut and western Vermont, an equally clear conclusion is reached: a two-vowel system where /ah = o/ ≠ /oh/, phonetically [ɑ] vs. [ɔ]. This pattern will be abbreviated as MAIN (Mid-Atlantic / Inland North).[54]

In the lower Connecticut Valley (in west-central Massachusetts and north-central Connecticut), all three word classes are tentatively stated to be separate phonemes: /ah/ ≠ /o/ ≠ /oh/, [a ∼ ɑ] vs. [ɑ] vs. [ɔ] (Chase 1935: 61). The /ah/-class "is recorded more frequently with [a] than with [ɑ]" (ibid.), suggesting that some speakers have the MAIN pattern, but most retain a three-way distinction, abbreviated 3-D.

For these five sections, Chase's analysis essentially agrees with later findings, although

[53]North of Boston, and initially settled before it, Essex County contains e.g. Andover, Gloucester, Ipswich, Newbury(port) and Salem. The phonological pattern here is made quite explicit, e.g. "such pairs as *card* and *cod* thus have different vowel phonemes" (Chase 1935: 50).

[54]"…words like *hot* and *heart* have one and the same vowel phoneme and words like *soft* and *salt* have another phoneme; and it is on this basis that I assume that *hot* and *soft* [both "derivatives of Middle English short *o,"* as in Chase's title] have two distinct phonemes and not merely two phones within one phoneme (Chase 1935: 61).

she is the first to explicitly identify an area of three-way distinction in New England. The other two areas analyzed were in eastern Massachusetts, one corresponding to Massachusetts Bay (Greater Boston), the other to Plymouth Colony (including Bristol County).

In both these areas, Chase concludes that there is a mixture of ENE and 3-D systems. That is, /ah/ appears to be a distinct phoneme for everyone, but some speakers distinguish /o/ and /oh/ while others do not. The mixture is thought to be more equal in Plymouth, with the 3-D pattern predominant in Massachusetts Bay (Chase 1935: 54-56).[55]

Although the overall analysis is far superior to Kilpatrick (1937), when it comes to explaining these patterns, Chase advances a theory which we can hardly credit, if we retain the principles of Garde and Herzog. The patterns in the northeastern regions (ENE) and the western regions (MAIN) are thought to derive from separate currents of early settlement. This is a plausible suggestion, in and of itself.[56]

But Chase believes that the areas of "mixture" in eastern Massachusetts represent the influence of the MAIN system on an original ENE system (Chase 1935: 18). Rather than a three-way merger (3-M) being the result of this contact, as would probably be supposed today, the suggestion is that the 3-D pattern is a transitional stage: the o/∼/oh/ distinction has been introduced to southeastern New England through "contact with western New England and other parts of the country", and this is presumably the first step towards a total adoption of the western pattern, with the /ah/∼/o/ merger perhaps coming next.[57]

Even if we dismiss these higher-level conclusions, though, we should still retain from

[55] Complicating the matter, in the Bay Colony area, the fieldworker Lowman tended to record /o/ and /oh/ with a very narrow distinction, e.g. [ɒ] vs. [ɒ^], while the other two, Bloch and Hanley, tended to overemphasize, writing [ɑ] vs. [ɒ^ ∼ ɔ]. Bloch, furthermore, did not distinguish /ah/ from /o/, which is assumed to be an error (Chase 1935: 54).

[56] However, Chase's suggestion that "the original settlers came over in the 17th century already having these dialectal variations" (1935: 63) may be implausible in light of §2.2.3; see §2.6.

[57] Maine and New Hampshire still retain the ENE system due to their "geographical isolation" (Chase 1935: 18), but the start of the same change is noted there too, and it is expected to accelerate under "the present-day influences of easy travel, radios, and talking-pictures" (3). This last quotation, though quaint, reminds us that it is not only in our own present day that progress has been observed in mobility and communications.

Chase (1935) the idea that many speakers in both main sections of New England – perhaps even a majority in some areas – had a vowel system that distinguished between all three low vowel word classes: /ah/, /o/, and /oh/. Chase sees this configuration as innovative, as would Kurath *et al.* (1939). If we use the logic of Garde (1961), however, we must instead conclude that this 3-D pattern is the most conservative one found in New England. This squares with §2.2.3, where it was shown that the first settlers of New England, in the 17th century, would have likely had a version of the 3-D system as well.[58]

The better-known Wetmore (1959) examines the low vowels of *LANE* in some of the same parts of New England. In the east, in coastal New Hampshire and Maine, he finds only the ENE pattern, /ah/ $\neq$ /o = oh/. In the west, in western Vermont, he finds the MAIN pattern, /ah = o/ $\neq$ /oh/. There is no mention of any three-way phonemic distinction in either of these areas;[59] nor was there in Chase (1935), however, in these particular areas.

2.3.5 *The Pronunciation of English in the Atlantic States (PEAS)*

The Pronunciation of English in the Atlantic States (Kurath and McDavid 1961) covers the whole Atlantic seaboard, but it derives its New England data from *LANE,* like the studies described above. The boundaries of the dialect areas have not changed from those described in earlier *Atlas* work.[60] However, the statements in *PEAS* tend to be more categorical, admitting less variation than the closer-range Chase (1935), for example. However, the data shown in individual synopses does not always accord with the text.

[58] It appears from Kilpatrick (1937) and Chase (1935) that the CLOTH lexical set belongs with /oh/ in the 3-D dialects of New England, like Dorset in England, but unlike East Anglia or RP (see Figure 2.7),

[59] In western Vermont, Wetmore (1959: 16) identifies an allophonic variant of /ɑ/, namely a long [ɑˑ] in *Ma,* commonly in *palm,* and occasionally in *John.*While the case of *Ma* is explicable as a positional variant – members of the /o/-class are never word-final – if a contrast existed between e.g. *balm* and *bomb, then this would be a 3-D dialect.*

[60] Although *PEAS* deals with phonology, its map of "The Speech Areas of the Atlantic States" is reproduced unchanged from Kurath (1949), where it was drawn based on lexical isoglosses. The question is not raised whether regional differences in sound and vocabulary really coincide as closely as this implies.

2.3.5.1 *PEAS:* Text

Most of the text of *PEAS,* as well as the synopses, deals with "cultivated speech".[61] Eastern New England, including Rhode Island and eastern Connecticut, is stated to have the ENE pattern of low vowels in cultivated speech:

> E[arly] M[oder]n E[nglish] /aer/ appears as the free vowel /a/, articulated low-front or low-central ... and this /a/ occurs also to some extent in *laugh, bath, glass, can't, aun't,* and occasionally in *dance, France.* EMnE short /o/ and /au/ are completely merged in a free vowel /ɒ/ (8) ... The free vowel /a/ ranges phonically from low-front [a˔, a] to low-central [ɑ˔, ɑ], the latter variant being apparently preferred by some cultured persons in urban areas ... The free vowel /ɒ/ is most commonly a low-back-raised [ɒ^˔, ɒ^] sound, more or less rounded; however, it varies all the way from low-back-unrounded [ɑ] to well-rounded [ɔ], partly by position or prosody, partly in regional and social dissemination ... The free low vowels /a/ and /ɒ/, as in *car* and *law*... are monophthongal and usually prolonged at the end of a word or syllable; in other positions their length varies considerably (Kurath and McDavid 1961: 13).

In the cultivated speech of most of western New England (and upstate New York), the MAIN pattern is indicated, and summed up just as concisely:

> [EMnE] /au/ becomes /ɔ/ ... /o/ splits into /ɑ/ and /ɔ/, and this /ɔ/, as in *cough, frost, dog, long,* is merged with the /ɔ/ derived from EMnE /au/... Earlier /aer/ becomes /ɑr/, the vowel being subsumed under the /ɑ/ from earlier /o/ (8)

[61] "The speakers classified here as 'cultured' are representatives of a group comprising the social and cultural elite and the upper middle class" (Kurath and McDavid 1961: 11). There are 36 cultured speakers in New England, of which none are within our study area; the closest are two from Boston, two from Providence, and two from Plymouth County (Bridgewater and Rochester). Synopses are given of the speech of 17 of these informants, including one from Boston and one from Providence.

> . . . Checked /ɑ/, pronounced as low-central [ɑ], sometimes fronted toward [a], is normal in *drop, John, college,* etc., in *car, garden,* etc., and in *father, palm*; it occurs also beside the more common /ɔ/ in *log, foggy,* etc., and sporadically in *half, glass, aunt* in place of the usual /æ/ . . . The free vowel /ɔ/ has a rather low tongue position and is but slightly rounded; it occurs in *law, daughter, water,* in *frost, off,* [and] in *dog, fog*. . . (Kurath and McDavid 1961: 15-16)

But within western New England, in west-central Massachusetts and central Connecticut, *PEAS* agrees with Chase (1935) in suggesting that the 3-D pattern sometimes occurs:

> In the Lower Connecticut Valley and the New Haven area. . . [c]ultured speakers in urban areas usually have two unrounded low vowels, a free low-front to low-central vowel /a/, as in *car, barn, father, palm, half, aunt,* and a checked low-central to low-back vowel /ɑ/, as in *crop, rod, John, college*; but the two are not always kept apart. . . /a/ ranges from low-front [a] to low-central [ɑ]; some speakers have [a] rather consistently, some fluctuate between [a] and [ɑ], others have predominantly [ɑ] (by preference, it seems) . . . /ɔ/ is usually well-rounded and long, but has less rounded short [ɒ]-like variants. . . (Kurath and McDavid 1961: 14)

In this western region, *PEAS* makes it clear that the /o/∼/oh/ contrast is universal, while /ah/ is "rather unstable" and contrasts with /o/ only "at times" (ibid.). When Chase (1935) identified 3-D patterns in eastern New England, it was /ah/ that was clearly a distinct phoneme, and the /o/∼/oh/ contrast was the marginal one.

2.3.5.2 *PEAS:* Synopses

By examining the synopses – which transcribe, for 17 cultured speakers in New England, the vowels recorded in seven potential /ah/-words, nine /o/-words, and five /oh/-words[62] – we observe that the regional distribution of the vowel patterns is not as straightforward as is stated in the text. Nor do the phonic records always match the phonemic configuration assigned to them in the synopses.

We begin in western New England (outside of the lower Connecticut Valley), where we expect the MAIN system. There are synopses from Burlington VT, Pittsfield MA, and Litchfield CT. Only the 75-year-old man from Litchfield shows an obvious MAIN pattern (Kurath and McDavid 1961: 45). The speaker from Burlington is a 40-year-old man; *PEAS* indicates a single phoneme for /ah/ and /o/, but we note that all the /ah/-words – *barn, father, garden, palm* – are transcribed with a length mark, [ɑˑ], while none of the /o/-words – *borrow, college, crop, John* – has such a length mark: [ɑ] (47). This is indicative of a 3-D system. The 85-year-old man from Pittsfield, on the other hand, is explicitly shown as having three low vowel phonemes: [aˑ ∼ ɑˑ] for /ah/, [ɑ ∼ ɒ˂] for /o/, and [ɔ] for /oh/ (46).[63]

In the lower Connecticut Valley and New Haven area, the text of *PEAS* identified variation between MAIN and 3-D patterns. Five synopses come from this area: (from north to south) Deerfield MA, Northampton MA, Springfield MA, Middletown CT, and New Haven CT. The speaker from Northampton, a 51-year-old woman, is shown as having a 3-D pattern (41); the 66-year-old man from Deerfield is said to have the ENE pattern, but as the /o/-words have [ɒ] and the /oh/ words have [ɔ˅ˑ ∼ ɔˑ], a 3-D system seems more likely (42). For the 55-year-old woman from Springfield and the 60-year old man from Middletown,

[62]The words are: *aunt, barn, father, garden, glass, half, palm* (usually /ah/); *borrow, college, corn, crop, forty, horse, John, log, morning* (usually /o/); *daughter, dog, frost, law, water* (usually /oh/).

[63]These small differences could be fieldworker errors, but it seems unlikely. The Burlington and Pittsfield records (probably 3-D) were made by Bloch, one of the highest-rated fieldworkers. And the Litchfield interview (definite MAIN) was done by Hanley, rated lower on both systematization and over-transcription (Kurath *et al.* 1939: 53).

the same comment applies: *PEAS* has assigned them a MAIN configuration, but they fairly consistently show long [ɑˑ] for /ah/ and short [ɑ] for /o/, suggesting a three-way distinction (40, 43). This is even clearer for the 45-year-old woman from New Haven, who produced [aˑ ∼ a˃ˑ] in /ah/-words and [ɑ] in /o/-words (44).[64]

In eastern New England, eight cultured speakers are shown with the ENE pattern, and for three of them – Portland ME, Concord NH, and Billerica MA – this can be confirmed from an inspection of their transcribed vowels (32-34). The speaker from Nobleboro ME probably belongs in the same group (31).[65] But a 46-year-old woman from Boston MA is shown with the 3-D pattern – [a˃ˑ ∼ ɑ˂ˑ] for /ah/, [ɑ ∼ ɒ][66] for /o/, and [ɔˇˑ ∼ ɔˑ] for /oh/ – and a 42-year-old man from Plymouth is said to have the ENE configuration, but with consistent [ɒ] in /o/-words and [ɔˇ ∼ɔ] in /oh/-words, a 3-D pattern seems clear (35-36). This would come as no surprise to readers of Chase (1935), but the text of Kurath and McDavid (1961) gives no hint to it.[67]

The remaining three synopses are of speakers interviewed by Harris in Providence RI, Newport RI, and New London CT. They are said to have the ENE system, and the transcriptions support this, usually with [a] for /ah/, and a range of phones for /o/ and /oh/, but without a consistent difference between word classes. We essentially must discard this evidence; at least in these synopses, Harris's transcriptions represent something closer to her own Essex County dialect than to anything found in Rhode Island or Connecticut.

The most important revelation from *PEAS* is that *in most parts of New England,* at least some speakers preserved three distinct low vowel phonemes: /ah/ ≠ /o/ ≠ /oh/. In the text

[64]The fieldworker in Northampton and Springfield was Bloch; in Middletown and New Haven, it was the equally highly-rated Kurath. Deerfield was done by Joos, a lower-rated fieldworker (Kurath *et al.* 1939: 53).

[65]Except for Concord, these interviews were done by Lowman, the highest-rated fieldworker overall but who rated poorly on "freedom from systematization according to the phonemic system of the informant" (Kurath *et al.* 1939: 53). The Concord interview was done by Chapallaz, who had similar practices.

[66]The symbol ɑ "is used with the kind permission of Hans Kurath" (Wetmore 1959: 12). Representing a low back unrounded vowel, it was not used by *LANE,* but *PEAS* emends certain *LANE* transcriptions to it.

[67]The Boston interview was by Hanley, the Plymouth one by Reynard, the lowest-rated fieldworker.

of *PEAS,* this configuration is only said to occur in central Connecticut and west-central Massachusetts. But the synopses explicitly identify it not only in that area (Northampton) but in eastern Massachusetts (Boston) and far western Massachusetts (Pittsfield) as well.[68] And the actual phonetic transcriptions confirm several other 3-D speakers in the Connecticut Valley and reveal two more in Burlington VT and Plymouth MA.[69]

Where the 3-D pattern is found in western New England, it consists of an /ah/ and /o/ that are close – sometimes distinguished only by length – and an /oh/ that is more clearly distinct. For example, Springfield shows [ɑˑ] for /ah/, [ɑ] for /o/, and [ɔ ∼ ɔˑ] for /oh/. In eastern New England, the mirror image configuration – /ah/ is far from /o/, while /o/ and /oh/ are close – is observed in Plymouth, where /ah/ is usually [aˑ], /o/ is [ɒ], and /oh/ is [ɔˇ ∼ɔ].[70] If we interpret these patterns as merger-by-approximation-in-progress, it makes sense that /ah/ and /o/ would merge in western New England, leading to the MAIN system, and that /o/ and /oh/ would merge in eastern New England, leading to the ENE system.

But what does not fit very well is that the three *PEAS* synopses from New Hampshire and Maine show no sign of the 3-D system. Chase's (1935) analysis of the same data agrees that northeastern New England consistently has the ENE pattern. Since in general these are conservative areas retaining older Massachusetts words and sounds (Kurath *et al.* 1939: 2), it is surprising that the /o/∼/oh/ merger appears more advanced there than in Boston.

[68]Given how well-known *PEAS* is, it is odd that these 3-D patterns are not better known. The following summary of the synopses for western New England cannot derive from a careful examination of them (especially Northampton, where three phonemes are clearly listed): "Informants from New Haven and Middletown, Connecticut; Springfield, Northampton, and Pittsfield, Massachusetts; and Burlington, Vermont . . . are all represented as having . . . [ɑ] for /ɑ/ and /aˑ/, and [ɔ] for /ɔ/" (Boberg 2001: 14). In fact, all six of these speakers show evidence of a distinction between /a/ and /ɑ/. If so, they have 3-D patterns, not MAIN.

[69]While 3-D must be the most conservative low vowel pattern, these speakers are not all elderly; several are in their 40's, hence born around 1890.

[70]For a few speakers – e.g. Boston, New Haven – the three phonemes are spaced more evenly.

2.3.6 Resolving the Providence controversy: Moulton (1968) and McDavid (1981)

In §2.3.1, the self-report of Moulton (1990) was given as evidence for the 3-D system existing in Providence RI as late as 1914. Moulton's is the western type of 3-D, where /o/ is distinguished from /ah/ by quantity, and from /oh/ by both quality and quantity. In an earlier publication, Moulton (1968) alluded to the error made in the *Atlas* tradition, whereby Providence was placed in eastern New England, and said to have the /o/∼/oh/ merger.

Calling the *LANE* fieldworkers "hopelessly and humanly incompetent at transcribing phonetically the low and low back vowels they heard from their informants" – though he concedes that "[p]robably none of us could have done any better" – he argues for a phonemically oriented type of dialect fieldwork, that would include asking subjects which sounds rhymed, because "our informants CAN do better" (Moulton 1968: 464).[71]

And so, returning to his childhood Providence dialect, and asking himself "as an informant" whether any of the words *cart, cot,* and *caught* rhyme, Moulton (ibid.) replies that none of them do, as they are /kɑːt/, /kɑt/, and /kɔt/, respectively.

McDavid (1981) is a response to Moulton's challenge to the practices of *LANE* and the error they led to in the case of Providence. McDavid initially identifies the problem as the fieldworker Harris, and confirms that Harris herself had a /o/∼/oh/ merger, unlike the other eight *LANE* fieldworkers (1981: 23).[72]

By listening to audio recordings (see §2.5) made of two *LANE* informants from Providence, including the one whose *PEAS* synopsis had shown no systematic contrast, McDavid

[71]This is quite unfair to the *LANE* fieldworkers. The low vowels were acknowledged to be challenging – "probably the most difficult of vowel-sounds to hear and analyze" (Chase 1935: 4) – but most fieldworkers seem to have handled them creditably. Harris alone may deserve to be called "hopeless"; but see below.

[72]Before laying the blame exclusively at Harris's feet, we should remember that Kurath, and *LANE* headquarters, were located at Brown University in Providence. It is surprising that no one was familiar enough with the local dialect to prevent Harris's transcriptions, and her even more erroneous dissertation, from being accepted.

confirms that the /o/∼/oh/ distinction was indeed present (24).[73] And by retrieving the entire *LANE* record for the speaker in the synopsis, McDavid (1981: 24-25) shows that Harris actually did transcribe /o/ and /oh/ with essentially non-overlapping sets of symbols.[74]

It seems that the particular words selected for the synopsis were an unlucky small sample which did not reveal the typical distinction made by Harris for this speaker. Despite a wide range of symbols for both phonemes, /o/ was most often transcribed with [ɒ], and /o/ with [ɔ]. McDavid ends up rehabilitating Harris: "Harris's phonetics were tolerably minute . . . Harris's *LANE* transcriptions come off very well" (1981: 25-26).

McDavid may be going too far, but it does seem as though Harris was sometimes able to hear and transcribe a distinction that she was unable to consciously recognize; she herself considered this speaker – like the other three she interviewed in Providence – to have the /o/∼/oh/ merger (Kilpatrick 1937). Because of the uncertainty over her reliability, the other *LANE* records made by Harris in the study area were not analyzed.

McDavid (1981: 26) concludes by addressing a type of question that is not often asked: "why should Providence retain a contrast that has been lost in Boston?"[75] He attributes it to the historic tradition of "individualism and dissent" in Rhode Island; "this local pride has undoubtedly contributed to the preservation of speechways distinct from those of Boston," including the /o/∼/oh/ distinction.

But this explanation seems dubious, since the low back distinction has also been preserved, so far, across a large swath of the eastern United States: the Mid-Atlantic and Inland North. Providence simply happens to be at the edge of this region. It seems backward to

[73] Unfortunately, there is no confirmation that /ah/ and /o/ were also distinct, but given Moulton's testimony, one would think that they were, since the *LANE* informants were considerably older than Moulton.

[74] Harris's transcriptions as given in McDavid (1981) do not always match the ones given in the *PEAS* synopsis (Kurath and McDavid 1961: 39). For example, the /o/-word *borrow* is transcribed with [ɑ˃] in McDavid (1981), but with [ɒ˂] in *PEAS.* The /oh/-word *water* has [ɔ] in McDavid (1981), [ɔ˅] in *PEAS.* These admittedly small discrepancies add somewhat to the confusion that McDavid (1981) is attempting to resolve.

[75] Not many years later, after the MAIN pattern became established in Providence, one would have to ask why Providence retained one contrast among three original phonemes, while Boston retained the other.

only ask why Rhode Island has resisted the spread of a change, when it is still totally unknown why the change occurred in Massachusetts.[76]

2.4 More recent studies

2.4.1 Carver (1987)

Although it does not deal with phonology at all, Carver (1987) draws dialect boundaries within New England based on a different set of vocabulary items than Kurath *et al.* (1939). Carver's data derives from interviews conducted in the late 1960's for the *Dictionary of American Regional English* (Cassidy 1985). Although Carver's presentation of dialect areas is confusing, especially compared to the *Atlas* approach, he presents one map that is highly relevant for this study (1987: 29, Map 2.4).

The lines on Carver's Map 2.4 – "The New England Dialect Layer Based on 45 *DARE* Isoglosses" – represent lexical isogloss bundles, although the specific words involved are never stated, and their individual distributions never given. Essentially, the map indicates that Rhode Island has fewer characteristically New England words than Massachusetts does. A heavy line runs east-west along the northern border of Rhode Island, separating informants in Douglas and Uxbridge MA from one in Pascoag (Burrillville) RI. And a lighter line running north-south through Bristol County divides New Bedford MA from

[76]McDavid also notes that "[i]t may be surprising that a difference in the structure of phonemic systems should set off two communities less than fifty miles apart, in a heavily industrialized region; but the difference . . . is explicable in the light of cultural history (1981:26)"

This expression of surprise is very similar to one made by Herold as a motivation for her research: "I began to wonder why, in late 20th-century America, with its highly mobile population, there would be a major difference between the phonemic inventories of two towns located only 15 miles apart" (1990: 108-109).

I cannot deny that a similar surprise motivated this dissertation, but it seems to me that it just amounts to an incredulity over the existence of sharp dialect boundaries, perhaps especially in the United States. It is hard to imagine anyone in Belgium or Switzerland expressing an equivalent surprise; in those countries, not only does 15 or 50 miles represent a considerable cultural distance, but the existence of linguistic boundaries is considered commonplace.

This difference between America and Europe can be better understood under the assumption that sharp dialect boundaries can develop over time, even if their ultimate reasons for existence lie in the past.

Little Compton RI.

Between them, these two lines follow exactly the path of the dialect boundary that will be identified in Chapter 4, which divides Bristol County MA in two. The part closer to Rhode Island, including Fall River and Rehoboth / Seekonk, will be shown to have developed the same MAIN low vowel pattern as Rhode Island. The rest of Bristol County, including New Bedford and Taunton, will be seen to have developed the ENE pattern, as in Plymouth County to the east.

It is quite unclear on what basis Carver drew his eastern line so accurately. Recall from §2.3 that Kurath *et al.* assigned Bristol County MA to *both* the Plymouth and Narragansett Bay areas, and their Charts 18 and 20 show no difference between Fall River and Taunton (1939: 35-36). But though he has just a single Bristol County informant, in New Bedford, Carver (1987) is led to split Bristol County in two, exactly as the phonological evidence of Chapter 4 does.[77]

2.4.2 Boberg (2001)

Using Telsur data – the telephone interviews that form the basis for Labov *et al.* (2006) – Boberg (2001) re-examines the phonology of western New England, including the status of the low vowels. We have seen above that in the *LANE* era, the 3-D system had not fully yielded to the MAIN system in western New England. Boberg (2001) shows that the MAIN pattern, with its low back distinction, still prevails today in Connecticut (19-20), but in Springfield MA, phonetic approximation may signal the onset of merger (22-23).

[77] As a national project, *DARE* did not have nearly as many informants in New England as *LANE* did. The boundaries drawn by Carver (1987), then, necessarily run through areas for which there is no *DARE* evidence. Boberg notes this in reference to a line drawn between eastern and western Vermont, saying "the position of Carver's line through central Vermont can be nothing more than a vague guess, apparently based more on Kurath's precedent and the intuitive appeal of the Green Mountains as a natural dialect boundary than on new or independent evidence. Carver's New England boundaries may in general be founded on more and better lexical isoglosses than Kurath's, but the comparative sparsity of his sample makes the location of some of these boundaries, if anything, more reliable" (8). For whatever reason, when he drew the eastern boundary of the Rhode Island vocabulary area, Carver's "vague guess" matched the phonological isogloss of Chapter 4.

The low back merger has more seriously affected western Vermont during the 20th century, with seven speakers showing a clear merger and only one elderly speaker maintaining the distinction.[78] Boberg speculates that this Vermont merger spread over the Green Mountains, possibly along with the original settlers, but not necessarily (22). The vowel resulting from the Vermont merger is approximately [ɒ] in Burlington (northwest Vermont), but [ɑ] in Rutland (west-central Vermont) (24).

It neither case is it explicitly stated whether the Vermont merged vowel includes the /ah/-class in a three-way merger (3-M). One would certainly expect so, if it evolved from a MAIN system, in which /ah/ and /o/ would have already been merged. Burlington's system is said to resemble the Canadian ones to the north (Boberg 2001: 25), which suggests 3-M. And Rutland's low back merger is in low-central position, not low-back, making a merger with /ah/ even more likely.

2.4.3 *The Atlas of North American English (ANAE)*

Analyzing the same interviews as Boberg (2001) in western New England, and others in the eastern part of the region, Labov *et al.* (2006: Ch. 16.4) make it more clear that it is indeed the 3-M system which has developed in Burlington and Rutland VT. Although /ah/ is fronted before /r/, other /ah/-words still have the same vowel as /o/; *father* rhymes with *bother* (228-230).[79] The low back merger characteristic of eastern New England has spread to western Vermont, or in any case developed there, but eastern New England's low central distinction has not. This is in keeping with the fundamental principles of merger.

Outside of western Vermont, *ANAE* identifies clear MAIN systems in Hartford, Mid-

[78]In Wetmore (1959: 18), the low back distinction is reported throughout western Vermont, though in the northern part of that area, /o/ and /oh/ are close.

[79]This fronting of /ahr/ appears to be an innovation. Wetmore (1959) describes the usual western Vermont /ahr/ as an "/r/-colored [ɑ̣]". However, in Franklin County, north of Burlington, some /r/-lessness is found, and the older informant "has a fronted ingliding [ɑ̣˙ᵊ] . . . reminiscent of eastern New England, the original home of numbers of settlers in northwestern Vermont (15-16). In Labov *et al.* (2006), the allophone seems to have fronted further, with an F2 at least 100 Hz higher than that of /ah = o/ in other environments.

dletown, New Britain, and New Haven CT, as well as from six speakers in Providence RI. Acoustic analysis was performed on three of these informants – the oldest born c. 1940 – and no /ah/∼/o/ distinction was reported, although it is not certain that the Telsur methodology would have identified a potential distinction based only on vowel length, as "the /ah/-class was not the focus of direct elicitation" (Labov *et al.* 2006: 230).[80] And as forecast by Boberg (2001), Springfield in western Massachusetts appears as a mixed area; one older speaker has a full-fledged low back merger, and a 3-M system overall.

In eastern Massachusetts (Boston, Worcester), New Hampshire (Concord, Manchester), and Maine (Portland, Waterville), the /ah/∼/o/ distinction is clearly indicated (Map 16.5), and the /o/∼/oh/ merger mainly so (Map 16.3). In the area as a whole, 22 of 29 informants show a total low back merger, while the others' merger appeared to some degree incomplete in either perception or production. But given the antiquity of the low back merger in this region, especially in New Hampshire and Maine (see §57, it is likely that these informants exhibit a stable ENE pattern in their usual speech.

To summarize this section, there is good evidence for an earlier three-way-distinct low vowel pattern (3-D) in most parts of New England. The evidence of this is best for southeastern New England: eastern Massachusetts and Rhode Island. It is even more clear from this review, however, that the most typical systems in the 20th century have become ENE in eastern Massachusetts, with the /o/∼/oh/ merger, and MAIN in Rhode Island, with the /ah/∼/o/ merger.

That is, a phonological boundary has developed where only a phonetic difference existed before. The next section will help to demonstrate this.

[80] The results of Chapter 4 suggest that most living Rhode Islanders have the MAIN system. The oldest with this pattern was born in 1908, while Moulton, born in 1914, reported the 3-D pattern for himself. Considering Moulton's (1968) somewhat patronizing account of the non-merger of /o/∼/oh/ in Rhode Island, it is interesting that he seemingly remained unaware of any merger of /ah/ and /o/ there. When it happens, the loss of length in /ah/-words – creating homonyms like *heart∼hot* and *Mark∼mock* – is quite striking to a listener used to association non-rhoticity with the ENE dialect of Boston. It would presumably have a similar effect on an older, 3-D speaker from the same community.

2.5 The 'Hanley recordings': voices from *LANE*

Though portable sound recording was all but unknown in the early 1930's, the *LANE* staff appreciated the advantages of creating a faithful and permanent record of an informant's speech, rather than a list of words and phrases phonetically transcribed on the spot by a fieldworker. And so from 1932 through 1934, Hanley and several other fieldworkers revisited many of the same informants that had been interviewed several years previously for *LANE.*[81] For each speaker, they recorded one or more aluminum phonographic discs, using a semi-portable recording apparatus, designed by Hanley, that fit – barely – in the back of a car (Hall *et al.* 2002). These discs contain five minutes of speech per side, so that most informants have from 10 to 30 minutes of conversation recorded.

Having listened to digital copies, I can say that most of the Hanley recordings are not themselves of poor quality, but some discs contain a great deal of noise, and others a lot of strained conversation or silence.[82] But the recordings are entirely adequate for acoustic analysis, which was carried out for three speakers. Needing to listen repeatedly to tokens of particular words, or pairs of words, gives one a new respect for the *LANE* fieldworkers, who had only one opportunity to hear a word and record its pronunciation accurately.[83]

[81] I have not made a careful reckoning, but would estimate that less than half the original *LANE* informants were revisited. The main collection is housed in the American Folklife Center of the Library of Congress, where it is known as the 'A[merican] D[ialect] S[ociety] Collection', and has recently been digitized. Other complete or partial copies of the collection exist at the University of Massachusetts at Amherst, *DARE* heaquarters at the University of Wisconsin, and at the University of Georgia, which is technically the headquarters of the *Linguistic Atlas of the United States and Canada,* of which *LANE* was the first publication. The collection also includes recordings of the *LANE* fieldworkers themselves, of various other notables, including an elderly Charles Grandgent and a young B.F. Skinner, of speakers of Gullah, and other treasures.

[82] One notes Lowman's greater ability as a fieldworker than Hanley. In an entertaining moment in Foster RI, the informant and Hanley discuss circumstances that led to 'Miss Harris' becoming Mrs. Kilpatrick!

[83] But as noted in §2.5.4, one loses respect in the case of Harris, because the low back distinction she consistently failed to hear across her territory is not even a close one, for the Providence speaker examined.

2.5.1 Maine

As noted in §2.3.5.2, Maine and New Hampshire are the only New England states where no evidence of a three-way-distinct low vowel system was found in the *LANE* records, and this is curious given their generally conservative dialects. A brief investigation of two Hanley recordings from Maine suggests that Lowman was correct in assigning the ENE configuration – /ah/ $\neq$ /o = oh/.

No audio recording exists of the two cultured Maine speakers whose synopses appear in *PEAS.* But for *LANE* informant 356 from Biddeford ME (born c. 1855), the auditory impression is similar to the synopsis of the informant from Portland. The phoneme /ah/ is roughly [ɑ], while /o/- and /oh/- words both occur with a back rounded vowel close to [ɔ].

For *LANE* informant 352.1 from York ME (born 1890), /ah/ appears as [a], while the low back vowels vary over a larger phonetic range centered around [ɒ]. For example, the word *morning* is at least as front as [ɑ], while *long* appears with a vowel close to [ɔ]. This dialect gives the auditory impression that if there are regular word class differences between /o/ and /oh/, they are smaller than the allophonic effects of surrounding consonants.[84]

Fortunately, this speaker produced four tokens of each word class in the environment before word-final /t/: for /o/, *lot* and three tokens of *not;* for /oh/, *bought, caught,* and two tokens of *thought.* Some of these near-minimal pairs, such as *bought* vs. *not,* sounded slightly different. Hearing only those words, I would have suspected a low back distinction, but the rounded sound of *lot* and the far-from-far-back vowel in *caught,* (not to mention in other environments like *all, haul*), would have suggested the low back merger.

Instrumentally measuring these tokens revealed formant ranges that were overlapping, but not exactly equal. For the /o/-tokens, the F1 range was from 766 to 860 (mean 816); for the /oh/-tokens, the range was from 756 to 821 (mean 783). For F2, the /o/-tokens ranged

[84]Similarly, duration differences between the word classes, if any, sounded smaller than duration differences made within each class for syntactic or prosodic reasons.

from 1163 to 1318 (mean 1249), while the /oh/-tokens ranged from 1167 to 1268 (mean 1218). Although for both formants, the vowels tend to differ in the direction expected if there were a distinction, both differences in means are less than 50 Hz, a statistically insignificant result even by a one-tailed t-test: $p\ (F1) = 0.14$; $p\ (F2) = 0.24$.

Assuming this result does not indicate a vestige of a 3-D pattern previously found in Maine, the discrepancy remains between northeastern New England's overall linguistic conservatism with respect to the Boston area, yet its apparently earlier completion of the low back merger.

2.5.2 Cambridge

One of the most unusual Hanley recordings is of Henry Wadsworth Longfellow Dana, a native of Cambridge. Dana was not a *LANE* informant, but had he been one, he certainly would have been considered a cultured speaker. Born in 1881 and educated at Harvard, he was descended on his father's side from early settlers of Cambridge; his maternal grandfather was the poet Longfellow.[85] Though only ten minutes long (one disc), this high-spirited recording[86] suggests that the upper class of the Boston area retained a clear 3-D pattern at this time.

The auditory impression of Dana's /ah/-words was of a long, low, unrounded vowel varying from front (in e.g. *can't*) to central (in e.g. *ask*): [aː ∼ ɑː]. The /o/-class was

[85] A good sense of this environment, and of Dana's position in it, comes from the following memoir of a Sunday afternoon salon in the late 1920's: "Miss Carrie sat in the center of a banquette, a large circular tea table in front of her, with capacious teapot and hot [water] pot and caddy and slop jar, "sinks" full of brandied cherries and candied ginger, and large trays of sandwiches, crusts trimmed, and petits fours and cookies, the dishes being of porcelain…She handed out "tea" (plate, napkin on plate, saucer over napkin, cup over saucer, and take your own sandwich and cake) in due order of precedence. Harry Dana always came first even if [Harvard] President Lowell was there" (Morehead 1960). But incongruous though it may sound, Dana was not only a researcher of Cambridge and his family's history, he was also a Communist who had lived in the Soviet Union and written about it extensively (LNHS 2004).

[86] Hanley sounds more at ease in this milieu than on most recordings. According to a note on the disc's jacket, it was made "when [he] spoke at the meeting of a lunch club where [Dana] was one of those present. The circumstances were a little strange, and there was some noise from a luncheon in the next room."

shorter and usually back and lightly rounded, but sometimes unrounded and more central: [ɑ ∼ ɒ]. The word *on* appeared once with each of these qualities. The /oh/-words had a noticeably-raised, clearly-rounded back vowel that varied in length: [ɔ ∼ɔː].

An acoustic analysis confirms that there are three distinct word classes. In fact, as Figure 2.1 shows, there is hardly any overlap in formant values between the three word classes (7 tokens of /ah/, 11 of /o/, and 13 of /oh/). Dana's categories are so distinct that even without measuring rounding or length, we can see that he has a 3-D system.

The /ah/-class is significantly *fronter* than the /o/-class. The mean F2 value is 1401 Hz (standard deviation 67) for /ah/ and 1192 Hz (s.d. 44) for /o/. A t-test shows that this F2 difference of 209 Hz is statistically significant ($p < 0.001$).

The /oh/-class is significantly *higher* than the /o/-class. The mean F1 value is 612 Hz (s.d. 54) for /oh/ and 788 Hz (s.d. 81) for /o/. This F1 difference of 176 Hz is also statistically significant ($p < 0.001$).

Although the categories are roughly equally spaced in terms of F1 / F2, the usually-rounded /o/ *sounds* closer to /oh/, the word class it would soon merge with in this area – than it does to the long, sometimes quite front /ah/. The next 3-D system to be examined shares that characteristic.

2.5.3 Plymouth

A Hanley recording exists for *LANE* informant 112.2, whose synopsis is in *PEAS* (Kurath and McDavid 1961: 36). The editors proclaim the ENE system for this speaker, but since most of his /oh/-words were recorded with a higher vowel symbol than most of his /o/-words, in §2.3.5.2 I wondered if the speaker, born c. 1890 in Plymouth, really had a 3-D system.

Auditory analysis supported this impression. In /ah/-words, a long [ɑ̘ ː] was the usual sound. For /o/, the vowel was shorter and varied over the range [ɑ ∼ɒ], only rarely sounding

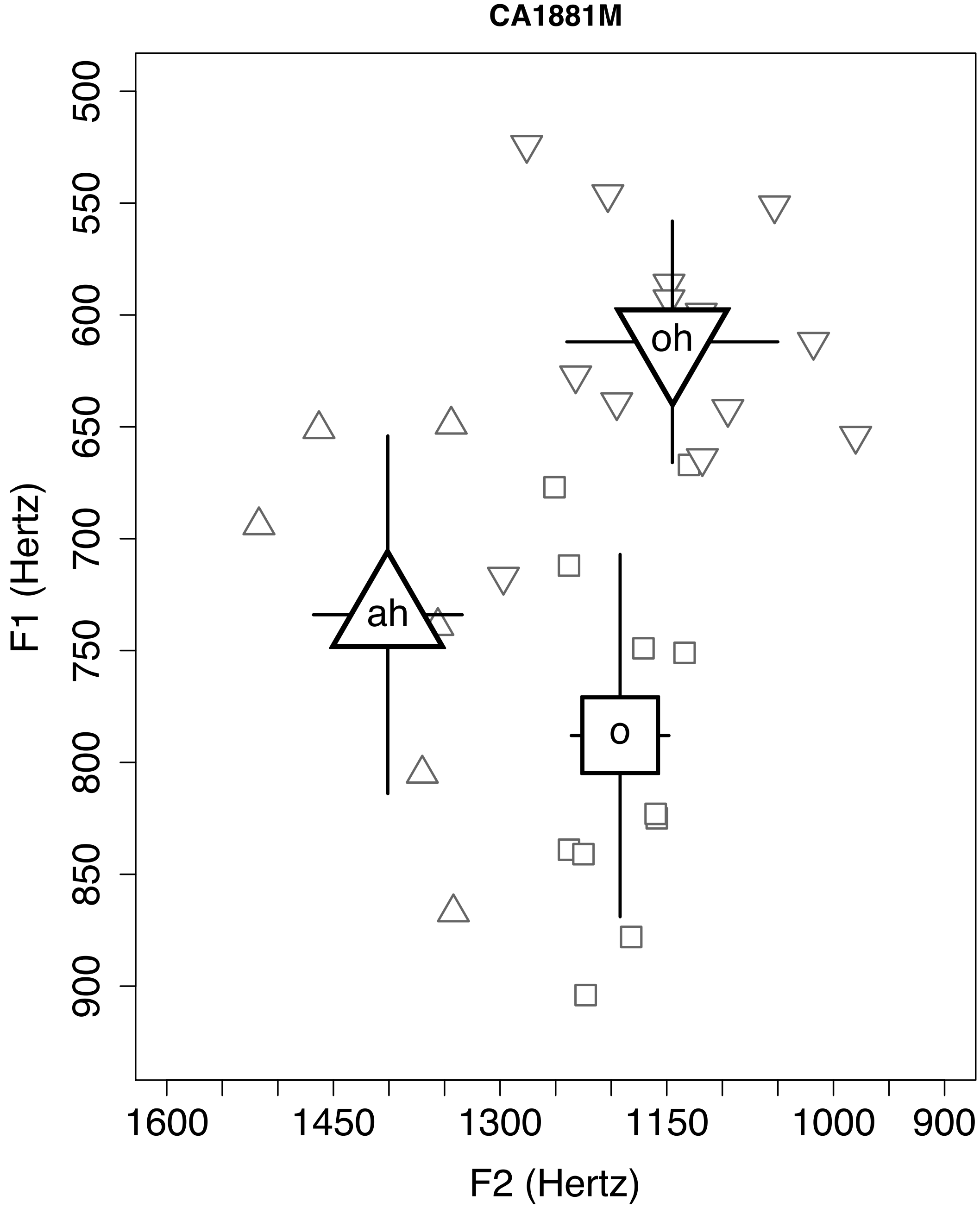

Figure 2.2: Henry Wadsworth Longfellow Dana (b. Cambridge MA, 1881): tokens, m eans, and ±1 std. dev. whiskers for /ah/ (triangles), /o/ (squares), and /oh/ (inverted triangles)

rounded. The few tokens of /oh/ in the 20-minute recording were mainly far back, lightly rounded, and sounded slightly higher: [ɒ̝].

An acoustic analysis of 25 tokens of /o/ and 19 of /oh/ showed complete overlap between the vowel clouds for F2, but only partial overlap for F1 (where /o/ ranged from 657 to 809 Hz, and /oh/ from 592 to 719 Hz). The mean F1 value for /oh/ was 67 Hz higher than the mean for /o/ – 660 vs. 727 Hz – and although this is a small acoustic difference, it was statistically significant at the $p < 0.001$ level. It also agrees with my own auditory impression, as well as that of the fieldworker Reynard.[87]

However, as will be discussed in §4.4.1.2, a gross comparison like this can lead to a spurious result, because some /oh/-tokens appeared in environments – word-final *raw,* after /w/ in *walking, water,* before final /l/ in *fall* and final /ŋ/ in *long* – which had no counterparts among the /o/-tokens.

For this reason, a restricted comparison was made, using only tokens before word-final /t/, of which there were seven of /o/ – *hot,* two of *not,* three of *lot,* and *lots* – and five of /oh/: *ought, taught,* and three of *thought.* Again, the word classes overlapped in the F1 dimension, but only partially. The mean for /oh/ was still 49 Hz higher than that for /o/; a two-tailed t-test gives a p-value of 0.06, so we can likely reject the null hypothesis of merger.[88]

Besides this small but significant height difference, there are probably other acoustic properties distinguishing the /o/ and /oh/ word classes for informant 112.2. Duration may play a role, although it was not discernible from the small number of tokens of /oh/ in the recording. What was audible, though not captured well by single-point measurements, was a offgliding diphthongal quality in some tokens of /oh/. In summary, informant 112.2

[87] If this is an example of the accuracy of one of their *worst* fieldworkers, the proficiency of *LANE*'s best fieldworkers must have been astonishing.

[88] A one-tailed t-test is actually more appropriate here, because if /o/ were found to be *higher* than /oh/ – a very unexpected outcome – this would not be seen as confirming a /o/∼/oh/ distinction. The p-value for the one-tailed test is half as large: 0.03.

from Plymouth does have a 3-D low vowel pattern, although his /o/ and /oh/ phonemes are indeed close.

2.5.4 Providence

A recording also exists for *LANE* informant 80.4, who was born c. 1890 and originally interviewed by Harris. We have seen in §2.3.5.2 that her *PEAS* synopsis indicates the ENE pattern, but we know Harris's transcriptions are untrustworthy, and Moulton (1968) asserts, based on his own speech, that Providence has instead a 3-D pattern.

An auditory analysis of the recording supports Moulton's assertion, and increases the blame due Harris. The speaker's /oh/ is not even close to the other low vowels, being realized as a fully rounded [ɔ]. The /o/ word class occupies a wide phonetic range, from a front-central [ɑ̟] to a far-back, lightly rounded [ɒ] reminiscent of RP /o/.

Words with /ah/ have a long vowel that takes up an even larger phonetic range, from a rather front [aː] to a far-back, unrounded [ɑː]. Because this range overlaps that of /o/, formant measurements are unlikely to demonstrate that the vowels are distinct. Instead, the difference in duration was pursued instrumentally.

The recording, nearly twenty minutes in length, contained 19 tokens of /ah/ and more than 30 of /o/. By removing the word-final tokens of /ah/ and those of /o/ before certain consonants, a set of /ah/- and /o/-words was constructed that was reasonably balanced prosodically and phonetically. It contained 14 tokens of /ah/ and 19 of /o/. The length of the fully voiced portion of these vowels was measured, and after discarding the longest vowel in each word class, which were outliers, a comparison was made between the classes.[89]

The tokens of /ah/ had an mean duration of 183 msec (s.d. 39), while the tokens of /o/

[89]The /o/-words were, in order of increasing length, *hop(scotch)* (82 msec), *gospel, possible, not3, hobby, drop, copies, contents, Gothic, upon, modern2, typography, on2, on, lots,* and *not2* (216 msec); outlier *(hop)scotch* (264 msec). The /ah/-words were *can't* (127 msec), *started, father, data, art2, compartment, marginal, department, started2, art, largely, marks, mark, Renaissance* (262 msec); outlier *parts* (296 msec).

had a mean of 129 msec (s.d. 40). A t-test shows that this difference is highly significant: $p < 0.001$. The vowel /ah/ is distinguished from /o/ mainly by being almost 50% longer. The overall pattern is 3-D, but of quite a different type than seen in Plymouth. For that speaker, /o/ and /oh/ were very much approximated, and one could anticipate – especially with the benefit of hindsight – those two vowels merging to yield the ENE pattern. This Providence speaker does not give the impression that any two of the three low vowels are nearing the point of merger, nor does Moulton.

2.5.5 General

At the point when I reviewed a large number of the Hanley recordings in southeastern New England, I was – like *ANAE* – more focused on the status of /o/ and /oh/, and less so on the relationship between /ah/ and /o/. For that reason, this section will summarize the low back status of *LANE* informants only in areas of Massachusetts which now have the low back merger, even among older adults (see Chapter 4).[90]

A clear low back distinction, indicating a 3-D pattern, was observed for four individuals, besides the Cambridge and Plymouth speakers already described: *LANE* informant 114, born c. 1860, from Rochester (Plymouth County); the abovementioned Grandgent, born 1862, from Cambridge (Middlesex County);[91]; informant 152.1, born c. 1862, from Weston (Middlesex County); and another non-*LANE* speaker, born c. 1864, from Worcester (Worcester County).[92]

The above communities form no geographical or historical pattern, and in fact, the low back merger was heard in an adjacent community to each of those where the distinction

[90]In Rhode Island and eastern Connecticut /o/ $\neq$ /oh/ even today; in those areas, including Westport and Rehoboth MA, the same distinction was heard in the Hanley recordings, though it was not always nearly as obvious as it was in §2.5.4.

[91]This confirms the self-report, in Grandgent (1891), of three low vowels.

[92]A probable low back distinction (and 3-D system) was the judgment for two *LANE* informants, both born in the 1850's, from Hingham (Plymouth County, but a Massachusetts Bay settlement).

was found. East of Rochester, in Marion, the low back merger (hence ENE pattern) was heard from informant 210.1, born in 1853. Across the Charles River from Cambridge, Boston speaker 150.1, born c. 1858, exhibited the merger.[93] Directly east of Worcester, Shrewsbury speaker 204.1, born c. 1854, was merged. And in Weston, where informant 152.1, a retired civil engineer, was judged distinct, informant 152.2 – a housewife 11 years younger, born c. 1873 – showed the merger.[94]

On the edge of our study area, informant 106.1, born c. 1854, from Raynham (next to Taunton), exhibits low back vowels that were judged merged, but only after much deliberation. An acoustic analysis would have been in order for this speaker.

The merger was also found contemporaneously on Martha's Vineyard, a notoriously conservative island (Labov 1963), where even the loss of post-vocalic /r/ had made no headway, as can clearly be heard in the Hanley recordings. On the Vineyard, two *LANE* informants – 122.1 from West Tisbury (born c. 1873) and 123.1 from Edgartown (born c. 1857) – showed a clear low back merger (ENE system).

There were several Hanley recordings in this area from somewhat younger speakers in the Boston area. Sometimes they were *LANE* informants, sometimes relatives of *LANE* informants, and sometimes they had no apparent connection to *LANE* at all. In this area, four speakers born between 1875 and 1910 had a clear low back merger; the only one who did not was Dana, analyzed in §2.5.2.

Synthesizing this information, we see that in eastern Massachusetts, the mainly elderly speakers from *LANE,* most of them born in the period 1850-1875, exhibit a mixture of distinct (3-D), probably distinct, probably merged, and merged (ENE) low back vowel systems. For most speakers born later than that, the merger is found, though the two

[93] A Boston speaker ten years older, 150.2, was judged to have a possible merger, and a non-*LANE* Brookline speaker of similar vintage was clearly merged.

[94] Likewise, directly east of Hingham, in Cohasset, informant 146.1, born c. 1863, was judged clearly merged.

cultured speakers analyzed in §2.5.2 and §2.5.3 preserved the distinction somewhat later.[95]

Although these data points are geographically quite haphazard, what should be clear is that we are not looking at the expansion of the low back merger from Boston, or any other central place. Although we are looking at the last fifty years or so of the 3-D pattern, it is still found relatively far from Boston (Plymouth, Rochester), very close to Boston (Cambridge), quite close to Boston (Weston, Hingham), and one Boston speaker may even retain the distinction himself.

For roughly the same time period, though, clear instances of merger are found on usually-conservative Martha's Vineyard, and on Cape Cod as well. The merger of /o/ and /oh/ seems to be developing – irregularly – everywhere in this area[96] during the last half of the 19th century. It does not appear to be spreading or diffusing. And it is not developing in Rhode Island, even in areas which are much closer and more accessible from Boston than e.g. Martha's Vineyard.

2.6 History of the low vowels of (southeastern) New England

In every area of New England except New Hampshire and Maine, we have seen at least some evidence that the original system of low vowels was 3-D: /ah/ $\neq$ /o/ $\neq$ /oh/. This fits well with what we know of English English in the 17th century, when the three-way distinction had recently developed from earlier patterns.[97]

[95] A New Bedford man, born 1882, exhibited the low back distinction in an oral history interview housed at the New Bedford Whaling Society Library. Several others born around 1900 exhibited possible 3-D systems of this 'eastern' type, where /ah/ is quite distinct from /o/ and /oh/, which may be very close. Younger New Bedford speakers showed the ENE pattern.

[96] The area appears to include the Massachusetts Bay settlement area and most of the Plymouth settlement area.

[97] In New Hampshire and Maine, the /o/~/oh/ merger has already occurred even in the Hanley recordings, but even though the *LANE* informants were born so long ago, they were still born 150-200 years after settlement: certainly enough time for a merger to occur. Why the merger seems to have occurred first in

The few New England 3-D systems we have heard can be divided into two types. There is an eastern 3-D system, where /ah/ is a distinct, fairly front vowel and /o/ and /oh/ are back and closer to each other, but distinguished by height and possibly other phonetic characteristics such as rounding. And there is a western 3-D system, where /ah/ and /o/ are unrounded and distinguished chiefly by length, and /oh/ is a quite distinct rounded back vowel.

To a first approximation, these two patterns were respectively found in the two major dialect regions of New England, as defined by the *Linguistic Atlas* tradition, with one major exception: Rhode Island in this regard belongs to western New England.[98]

We can connect these patterns to 17th-century English by imagining that the first dialects to coalesce in Massachusetts Bay and Plymouth resembled a more conservative English system with respect to /o/, where /o/ had not progressed very far on its path of lowering and unrounding, and therefore was phonetically close to the new monophthongal /oh/. On the other hand, in Rhode Island (and presumably Connecticut), a dialect formed with a lower, more unrounded /o/, which became the short counterpart of /ah/.[99]

It is not clear how – or if – this proposed difference in /o/ in the two major colonial varieties relates to the regional (and social) origins of the first effective settlers. While many settlers have known origins – the eastern and southwestern English counties provided the majority – knowledge of the dialects they spoke, or what their version of Standard English might have been like, is not very great. Even before attempting to make trans-Atlantic connections, we should distinguish between two scenarios, which we can call

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this northeastern area is an open question.

[98] Were it not for Harris, Rhode Island might never have been seen as definitively eastern, but it does group with eastern New England by being non-rhotic.

[99] There could also have been a difference in the original pronunciation of /ah/, and it is tempting to link eastern New England to a more conservative, fronter realization of /ah/ and western New England to something closer to the RP back vowel. However, not only is the backing of /ah/ in England a much later change – it "probably happened early in the 19th century" (Wells 1982: 234) – in terms of incidence it is *eastern* New England's treatment of /ah/ that resembles the modern English pattern, with its TRAP-BATH split.

transplantation and *divergent leveling.*

A transplantation theory holds that there *were* important linguistic differences due to differing regional and/or social backgrounds between the settlers of eastern and western New England, *pace* Fischer, who said that "Connecticut and Rhode Island were broadly similar (not identical) to the Bay Colony in the English origins of their founders" (1989: 270). This is basically the perspective adopted by Bloch (1935) in his reconstruction of early colonial rhoticity patterns from the data of *LANE.*However, since Bloch does "not attempt to go back beyond the colonial stage" (180) – citing, just as this chapter does, insufficient information on settlers' origins and English rural dialects – we are left wondering how plausible it is that the settlers of Massachusetts Bay were mainly /r/-less, those of Plymouth Colony mainly /r/-ful, and those of Rhode Island more evenly divided (184-185).[100]

A divergent leveling theory suggests that even if regional and other dialect differences between the settlers of the two areas were not very significant – the within-colony variation being probably greater than the between-colony variation – the leveling processes that took place in each area nevertheless had different outcomes, and these different outcomes were then carried throughout each colony as it was settled.[101] [102]

[100]In Bloch's account, the Plymouth and Rhode Island areas later became largely non-rhotic due to Massachusetts influence. Taunton remained an island of partial rhoticity.

[101]The discussion in Bloch (1935) contains elements of this theory as well. He says that every colonial group had a diverse original population (180), and that rhoticity or non-rhoticity prevailed depending on the "number or prestige" of settlers with each pattern (184).

[102]Under a third, *contact* theory, the difference between the eastern and western 3-D patterns would not have developed as early as the mid-17th century settlement period. Rather, the two areas would have diverged more gradually after different patterns of contact developed between the American colonies. In Kurath *et al.* (1939) and other sources, it is often mentioned that western New England had greater connections with New York and the rest of the country, while eastern New England was a more culturally isolated region. And New York City developed a 'hyper-western' 3-D low vowel system, with a long /ah/ further back than /o/ – [ɑː] vs. [ɑ] (Kurath and McDavid 1961: 56-57) – making it more similar to Providence than to Plymouth.

The biggest problem with a contact approach arises when we note the coincidence of more recent linguistic developments with the earliest settlement boundaries. It is indeed likely that during the colonial period Providence, Newport, and Fall River had extensive commercial contacts with New York. And perhaps these ties were stronger than the ones New Bedford, Plymouth, and Boston had, enough so to create a linguistic difference. But we can see that each vowel pattern did not just develop in the port cities, but throughout the

The phonetic differences between the eastern and western 3-D patterns may have in a sense predated settlement (transplantation), or originated shortly after settlement (divergent leveling). What is clear is that in each area a different merger eventually took place, reducing the inventory of low vowels from three to two: /o/ merged with /oh/ in the east, creating the ENE pattern as early as the mid-19th century (and probably earlier in NH and ME), and /ah/ merged with /o/ in the west during a similar or possible somewhat later period of time, creating the MAIN pattern.[103] I propose that this happened in the communities within each area for internal structural reasons, not because of diffusion.[104] The geographic pattern of /o/∼/oh/ merger in the Hanley recordings is not compatible with spread from Boston, nor is the apparently earlier merger in northeastern New England.[105]

Anticipating Chapter 4's delineation of the boundary between ENE and MAIN patterns, we note that the line essentially follows the settlement boundary between Rhode Island on the one hand, Massachusetts Bay and Plymouth on the other. But the correspondence is not exact, and certain communities appear on the 'wrong side' of the line, as if they had shifted allegiance from area to the other after the settlement era was over.[106]

As long as these shifts occurred while both dialect areas retained three low vowel phonemes, the changes would be unproblematic, not involving the reversal of any merger.

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interior of each colony as well.

If we propose that the key difference developed after the settlement period, we must still appeal to settlement patterns to understand the dialect boundaries that resulted. It may be true that patterns of contact and migration are denser within settlement areas than between them. But a much more parsimonious theory would date the fundamental difference to the settlement period, and imagine that all parts of each dialect area developed in parallel from that point on.

[103] At least in the eastern region, the change was gradual: a merger-by-approximation.

[104] If the two 3-D patterns were already disseminated throughout their respective areas at the time of settlement, there would be nothing to diffuse.

[105] With the /ah/∼/o/ merger, we are talking about a change that is not confined to New England, but has affected the entire rest of the United States; more study would be necessary to identify its chronology and cause(s).

[106] Since the settlement history of the east shore of Narragansett Bay is so uncertain, the best examples of this are Blackstone and Millville MA, which have a Massachusetts settlement history in the late 17th century, but are located right across the state line from Woonsocket RI, which developed into a major industrial city in the early 19th century. See Chapter 4.

Before succumbing to one of the two complementary mergers – that is, into the 19th century in southeastern New England – dialects of the phonetically different 3-D types could influence each other across the settlement boundary, and this shifted the destinies of some border towns.

After the mergers occurred, however, we would expect the resulting two-vowel areas to be divided by a much more significant boundary. Given Herzog's Principle, any influence across a MAIN / ENE boundary could only lead to three-way merger, never a shift in the boundary line.

2.7 The pilot study: locating the dialect boundary

One or another system of three low vowels was likely original to southeastern New England, but we have seen that by the twentieth century, 3-D patterns were moribund, and a division developed between two different two-vowel systems: MAIN in Rhode Island and some adjacent part(s) of Massachusetts, and ENE in the rest of eastern Massachusetts.

The pilot study set out to determine, at least roughly, the location of the boundary between these two patterns. It concentrated exclusively on /o/ and /oh/. The first phase of the pilot study, conducted in 2002 with the assistance of Joanie Sanchez, asked local people in public libraries – often the librarians themselves – to read five cards containing minimal pairs of the type *wok*∼*walk*. We judged whether each pair sounded the same or different, and the same question was put to the informants.

Using this method, the low back merger was identified in the following Massachusetts communities: in Plymouth County, Plymouth (2 informants), Wareham (2), and Middleborough (2); in Bristol County, New Bedford (2), Dartmouth, Raynham, Taunton (3), and North Attleborough; and in Norfolk County, Bellingham (2). In these places, the vowel productions were almost universally judged merged; most subjects' perceptions agreed.[107]

In northeastern Rhode Island – Providence (4), Pawtucket, Cumberland, and Woonsocket – the low back distinction was universal, with not a single judgment of "same" in perception or production out of 35 tokens from seven speakers.[108] In Massachusetts, the Bristol County communities of Fall River, Somerset (2), and Rehoboth to the east, and the Worcester County town of Blackstone to the north,[109] agreed with Rhode Island by showing a clear low back distinction.

In Westport MA, one speaker showed a clear merger and one a clear distinction.[110] In Attleboro MA, the same variation was seen, but with a geographical correlate: a 30-year-old woman from South Attleboro, a neighborhood close to Rhode Island, showed the distinction; a 50-year-old man from the other side of the city showed the merger.[111]

The possibility of a linguistic boundary cutting through a municipality was an exciting one, and the second phase of the pilot study, carried out in 2004, pursued it. This phase located informants in retail businesses in and near Attleboro and asked them to react to the similarity or differentness of five written /o/∼/oh/ pairs, while saying them out loud so their productions could be judged on the same score. Subjects from Attleboro also marked, on a map, where in the city they grew up, and indicated which schools they had attended. Information about parents' origins was also obtained.

Along with confirming the results of the first phase for nearby communities such as

[107]In Taunton, two subjects gave a fully-merged response, but an older woman gave a largely-distinct response; further work in Taunton found only the merger. One Bellingham subject was fully merged; the other was merged on *collar∼caller, cot∼caught, knotty∼naughty,* and *stock∼stalk,* but pronounced and judged *Don∼Dawn* to be different. One New Bedford speaker also had an intermediate pattern.

[108]This is similar to *ANAE,* where the low back distinction was shown categorically in Providence, while in the merged areas of New England there was some variation in perception or production for some speakers.

[109]The case of Blackstone was the first indication of the MAIN pattern in any community in the original Massachusetts Bay Colony territory.

[110]In later work, only the distinction would be found in Westport. We note that during this phase of the study, informants were simply asked if they were from the community in question, without further probing into their background. It cannot always be sure that an informant was from the exact town we found them in.

[111]A third Attleboro speaker, a 20-year-old woman, may or may not have been from South Attleboro. She showed the merger.

Cumberland (distinct) and North Attleborough (merged), this study obtained five responses from 'regular' Attleboro and four from South Attleboro. However, this data did not confirm the hypothesis of a geographical division between a merged Attleboro and a distinct South Attleboro.

Of the five responses from 'regular' Attleboro, only one was fully merged (a 17-year-old boy), while two were judged distinct for all pairs in perception and production (a 27-year-old woman and a 37-year-old woman). The other two responses were intermediate.

Of the South Attleboro responses, one was merged on four pairs, but close on *Don*∼*Dawn* (man, age 38); another was fully merged in production, fully distinct in perception (woman, age 20); and a third was distinct in production, but mixed in perception (man, age 50). Only the fourth respondent, a 43-year-old woman, was essentially distinct, although she too behaved anomalously on the pair *Don*∼*Dawn.*

The second phase of the pilot study was disappointing, in that it did not show a clear geographic division within the city of Attleboro. However, it was decided to continue to explore Attleboro, and all subsequent interviews there did show the geographic split – among adults. It is not clear why the pilot study got such inconsistent results. One difference was that in the later work, the key words were first presented embedded in sentences, while the pilot study presented only bare minimal pairs.

Overall, though, the pilot study showed that a boundary line *can* be drawn between merged and distinct communities on this scale, something that could certainly not have been predicted ahead of time. Chapter 4 goes on to establish this boundary with consistent data from senior citizens and young adults in each community. In the meantime, Chapter 3 will address questions on the level of the individual, such as, "could the 27-year-old from Attleboro be distinct because her father is from Rhode Island?" To approach questions such as this requires a large sample of individuals, which was obtained in a survey of schoolchildren in Attleboro and other communities.

Chapter 3

The School Survey

3.1 Introduction

The findings of dialect geography demonstrate – indeed, they may even assume – that the place where a person grows up is a factor of prime importance in determining the way he or she speaks as an adult. But the importance of other factors, such as parental influence, has also been recognized since the early days of dialectology.

For this reason, *LANE* instructed its fieldworkers to interview subjects whose parents had come from the same locality: "In every community selected for study an elderly descendant of an old local family was to be included" (Kurath *et al.* 1939: 41).

By causing the influences of parents and peers to overlap as much as possible, this procedure reduced the need to ask which influence is more important. This question, an interesting one for language acquisition in any case, is also quite relevant for dialectology, especially if young (or prospective) parents are more mobile recently, so that children are more commonly growing up with peers whose dialects differ from their mothers' and fathers'.

To distinguish the effect of parents and peers, and discover other potential factors affecting the development of the low vowel system, it was necessary to study a large number of subjects. Because the 'independent variables' potentially influencing the low vowel system of each subject tend to correlate – for example, a person's mother and father quite often come from the same place – an especially large sample was needed to have a chance of determining their relative significance.

This was achieved by means of the 'school survey', a written questionnaire administered to over two thousand young people with the help of teachers and school administrators in several sites in New England and New York. The survey was completed by some college students and older adults, but the great majority of subjects were elementary, middle, and high school students.

The questionnaire was a simple, almost crude instrument that directly asked subjects to decide whether minimal word pairs sounded "same" or "different". Seven of the items dealt with the low back vowels – the merger vs. distinction of /o/ and /oh/. Two items probed the status of /ah/ vs. /o/ by asking whether pairs of words rhymed or not. The survey also gathered basic demographic information about each subject, as well as a history of previous schools attended.

The responses ("same" or "different") were analyzed using mixed-effects logistic regression (a type of generalized linear mixed model), treating the variables of item and subject as random effects, while treating variables like parents' origin, gender, and number of siblings as fixed effects. This method succeeded in determining which variables did not have a significant effect on the response, which ones did, and what the relative size of the effects was among the significant variables.

The data from the school survey shows that as a child grows up, the greatest influence on their speech (specifically, on their low vowel inventory) is the speech of their peers. Not much less important overall is that of their parents, particularly the mother. If two vowels are merged in maternal input, the child is likely to keep them merged. The father has a lesser influence, that shows up mainly when the mother is distinct. The same asymmetry applies to the peers, who can collapse (though not always, and perhaps never totally) a child's parentally-acquired distinction, but are much less able to reverse an 'inherited' merger.

Other subject attributes did not have consistent effects, though they were relevant in some communities. These included race, speaking a foreign language at home, having older or younger siblings, and gender – whose almost complete non-relevance was surprising, given that the low back merger was in progress in some of the communities studied.

3.2 The difficulty of second dialect acquisition

Though accommodation to the speech of those around us happens quite generally and at all ages, there is a range of difficulty according to which new linguistic forms are learned. 'Easier' things can be learned later in life; 'harder' ones must be learned earlier. As summarized by Kerswill (Kerswill 1996: 150), the two processes most relevant for forming one's vowel inventory – learning oppositions and mergers – are to be found towards opposite ends of the scale:

RANK		FEATURE	AGE ACQUIRED
1 (most difficult)	i	lexically unpredictable phonological rules . . .	by 3 (?)
	ii	new phonological oppositions	by 3-13
. . .	. . .	. . .	. . .
6	viii	mergers	lifespan
. . .	. . .	. . .	. . .
9 [least difficult]	xii	borrowing: vocabulary	lifespan

Table 3.1: Difficulty hierarchy for the acquisition of second dialect features (adapted from Kerswill 1996: 200)

The data supporting this pair of conclusions is very wide yet surprisingly shallow. On the one hand, granting certain caveats, vowels, once merged, never again separate. This "irreversibility of merger" (Labov 1994: Ch. 11) is a principle usually stated at the level of the speech community or higher (dialect, language), but such a consequence would be unlikely if individuals could complete the task of unmerging with much ease. Conversely, observations of the rapid spread of various mergers, including the low back merger in American English (Labov *et al.* 2006: §9.1), strongly suggest that individuals can adopt it.

On the other hand, few studies have specifically addressed how hard it is to learn vowel distinctions, or how easy it is to merge vowels. For a more direct investigation of this point than will be found here, see Nycz (forthcoming).

Chambers (1992) studied 6 children in two families who had moved from Canada, an area of low back vowel merger, to England, an area of distinction, around two years before. Two of the children, aged 7 and 11 when they arrived, acquired the distinction well, pronouncing 9 of 10 and 8 of 10 word-list pairs, respectively, with distinct vowels. None of the other children, who moved between age 10 and 14, pronounced more than one pair differently.

The most influential work on the relative ease and difficulty of acquiring the phonetic and phonological features of a second dialect is that of Payne (1976, 1980). She studied the relative acquisition of several local linguistic variables among children who had moved to King of Prussia PA, a Philadelphia suburb. One of these acquisition tasks was similar to unmerging a merged vowel; two involved learning a certain sub-type of merger.

Payne's key finding was that the out-of-state children essentially failed to learn the Philadelphia-area 'short-*a* pattern', a complex division (or split) of the phoneme into lax [æ] and tense [æ̃ː∼iᵊ]. This split is partially phonologically predictable (short *a* is tense before front voiceless fricatives in closed syllables, for example), but also has lexical exceptions (short *a* is tense in *mad, bad, glad*, but lax in all other words before /d/).

Of 34 out-of-state children, only one (3%) completely acquired the Philadelphia short-*a* pattern, although six others (18%) had substantial success. In the secondary literature, the overall lack of success is often exaggerated, e.g. "none of the migrants acquired the 'correct' patterning" (Kerswill 1996: 187). Nevertheless, the contrast is extremely clear between the "migrants" (some of whom were actually born locally to migrant parents) and the children of local parents, of whom 34 of 36 (94%) learned the complete pattern (Payne 1976: 209).

In summary, "unless a child's parents are locally born and raised, the possibility of his acquiring the short-*a* pattern is extremely slight even if he were to be born and raised in King of Prussia" (Payne 1980: 174). That is, this complex phonological pattern seems to require learning at a very early age, from parental input. The simpler phonetic variables in the study, on the other hand, were much more successfully acquired from local peers: averaging the five variables for the out-of-state children shows 53% complete success plus 40% partial success, compared to a 89% average score from the local children (Payne 1976: 209).

Although Payne generalizes from the short-*a* result to say "parental influence is dominant in the learning patterns for the phonological variables" (Payne 1980: 175), the other two variables to which she refers do not show the same degree of difficulty of acquisition. These variables are conditioned (or allophonic) mergers characteristic of Philadelphia-area English: the raising of /ohr/ to merge with /uhr/ (so *more* sounds like *Moore*), and the backing of /er/ to merge with /ʌr/ (so *merry* sounds like *Murray*).

The out-of-state children did better at learning these mergers than they did at learning the short-*a* pattern: 33% had acquired the /ohr/∼/uhr/ merger, 18% the /er/ ∼ /ʌr/ merger. And the level of learning seems even higher when we note that the local children only scored 51% and 53% with respect to these mergers.

Given this, Payne's statement that "the out-of-state children tend to learn and retain the basic patterns of their parents' short-*a*, /ohr/ and /er/" (1976: 238) seems more firmly supported regarding short-*a* than for /ohr/ and /er/. The un-split short-*a* pattern of the out-of-state parents is retained, while their non-merged pattern of /ohr/ and /er/ is reversed, at least to some extent, by peer influence. However, none of these percentages represents very much data, especially in the case of the mergers, where the relevant sequences occur too rarely to be observed in spontaneous speech.

Payne's overall conclusion is that phonological features of a second dialect are harder to acquire than phonetic ones, but this should be adjusted – and has been, as in Kerswill's summary (Table 3.1 – to state that certain phonological features, namely mergers, are easy to acquire, perhaps almost as easy as phonetic features.

The corresponding features potentially being acquired in this study are more straightforward examples of distinctions and mergers among the low vowels, than the features studied by Payne. The task of learning the low back distinction between /o/ and /oh/, for example, can appear as hard as that of learning the Philadelphia short-*a* system, which is at least partly phonetically predictable. Most of the low-back unmerging task involves learning and marking lexical 'exceptions' roughly analogous to the *mad, bad, glad* cases.

That being said, unmerging a complete merger is conceptually simpler, if more arduous, than transmuting most out-of-state short-*a* patterns into the complex pattern of Philadelphia. Kerswill lists both tasks under "most difficult" in his hierarchy (see Table 3.1), but says "lexically unpredictable phonological rules" must be learned by "age 3 (?)" while "new phonological oppositions" can be learned by "age 3-13" (1996: 200). The upper end of this range derives from Chambers' small family study, where 13 was the age *at interview* of the older distinction-acquirer and also of the youngest non-acquirer; they actually arrived 2 or 3 years earlier.

One of the tasks examined here, that of learning the low back distinction, might appear easier than it really is because only a few words are being checked. Examples of moderate progress might be classified as successes, while only a complete, better-documented acquisition of Philadelphia short-*a* qualified as success for Payne.

In fact, because of the actual distribution of parents' and subjects' origins in the data collected for the school survey, there were relatively few opportunities to test the difficulty of unmerging the low back merger. Of the students who grew up with distinct peers, almost all had parents who were themselves from distinct backgrounds, or else foreign countries. For various reasons, the reverse direction of migration – students with distinct parents, and merged peers – was more common in this data set, and therefore it is more possible to examine the constraints on the acquisition of the merger. (The limited data on /ah/ and /o/, by contrast, sheds some light on the difficulty of acqusition of a distinction.)

Some children appear to acquire the low back merger much better than others, given the same general conditions (including distinct parents and merged peers). This 'subject effect' suggests a degree of indeterminacy, of different aptitudes in the population for losing a distinction acquired in infancy in favor of a merger dominant among the peer group. While some truly irreducible individual variation is likely to be part of the picture, there are also other factors involved, some of which were addressed in previous research.

For the Philadelphia phonetic variables, Payne found that "the age of arrival [in King of Prussia] had the strongest effect on the success of acquisition" (1980: 175), with the number of years since arrival being a secondary factor.

However, Labov re-analyzed Payne's data with multiple regression and concluded that neither age of arrival, nor years since arriving, had significant effects, and that the most important factor was "the number of times that the speaker was mentioned by peers" (Labov 2001: 430), an index of the degree to which they had become integrated into the local peer group, and which Payne had downplayed.

For the Philadelphia split short-*a*, "the acquisition . . . does not appear to be influenced by the age at which the child moved" (Payne 1976: 210), which follows directly if it must be learned from parents. But since this type of underlying-category learning was relatively rare in King of Prussia, more cases of it may show up in a study reaching more subjects – though much more superficially – and so the question of age-of-arrival and years-since-arriving will be re-examined.

While the age and date of arrival of most migrant children is known, the school survey was anonymous and only a limited number of demographic questions were asked. Therefore, the data does not contain information on peer networks or other measures of popularity, let alone social class or other potentially relevant independent variables. Knowing about these matters would surely reduce the amount of leftover variation assigned to the 'subject effect'.

When a group of children attempting the same learning task show partial acquisition of a feature in the sense that some of them have acquired it while others have not, it is also likely that some of the children will exhibit partial acquisition on an individual level. The school survey is well equipped to observe this, having multiple items for each phonological contrast, and many intermediate responses (e.g. 2 of 7 low back pairs marked 'different') were in fact obtained.

Because the minimal pairs on the survey contain the target phonemes in different phonological environments, the most naive interpretation of the intermediate responses is that some children merge the low back vowels in certain environments and not others, such as before /n/ but not before /k/. But while speech patterns like these have been observed in other parts of the United States, particularly in the Midland (Labov *et al.* 2006: 64), I have not observed them in New England in the in-person interviews conducted for this project.

Indeed, some of the children surveyed were also interviewed in person along with their families, and some of the ones who had given an intermediate response on the written survey did not produce any type of intermediate pattern in their speech production, but were fully merged or fully distinct.

This discrepancy has at least two sources: the survey, in the first place, was not an objectively-measured production task, but a self-administered perception task. And as it was administered in a classroom setting, it is likely that some students (though certainly not all) were uncomfortable marking each item the same way, despite the survey's insistence that "There are no wrong answers!" Like on a 10-question True / False history quiz, savvy students might have concluded that the chances of all ten 'correct' answers being True (or False) were very low. But neither of these explanations of intermediacy imply that students would choose their responses randomly, and in fact there were consistent patterns of 'item effects' that stood out above any randomness.

The intermediate responses may in some cases reflect the tendency for perception to 'lead' production, thereby usually signaling incipient merger in the community (Labov 1994: 319), and perhaps the individual as well. In other cases, intermediate responses may convey the tension between the merged production patterns of the individual, which match the peer group, and the underlying distinct representations learned from parental exposure at a much younger age and retained, perhaps reinforced through continued contact with the parents, other distinct relatives, etc. And of course, in some cases intermediate responses may accurately represent the production patterns of children whose low back vowels, possibly for either of the above reasons, actually are partially merged and partially distinct, on a phonological or lexical basis.

Among some linguists, the primacy of peer influence over parental influence on dialect is overstated, as more nuanced results like Payne's are lost: "young children, almost universally, pick up their accents from their peers"; "kids get their accents from their peers" (Barbara Partee and Susan Ervin-Tripp, respectively, in O'Brien 1992: 1). Even in more careful accounts, the learnability of mergers, in particular, may sometimes be exaggerated.

Part of the difficulty is that different features behave differently. Also, the hypotheses necessary to accurately account for individual learning, or failure to learn, are not necessarily sufficient to explain dialect change, nor vice versa. Just as an example – although I do *not* believe this to be the case! – vowel mergers could spread rapidly by contact between communities, without all (or even very many) individuals in those communities being affected.

Although the school survey carried out here was designed and administered in parallel with the other parts of this dissertation project, and indeed suffers for that reason, it has the advantage of a large scale. While the data is very narrow, and does not have as clear an interpretation as, for example, production data from an interview, the survey data has been collected from many more people than most sociolinguistic studies reach. While the responses of some subjects may in fact be almost worthless, the very large total number of subjects allows us to ask, and to some extent answer quantitatively, questions that have so far been approached only qualitatively, if at all.

3.3 The Instrument

The version of the school survey that was administered to most subjects is shown in Figure 3.1. The one-page questionnaire begins by asking for the student's first name, gender, age, and the school currently attended. Asking for only first names was a prerequisite of getting the surveys approved for distribution; however, some students gave their last names as well, which sometimes made it possible to identify pairs of siblings in the same school system.

Next the survey asks the subject to list "all the other SCHOOLS you went to before this one." While many complied with this instruction and gave a full school history back as far as preschool, most histories were at least somewhat incomplete. Questions about parents' origins, age and gender of siblings, race, and whether a foreign language was spoken at home, were answered rather straightforwardly, although the instruction to "be as specific as possible" about where parents had grown up surprisingly often yielded a location as imprecise as 'Massachusetts' or even, a few times, 'USA'.

The above parts of the instrument were completed in some places with assistance from

First Name: | Male / Female | Age: | School:

List all the other SCHOOLS you went to before this one. Include kindergarten, pre-K, etc.

	Name of School	Location of School (City/Town/State)	Grade(s) Attended
1 .			
2 .			
3 .			
4 .			

Be as specific as you can.

Where did your MOTHER grow up?

Where did your FATHER grow up?

List any SIBLINGS you have.

	Brother or Sister?	Age
1 .		
2 .		
3 .		

Circle your race (one or more): WHITE HISPANIC AFRICAN–AM. ASIAN OTHER

Does anyone in your family ever speak ANOTHER LANGUAGE besides English?
If so, WHO is it and WHAT LANGUAGE do they speak?

- Sometimes two words MEAN different things, and they are different in SPELLING too, but they SOUND exactly the same. Not just close, but EXACTLY the same sound.
- A grizzly BEAR isn't the same thing as BARE skin, but the two words sound the same. To MEET somebody is different from eating MEAT, but the words sound the same.
- Sometimes people disagree about what sounds the same. So what do YOU think? Circle "same" or "different" for these 10 pairs of words. There are no wrong answers!

1. farm animals sleep in the BARN – he was BORN in 1990	same	different
2. press this button to PAUSE – cats lick their PAWS	same	different
3. in singing you go "fa la la la LA" – don't break the LAW	same	different
4. the boys' name is DON – and the girls' name is DAWN	same	different
5. Emily CAUGHT the ball – a small bed is called a COT	same	different
6. a boy named OTTO – another word for a car is an AUTO	same	different
7. a nickname for Molly is MOLL – you shop at the MALL	same	different
8. students learn what they are TAUGHT – eat a tater TOT	same	different
9. the clock goes "tick TOCK" – teenagers like to TALK	same	different
10. a shirt has a COLLAR – a phone has CALLER i.d.	same	different

• Do these words rhyme? 11. my FATHER – don't BOTHER	rhyme	don't rhyme
12. the boy's name is TOMMY – one kind of meat is SALAMI	rhyme	don't rhyme

Figure 3.1: The School Survey Instrument

teachers or parents, especially for younger children. The rest of the survey is the linguistic part, which was in all cases meant to be filled out by the student alone. It is preceded by a panel of written instructions intended to show how two words can be spelled differently and have different meanings but sound exactly the same (teachers were instructed to review this concept of 'homophone' if necessary).

Since the surveys were completed in classroom settings, it was important to discourage subjects from pronouncing the key words out loud and thereby influencing their peers. Teachers were instructed not to pronounce the words out loud themselves either. For the same reason, the instructions talked about how words "sound", using that word five times, and concluding: "Sometimes people disagree about what sounds the same. So what do YOU think? Circle 'same' or 'different' for these 10 pairs of words."

Each item consists of two short sentences, each one using a word from the target pair, which is capitalized. Students read the pairs silently (if necessary, they were permitted to "say the words to themselves quietly"), then circled "same" or "different" to indicate their opinion of how the target pairs sounded.

The first two items were designed to identify subjects who were likely to give inaccurate answers on the other items. Since *barn* and *born* are pronounced differently by all native English speakers in the Eastern United States, anyone who marked the pair as sounding the "same" would be unlikely to accurately recognize more subtle potential differences in sound. However, only 2% of subjects could actually be eliminated because they 'failed' this item.

The second item was the opposite type of case: *pause* and *paws* are pronounced identically in all dialects of North American English, if not universally in the modern language, so subjects who said they sounded "different" would be likely, probably under the influence of spelling, to mis-identify other identically-pronounced pairs. 13% of subjects, disproportionately younger children, were eliminated by this item.

The next pair attempted to contrast /ah/ and /oh/ using the singing term *la,* contrasted with *law.* These 'should' sound the same only if they are both merged with /o/: no pattern where /ah/ and /oh/ merge while /o/ is kept distinct has been reported, nor was any observed in the interviews for this project. The three-way-merged pattern is expected to occur among some young people, perhaps especially in situations of contact between the two two-way mergers, and a response of "same" to the *La*∼*Law* pair can be considered a marker of this vowel system. But perhaps because of the marginal status of *la* as a word, this pair was actually marked "different" even by some speakers believed to have the three-way merger.

The next seven items constituted the heart of the school survey. They all inquire about /o/∼/oh/ pairs. The order of phonemes varied on the survey instrument, but in discussing the pairs in this section they will be given in the order /o/∼/oh/: *collar∼caller, cot∼caught, Don∼Dawn, Moll∼mall, Otto∼Auto, tock∼talk, and tot∼taught.*

While many subjects (including most adults) answered all seven items identically, there was substantial variation in the intermediate responses. Most of this variation patterned according to the community where the subjects lived, but some items stood out overall as better than others. In particular, certain items were better correlated with the other items, even though they were not consistently marked more 'same' or more 'different' than the others.

Other items are believed to have given subjects more trouble, and the responses to these are somewhat less reliable, not so much because of their interaction with the vowel differences being investigated, but due to imperfections in the items that partially obscured these differences.

Three of the pairs were perhaps easiest for children to handle. The canonical low back vowel pair *Cot*∼*Caught* was accompanied by *Tot*∼*Taught*, giving two items for the same environment before /t/. The pair of names before /n/, *Don*∼*Dawn*, was also well-behaved; these personal names are familiar to children at a young age.

Two pairs were more often rated "different" than the others, and were slightly worse predictors of overall behavior. In *Tock*∼*Talk*, the form *tock* is onomatopoeic, although very familiar, and the word *talk* could suffer from actual re-introduction of a pronounced /l/, or the belief, from looking at the word in print, that the /l/ should be pronounced.

With *Collar*∼*Caller*, several factors are at play. The morpheme boundary in *caller* could lead to a different pronunciation, or the belief in such, even if the stressed vowels were identical. In particular, many subjects live in the non-rhotic dialect area of Eastern New England, and in interviews *collar* was observed to drop its /r/ more frequently than *caller*. The particular sentence context accentuates this: "a shirt has a colla**r**" has the /r/ utterance-finally, where its loss is more likely; "a phone has calle**r** i.d." has an intervocalic context where the so-called 'linking *r*' is much more likely to be retained. This asymmetry was an oversight.

Two pairs were more often rated "same" than the others, and were substantially worse predictors of overall behavior. *Moll*∼*Mall* presumably suffered from subjects' actual unfamiliarity with this alleged "nickname for Molly". *Otto*∼*Auto* was the only vowel-initial pair, which may have been relevant; unfamiliarity with the name *Otto* may have contributed to its moderately aberrant behavior.

Despite the idiosyncrasies of some items, none was judged bad enough to be thrown away, and so data from all seven /o/∼/oh/ pairs were analyzed.

The final two items on the survey inquired about /ah/ and /o/. For these vowels, no true minimal pairs exist that are suitable for younger children: pairs like *Mali*∼*Molly* and *lager*∼*logger* contain words that most children do not know, while pairs like *balm*∼*bomb* and *heart*∼*hot* assume the absence of consonants that, at least nowadays, are very likely to be pronounced.

For this reason, potentially rhyming pairs were chosen, and the questionnaire simply asked "Do these words rhyme?" The canonical pair *father*∼*bother* was used, initially accompanied by *Osama∼Comma*. When it became clear that many children did not know the name *Osama [bin Laden]* or how to pronounce it – and several wrote as much on the back of their questionnaires, where they were encouraged to leave comments, e.g "I can't answer question 12 because I don't know what Osama sounds like" – the second /ah/∼/o/ pair was changed to *salami∼Tommy*.

The concept of rhyme is not as much a phonological primitive as "same" vs. "different," and the data from these two items is, on the whole, less reliable than that from the minimal pairs. The rate of disagreement between the two items – which 'should' agree if word classes rhyme consistently – supports this: 27% gave opposite answers for *Father∼Bother* and *Salami∼Tommy* (for the surveys with *Osama∼Comma*, the disagreement rate was 45%, suggesting that item had been answered almost randomly).

This compares to the worst of the /o/∼/oh/ pairs: for example, 29% gave opposite answers for *Otto∼Auto* (25% "different" overall) and *Tock∼Talk* (35% "different" overall). Still, even for the best of the /o/∼/oh/ pairs, which also agreed with each other most consistently, there was a reasonable amount of disagreement: 17% gave opposite answers for *Cot∼Caught* and *Tot∼Taught* (both were 31% "different" overall).

The survey was administered by obtaining the permission of school administrators in some places, individual teachers in others. The teachers who oversaw the completion of the questionnaires instructed the students that participation was voluntary. By every indication, the great majority of students in each class did complete the form, as did some teachers. Teachers and students were encouraged to comment on the back of the paper, teachers especially about whether the pronunciation or spelling of the low vowels tested had ever been an issue in their teaching. However, very few comments of this type were returned.

3.4 The Sample

The total number of survey responses that were legible, substantially complete, and not filled out in an obviously joking manner (e.g. Father From: “North Pole”), was 2029. Not counting surveys that failed either the *barn-born* criterion (2%) or the *pause-paws* criterion (13%), and also eliminating surveys from teachers (2%), other adults (1%), and children who did not provide clear answers to all seven /o/∼/oh pairs (1%), this ‘raw’ number was reduced to 1671, and it is out of this ‘filtered’ total that further discussion is based. These surveys came from four primary communities and five smaller sources, shown on Map 3.2.

Although it is being discussed first, the school survey was administered in connection with, and subsequent to some of the other fieldwork for this project, in the fall and winter of 2005-06. This coordination with the other studies, as well as convenience and luck – friends who are teachers, school departments that cooperated – partially account for where it was administered.

The largest survey site was Attleboro MA, a city of 43,000 people (2005 Census estimate) located 35 miles southwest of Boston, and 12 miles northeast of Providence RI. In Boston, a front /ah/ is distinct from a low back merged /o = oh/, while in Providence, a raised back /oh/ is distinct from a low central merged /ah = o/ (Labov *et al.* 2006: 59). Attleboro had already been identified as lying on the boundary between these two low vowel systems.

Pilot research showed that differences existed between the speech of a part of Attleboro called South Attleboro, and the rest of the city. In part to investigate the age at which this division would be observable, the school survey was launched and conducted on the first Friday of the school year in the 4th, 8th, and 12th grades: the last years of elementary school (Attleboro has 5), middle school (3), and high school (1), respectively. Attleboro’s 4th grade (henceforth AB4) yielded 330 responses, its 8th grade (AB8) 402, and its 12th

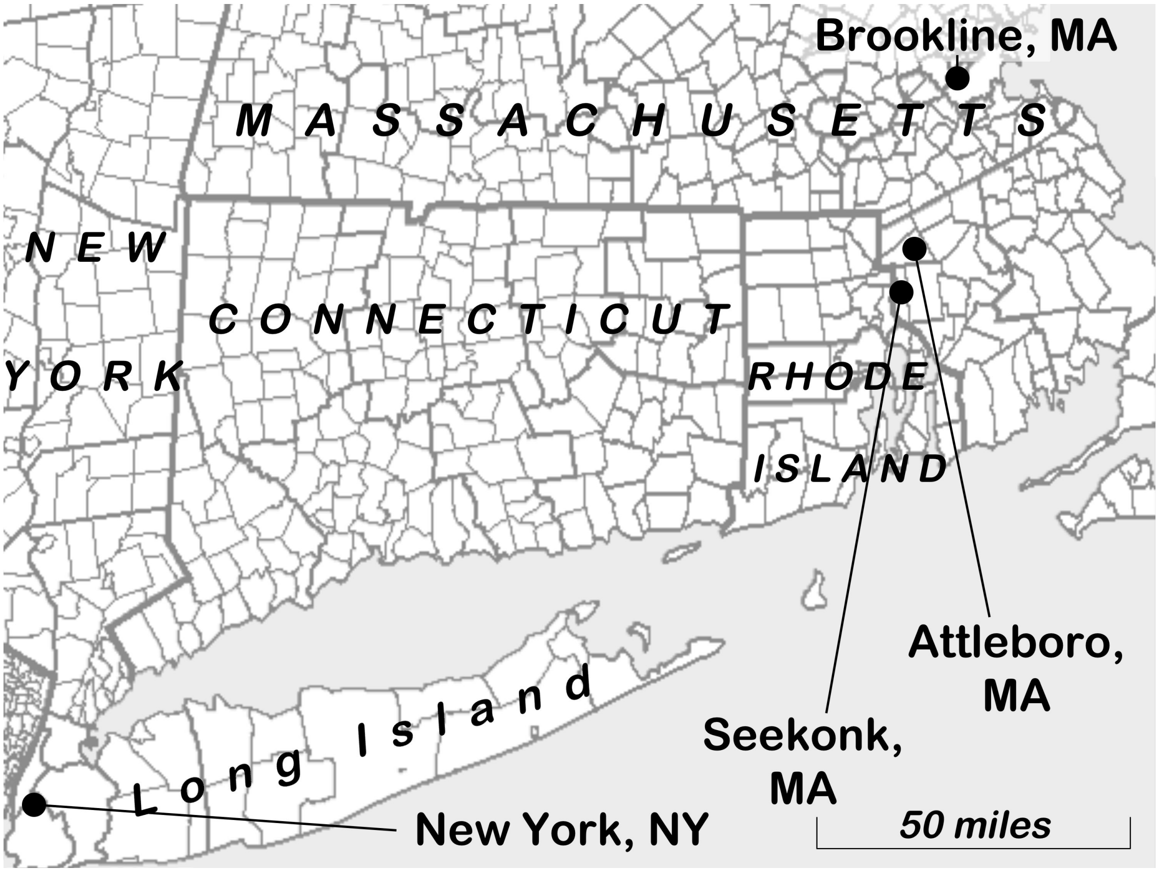

Figure 3.2: Location of Primary Data Sources

grade (AB12) 281. These 1013 filtered Attleboro responses comprise 61% of the grand total.

When it was discovered that the linguistic division between the low back merger in Attleboro and the distinction in South Attleboro no longer existed for most children in that city, permission was sought to extend the school survey to the south and west – towards Rhode Island – into areas where the low back distinction would likely still be more intact. The only community adjacent to Attleboro where permission was obtained to conduct the school survey was Seekonk MA.

Located just 5 miles east of Providence and sharing a border with East Providence RI, the town of Seekonk MA, population 14,000 (2005 est.), had appeared to pattern linguistically – including having the low back distinction – with the adjacent metropolitan area of Providence, where many of its residents indeed originally had come from. The Seekonk school department agreed to administer the survey to its 4th, 8th, and 12th graders, although in one of the three elementary schools it was mistakenly administered to the 5th graders instead.

Except for the 12th grade, Seekonk required signed parental permission for taking the survey, which cut down the number of responses (and in so doing may have introduced a bias towards students of higher socioeconomic status). There were 72 responses from SK4/5, 27 from SK8 (it is unclear why the middle school returned so few), and 109 from SK12, for a total of 208 (12% of the filtered total).

The other two main sources were far from the dialect boundary. In the heart of the Eastern New England area of low back merger, Brookline MA, population 55,000 (2005 est.), an inner suburb of Boston that is partially surrounded by that city, agreed to administer the survey to its 12th graders (at the same high school that I attended): BR12 gave 227 responses (14% of the total).

And in New York City, the heart of the Mid-Atlantic area where the low back distinction is known to be strong among adults (Labov *et al.* 2006: 59), I contacted two friends who are high school teachers, who agreed to distribute the survey to their students. One teaches at a public magnet high school in Brooklyn that attracts students from all five boroughs, though mainly from Brooklyn and Queens; her students, 11th graders, contributed 103 responses. Another friend taught at a Jewish high school in Manhattan (again, with students from many parts of the city); 11 of her 10th graders completed the survey. Combining these, NY12 gave 114 responses (7% of the total).

The smaller sources were: 35 responses from students at a Massachusetts state college (MS15), enrolled in a course teaching diction and accent reduction (BS15); 25 from 4th graders (DS4) and 15 from 8th graders (DS8) at Dayspring Christian Academy in South

Attleboro, whose students come from a wide surrounding radius on both sides of the dialect boundary; 16 from Eastman School of Music in Rochester NY, whose students come from all over the country (EA15); 12 from 4th graders at a charter school in Jersey City NJ (NJ4); and 6 from students at a public high school in Providence RI (PR12). This data, totaling 109 responses (7% of the total) was likewise obtained through the cooperation of teacher friends and school officials.

The various sources of school survey data are summarized in Table 3.2.

source	raw total	% eliminated	filtered total	*father∼bother* &	permission
AB12	328	14%	281	*Osama∼comma*	school
AB8	473	15%	402	*Osama∼comma*	school
AB4	428	23%	330	*Osama∼comma*	school
SK12	120	9%	109	*salami∼Tommy*	school
SK8	29	7%	27	*salami∼Tommy*	parent
SK4	90	20%	72	*salami∼Tommy*	parent
BR12	269	16%	227	*salami∼Tommy*	school
NY12	136	15%	114	*Osama∼comma*	teacher
MS15	38	8%	35	*salami∼Tommy*	teacher
DS8	17	12%	15	*salami∼Tommy*	school
DS4	33	24%	25	*salami∼Tommy*	school
EA15	17	6%	16	*Osama∼comma*	teacher
NJ4	20	40%	12	*Osama∼comma*	teacher
PR12	14	57%	6	*salami∼Tommy*	teacher
total	2029	18%	1671	—	—

Table 3.2: The school survey sample: sources of data

3.5 Accuracy

A strength of the school survey is that it collected data from a very large number of subjects, but a weakness is that it is not immediately clear how accurate the data is, or even exactly what it means.

A common procedure in sociolinguistic interviews is to elicit a speaker's pronunciation of both members of a 'minimal pair' of interest – often two words which would sound identical, if their stressed vowels had merged – and then to ask the informant whether the words sound the same or different (Labov 1994: 353-6). The linguist's impression of the two sounds, or subsequent instrumental analysis of them, is usually called 'production' data: vowels can thus be 'merged in production' or 'distinct in production'. The informant's report on the words he just uttered, and perhaps repeated, is known as 'perception' data; this term is somewhat less apt, but it is traditional.

There would be little need to distinguish the two if not for the fact that production and perception do not always match. Speakers may produce a distinction that they do not perceive; this is typical of mergers in progress and a defining feature of near-mergers (a type of small yet stable distinction).

Speakers may also produce (and perceive) a distinction in a minimal pair test that they would not produce in ordinary speech, by using a "borrowed prestige pronunciation" (Labov *et al.* 1972: 232) or shifting more subtly towards an incoming norm (Labov 1994: 355).

It is also possible for speakers to actually produce identical forms in a minimal pair test, yet perceive them to be different, or at least claim that they are. This phenomenon was occasionally observed in my in-person interviews, most often with young children. As discussed by Herold (1990: 17), these two facts together usually indicate that the subject makes no distinction in natural speech. The problem with the written survey is that it provides us with the 'evaluative statement' only.

In light of the above, the judgment school survey subjects had to make for each minimal pair was a type of 'perception' task, and might or might not accurately reflect how they would naturally pronounce those words. The decision to circle "same" or "different" could be affected by the following factors, at least:

1) how the subject actually pronounces the pair in spontaneous speech; 2) how the subject believes – more or less consciously – the pair 'should' be pronounced, including the influence of a) orthography, b) the dialect of current peers, c) the dialect learned as an infant (parents' dialect), d) unconscious limitations in accurately accessing the production grammar; 3) how other survey items have been answered (the 'history quiz effect' suggested above); 4) some degree of randomness, if not outright capriciousness.

Fortunately, 31 survey responses (1.5% of the total) came from subjects who were also interviewed in person. This makes it possible to compare their production of the low back vowels to the judgments indicated on the questionnaire, obtaining an estimate of the 'accuracy' of the survey.

Of these 31, 14 were children in Seekonk, who completed the survey in school and later were interviewed as part of the family study (indeed, the Seekonk families were recruited by asking parents, on their children's survey permission slip, to leave their phone number if they wanted to participate further). Six children in Attleboro (5 of them from South Attleboro), interviewed as part of the family study there, happened to have already participated in the school survey.

Three mothers from the family study took the survey, as did 8 friends and family members of mine. This last group of subjects were not formally interviewed, but I am very familiar with their speech, including their low back vowel productions.

All the others were judged on their production of five or six minimal pairs, from among the following: *cot∼caught, Don∼Dawn, knotty∼naughty, nod∼gnawed, Otto∼auto, tot∼taught, and tock∼talk.* The pairs were read twice, first embedded in sentences, then as bare minimal pairs. Each production was judged "S[ame] "D[ifferent]," or "?", and as the task was recorded, productions thought unclear when heard 'live' could be reviewed.

Figure 3.3 compares the speakers' speech production scores with their school survey data. Several patterns emerge from the comparison.

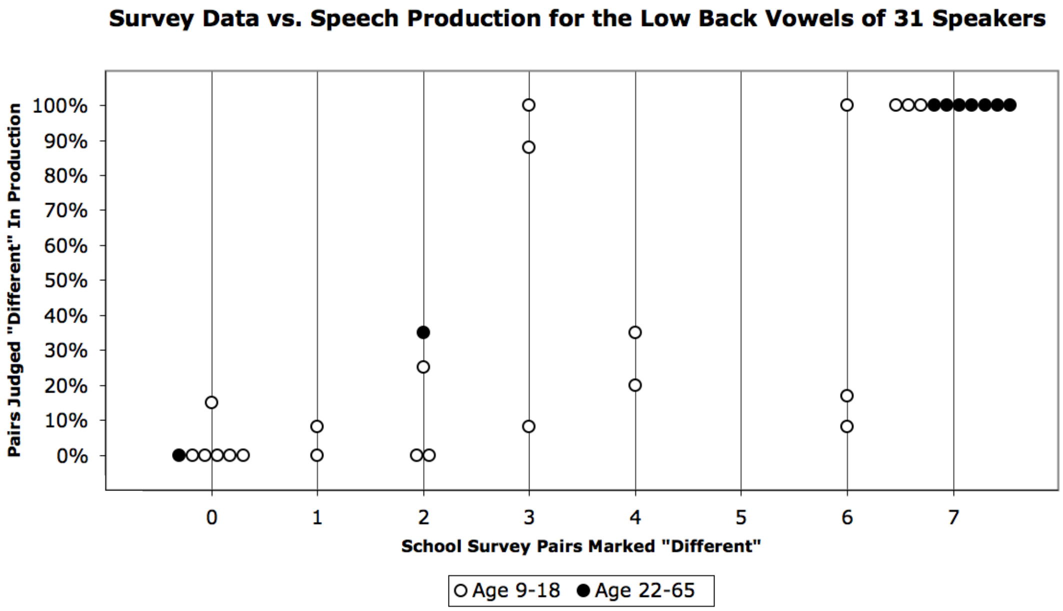

Figure 3.3: The Low Back Vowels: Survey Responses vs. Speech Production

3.5.1 Adults' accuracy

Looking first at the 9 adult speakers (the 3 family study mothers and 6 of my own friends and family, who range in age from 22 to 65), we see that 7 of them – 3 from New York City, 1 from Philadelphia, 1 from Cranston RI, 1 from South Attleboro MA, and 1 from England – are 100% distinct in production and marked 7/7 pairs "different" on the survey (even though 3 of these speakers have lived for 25-30 years in fully merged communities and have fully merged speakers in their immediate family – including myself).

The eighth adult, from near Boston, is 100% merged in production and marked 0/7 pairs "different" on the survey (although he has been married to a 100% distinct NYC speaker for over 20 years). So in this small and unrepresentative sample, we see that 8 of 9 adults (89%) are at one extreme or the other in their low vowel production.

The final adult, a mother from Wooster OH, was intermediate in both tasks. Her low back vowel production was unique among the subjects. In her first reading of the word pairs, when they were embedded in sentences, her vowels were either distinct or very close; but when presented with the bare pairs, she pronounced them all identically. Averaging all these pronunciations earned her a score of 35% distinct in production. On the school survey, she marked 2/7 pairs “different” (29%), a quite similar result. Her intermediate pattern is not particularly surprising as she grew up on the northern edge of the Midland, where similar behavior is widespread (Labov *et al.* 2006: 62-64). Her being married to a fully-merged Boston-area speaker may or may not be relevant.

We see that on the whole, the adults tend to be extreme (that is, consistent) in their productions and very accurate in their representations of them on the survey. If being merged or distinct in production is one factor affecting performance on the survey questionnaire, then as far as these adults are concerned, no other factor needs to be considered.

3.5.2 Children’s accuracy

The 22 children in this comparison – 14 from Seekonk, 6 from Attleboro, and 2 family members from Brookline, ranging in age from 9 to 18 – behaved differently from the adults, being at the same time more variable in production and less accurate in reflecting that production on the school survey.

While 89% (8/9) of the adults were at one extreme or the other in production, only 59% (13/22) of the children were: 8 were judged 100% merged, and 5 were judged 100% distinct.[1]

An additional 4 children were between 85% and 100% merged (1 at 85%, 3 at 92%), and one was between 85% and 100% distinct (at 88%). So overall, the great majority of children (18 of 22, or 82%) were at least close to being fully merged or fully distinct in their production of low back vowel minimal pairs.

[1]The greater proportion of invariant responses for adults as compared to children is not statistically significant, but it is suggestive. In in-person interviews, it was also noted that adults’ patterns were usually more clear-cut.

Turning to the relationship between production and performance on the school survey, we see that both merged and distinct children represented their speech on the survey with the same fairly high degree of accuracy. Of the children judged fully merged in speech, 5/8 (63%) marked all 7 pairs "same" on the survey. Of the children who were fully distinct, 3/5 (60%) marked all 7 survey pairs "different".

While more than half of fully merged and fully distinct children are thus seen to reflect their production accurately on the survey, those children who are intermediate in production are, so to speak, even more intermediate on the survey. This can be seen in Table 3.3, which compares the expected survey performance, if it directly reflected production, to the actual average response on the survey (number of pairs marked "different", divided by 7), for each of the production categories established above.

production bin	% distinct (speech)	% "different" (survey)	# of children
fully distinct	100%	86%	5
close to distinct	*88%*	*43%*	*1*
mainly distinct	–	–	–
mainly merged*	17-35%	57%	4
close to merged*	8-15%	36%	4
fully merged	0%	9%	8

*Note: if one speaker is shifted between these categories, so that the ranges are "15-35%" and "8%", their survey percentages would become 46% and 48%.

Table 3.3: Comparison of /o/∼/oh/ in speech production vs. school survey for 22 children

For each category of production, the average survey response is less extreme (closer to 50%) than if it were an faithful reflection of production. And this effect appears to be stronger for the more intermediate production categories.[2]

This probably requires a two-part explanation. First of all, we can say that children, while accurate, are not as good as adults seem to be at representing the facts of their

[2]Note that the general finding that perception leads production in merger (Labov *et al.* 2006: 62) would only explain the top half of Table 3.3. The bottom half shows 'perception' – survey performance – lagging production.

production on the questionnaire. Less tendentiously, it could be stated that children's vowel perceptions diverge from their productions more often than adults'.

The two most extreme examples of this are a 10-year-old girl from Seekonk rated 8% distinct in production (10/12 pairs judged the same, 2/12 judged unclear) but who marked 6 of 7 pairs "different" on the survey, and a 13-year-old girl, also from Seekonk, rated 100% distinct in production but who marked only 3 of 7 pairs distinct. The latter case reinforces the observation that perception leads production as a community undergoes a merger, but the former case shows the reverse pattern.

But it is not accurate to simply say that children (try to) reflect their production facts on the survey, plus or minus some degree of more or less random error (explanation 4 above). The 'error' – if we can call it that – is decidedly skewed.

Only one child, a 17-year-old girl from South Attleboro, had survey data that was *more* consistent (farther from 50%) than her own productions: she marked 0/7 pairs "different" on the survey (0% distinct), while of her 10 minimal pair productions, 8 were judged same, 1 different, and 1 unclear (15% distinct overall).

Meanwhile, 13 children had survey data that was *less* consistent (closer to 50%) than their own productions, while the 8 remaining children were equally, and maximally, consistent: 5 were fully merged on both measures, 3 fully distinct.

Note that this pattern is different from the 'history quiz effect', which would affect fully consistent producers the most, imagining that they would be unwilling to hand in a questionnaire where all the 'answers' are the same. This effect would be smaller for intermediate producers, as there would be little pressure to mark 3 or 4 pairs "different" instead of 1 or 2. What Table 3.3 shows instead is that consistent speakers are *more* accurate than intermediate ones.

What may be happening is this: although some speakers who are fully merged or fully distinct in production sometimes allow various other factors to override their production grammar in making choices on the school survey, these other factors have much more influence on speakers who are intermediate, perhaps ‘unsure’, in production.

Bresnan (2007) described a similar pattern for speakers asked to judge the relative acceptability of double-object and prepositional-dative versions of the same sentences, in context. She found that for sentences strongly predicted (by a regression model trained on corpus data) to appear in a given construction, subjects had strong preferences in the same direction. However, for sentences less strongly predicted to appear in a given construction, subjects on average had almost no preference (that is, 50%).

The shared finding is that in tasks where subjects consciously reflect on their choice of linguistic forms, they discriminate less sensitively, tending towards categories of 0%, 50%, and 100% (or perhaps ‘no’, ‘I don’t know’, and ‘yes’). In tasks measuring subjects’ actual linguistic performance with respect to these choices, a finer, more gradient pattern is observed.

Interestingly, as discussed below in §3.6.7, subjects’ survey performance is also consistently less extreme – closer to the mid-point between merged and distinct – than the regression models set up to account for it predict. The best interpretation of this parallel finding is not immediately clear.

The small total number of children in these accuracy comparisons, as well as the unexplained deficit of speakers judged ‘mainly’ or ‘close to’ distinct in production, makes it difficult to confirm these patterns and say more about them. But it seems that if speakers are at least as consistent (that is, extreme) in speech production as they are on the school survey, then any differences found among subjects in the survey data are likely to reflect similar (and perhaps even larger) differences in their production.

Said another way, subjects’ perceptions as recorded on the school survey are a fairly accurate – for adults, very accurate – reflection of production, and where they are inaccurate they almost always underestimate the consistency (whether merged or distinct) of speech.

Thus, differences between speakers or types of speakers that can be observed with the survey are at worst underestimates of differences in speech.

In conclusion, the 98.5% of school survey data for which no corresponding speech data is available should be analyzable without any great conceptual or practical transformation: fully merged or fully distinct responses are likely to have come from fully merged or distinct speakers, while intermediate responses probably came from speakers who were at least somewhat less intermediate.

If survey responses are less extreme and more noisy than production realities, though generally in line with them, it seems that this would make it harder for legitimate regression factors to reach statistical significance. This does not necessarily mean they can be trusted, if they do appear significant. There could in principle be factors that influence speakers' survey responses that are unrelated to their underlying patterns of low vowel production.

3.6 Factors affecting vowel inventory: evidence from /o/ and /oh/

3.6.1 Mixed-effects logistic regression

Once the number of speakers was filtered down to 1671, as discussed above, the main analysis of the low back vowel data was carried out. First, the data was explored using cross-tabulations and by simply comparing the proportions of "same" and "different" responses for different groups and combinations of sub-groups in the data.

Following that, the main statistical tool used was mixed-effects logistic regression, implemented using the `lmer` package in the statistical software environment `R` (Pinheiro and Bates 2000; Baayen *et al.* 2007). The mixed-effects logistic regression, or mixed logit, used Laplacian approximation to maximize the log-likelihood of models fitting the probability p of a binary response with an equation of the following form:

$$\text{logit}\, p = \log(p/(1-p)) = X\beta + Zb, b \sim \mathcal{N}(0, \sigma^2)$$

According to this equation, the log-odds of the response depend on two sets of factors: the *fixed effects* and the *random effects*. The fixed effects, represented by the vector β, model the more traditional independent variables, factors whose levels are fixed and repeatable. A good example of a fixed effect is gender, which has a small, known number of possible levels, each of which could be sampled again, in repeating or extending an experiment.

The random effects, represented by the vector b, are factors that are not necessarily fixed or repeatable, and are often best thought of as samplings from a large range of possible levels. A typical random effect is that of experimental subject, where each participant constitutes a unique level of the factor sampled from a larger population. Random effects can also capture the correlations when repeated measurements are taken within nested groups: a subject, a school class, a school year, a school, a community. Each subject or larger group's effect is assumed to be taken from a normal distribution with a mean of zero; the larger the random effect, the larger the variance of this distribution.

In a typical mixed-effects model, the fixed effects are those for which the experimenter wishes to estimate, and often predict, the effect of each specific level on the response. Though other levels of the fixed factor may exist, inferences about them will not be possible. The random effects, on the other hand, are those for which the experimenter cares more about estimating the overall variance of all the levels, rather than the effect of the particular ones observed.

Random effects are often used to model, or 'factor out', variables that the experimenter is not interested in for their own sake. For example, in studying the effectiveness of a model curriculum (a fixed effect) in raising test scores (the response), several schools might be sampled, to increase the total number of subjects and to make the subjects more representative of a larger population of students, both of which would increase the reliability of the estimate of the curriculum's effect. Although any set of schools would probably differ measurably with respect to (average) test score, exploring these differences is not the purpose of the experiment, and the effect of school on the response would be a classic case of a 'grouping effect' best modeled as random.

The school study differs in that there are few possible independent variables whose effect on the response are *a priori* of little interest, except perhaps any variation between subjects which really does not reflect linguistic competence at all. It remains true that factors sampled from a potentially larger 'population' (Subject, Item) as well as grouping factors (Class, Grade, School, Community) are better treated as random effects, and usually were.

Despite the above distinction, fixed and random effects in a mixed model are not, practically speaking, totally different. While using different mathematics than for fixed factors, the model still gives estimates of the effects of each level of a random factor (called *best linear unbiased predictors,* or BLUPs); these are always smaller than the coefficients that would obtain if the factor was treated as fixed. It follows that a treating an effect as random makes it less likely to be considered a statistically significant contributor to the overall model, and thus more noteworthy if it still is – in a word, a more conservative procedure. Indeed, there are arguments for treating any factors with "more than very few" levels as random effects (Baayen, p.c.).

Another popular use of random effects is to estimate different values for a regression coefficient for each of several groups in the data. For example, assume not only that average test scores varied by school, but that the effect the model curriculum had on test scores varied from school to school too. This is equivalent to an interaction between a fixed effect and a random effect; interactions between random effects can be estimated similarly. Unfortunately, the computing time necessary to fit these combined models could be considerable (and they still sometimes failed to compute), so some regressions were instead performed separately on different subgroups of the data.

3.6.2 The response variable

In responding to the /o/∼/oh/ minimal pairs, each subject was asked to choose "same" or "different" seven times. One possible statistical approach would have been to add the number of "different" responses to create subject scores ranging from 0 to 7, and carry out ordinal logistic regression using the score as the dependent variable. However, while 0-7 subject scores will be used extensively in displaying and discussing the data, using them for regression would lose track of any systematic differences between the seven items.

For this reason, each of these responses was treated as an observation (a row in the `R` data frame), and the identity of the particular pair being asked about was turned into a new variable, called Item. Meanwhile, all seven responses from a given subject were given the same value of another new variable, called Subject, which is meant to capture the unexplained between-subject variation, once other subject variables (Gender, Race, parents' origin, etc.) are considered.

By treating both Subject and Item as crossed random factors in all analyses, the model will 'assign' a certain amount of the variability in the data to each one. Comparing these effects and how they change for different subsets of the data is interesting for its own sake; just as importantly, taking them into account helps reveal the significant patterns in the remaining variables under consideration.

As in traditional logistic regressions, all coefficients are expressed in *log-odds.* Suppose the regression coefficient for a certain level of a factor comes out as +1.00. This would mean that compared to the 'baseline' level, this 'treatment' level *adds* 1.00 to the log-odds of obtaining the response “different”. That is, it *multiplies* the odds by $e^{1.00}$, which is approximately 2.72. So if with the baseline level, the odds were already 2:1 in favor of the response “different”, they would be 5.44:1 in favor with the treatment level. These odds correspond to the probability of the response “diffferent” increasing from 0.67 to 0.84.

But if the baseline odds were 10:1, probability 0.91, the treatment odds would be 27.2:1, probability 0.96. This illustrates the fact that a given change in log-odds does not correspond to a fixed increase or decrease in probability, as illustrated in Figure 3.4.

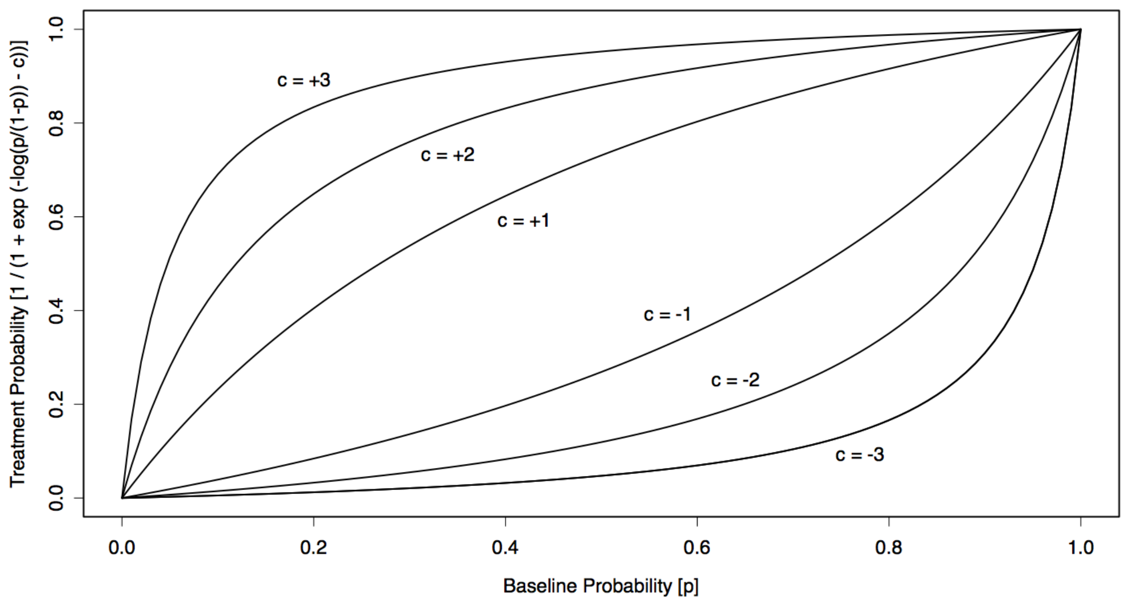

Figure 3.4: The effect of a log-odds increment *c* on probability *p*

3.6.3 Analysis by community: primary communities

It was known from the start that the community in which a subject took the school survey – and, usually, also resided – would be a powerful predictor of their low back vowel response. Indeed, the four main communities for the survey were selected on the basis of their location with respect to geographical dialect boundaries: Brookline MA, in ‘Eastern

New England' near the focal city of Boston; Attleboro MA, near the dialect boundary but mainly on the Eastern New England (low back merged) side; Seekonk MA, just on the 'Mid-Atlantic' (low back distinct) side of the boundary; and New York City, a focal city of the Mid-Atlantic.

Besides geography, a constellation of factors determines an individual's low back vowel system, and since at least some of this explanatory structure may differ between communities, it seemed wisest not to analyze the entire data set from the outset, but to approach each community individually. Later, the sub-analyses will be combined as much as possible, reflecting that most of the same factors are operating similarly in different places.

Within each community, the same procedure will be followed. A 'super-model' with many variables will be introduced, and then each variable will be removed, at least temporarily. It is by removing a variable, and comparing the model's fit to the data with and without it, that its significance is assessed. Once the variables that do not contribute significantly are removed, those in the resulting 'best model' will be discussed.

The several community models will then be compared and generalized as much as possible. Interactions between variables are deferred until §3.6.7.

3.6.3.1 Brookline MA 12th graders (BR12)

The filtered data from Brookline MA consists of 227 responses, all from 12th graders. The overall Response percentage was 25% "different", corresponding to a mean subject score of 1.72. The subjects' responses were distributed as shown in Figure 3.5, showing almost half the subjects as fully merged, followed by then a steep decline, then a leveling off in the distinct half of the 'spectrum.'

The initial super-model for Brookline contained the following bolded **factors,** each of which is listed with the *baseline level* italicized: **Gender:** (*Male,* Female); **Race:** (*White,* Asian, Black, Hispanic, other (or >1) race, unknown; Who Speaks a **Foreign Language**

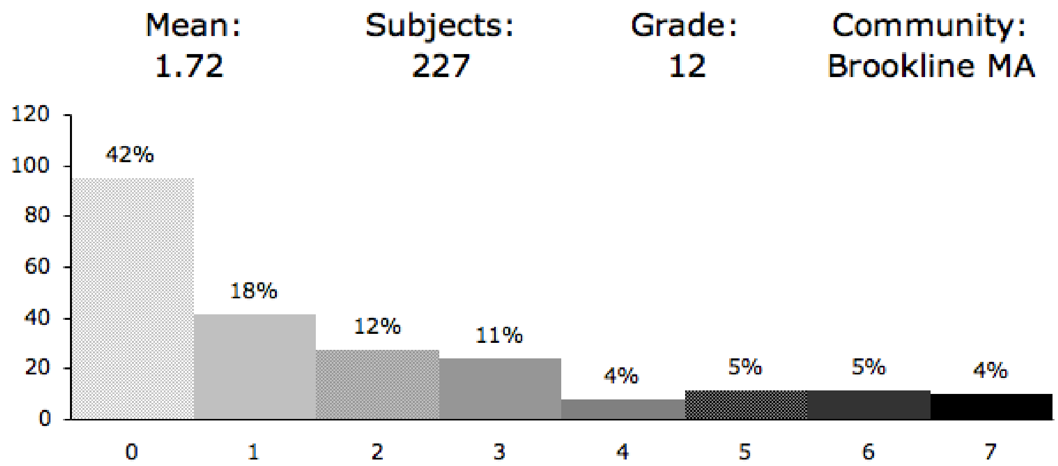

Figure 3.5: Number of Subjects vs. Items Marked "Different" (Brookline High)

at Home: (*0: "no one" or blank,* 1: one parent and/or other relatives, 2: both parents, 3: "everyone" or bare language name); Number of **Older Siblings:** (*0,* 1, 2, 3+); Number of **Younger Siblings:** (same as previous); **Origin** of Subject: *Brookline,* distinct community, merged community, unresolved, unknown, foreign; Origin of **Mother:** (*distinct*, probably distinct, probably merged, merged, unresolved, foreign, unknown), Origin of **Father:** (same as previous); **Item:** (random) *Collar*∼*Caller*, *Cot*∼*Caught*, *Don*∼*Dawn*, *Moll*∼*Mall*, *Otto*∼*Auto*, *Tock*∼*Talk*, *Tot*∼*Taught*; **Subject:** (random) one level per subject.

Most of these factors and levels were directly transcribed from the questionnaires. When multiple Race categories were circled, this was treated like "other". The Foreign Language factor reduced a variety of written responses to a single estimate of foreign language exposure in the home. In terms of Number of Older or Younger Siblings, anything more than two was combined into "3+".

The factor called Origin is not precisely defined, but it represents where the subject spent their earliest childhood, based on the information given for where they attended preschool, kindergarten, elementary, and sometimes middle school.

The factors Mother and Father are based on where subject's parents were said to have grown up. The coding was conservative; only places whose low back vowel status was known with certainty were called "merged" or "distinct"; when in doubt, the assignation was to another category.

Regions coded as "merged" included Maine, New Hampshire, and most of eastern Massachusetts, where the boundary of merger to the west is unclear, but that to the south is now clearly known, through the geographic study reported in Chapter 4. Western and parts of northeastern Pennsylvania (Herold 1988), Canada, and Scotland are also "merged".

Known "distinct" areas were the Mid-Atlantic states, including Connecticut, Rhode Island, and a small area of southeastern Massachusetts, New York, New Jersey, Pennsylvania, the Inland North or Great Lakes states, England, South Africa, and Australia.

For parents, underspecified origins like "Pennsylvania" were considered "probably distinct," as was most of the South, while places like "Massachusetts" and the West were "probably merged". Some places (e.g. Florida, Vermont, the Midland) were considered inherently "unresolved," a status also assigned to people who grew up having moved between merged and distinct places. A considerable number of parents grew up abroad; their origin was coded as "foreign" even though in some cases (e.g. India, Jamaica) their native language was a form of English.

Fitting the Brookline super-model to the data, then removing each factor one at a time to test its significance, produces the results shown in Table 3.4.

The non-significant effects, with more than a 5% chance of having arisen by chance ($p>0.05$), are Gender, Race, Older Siblings, Younger Siblings, and Foreign Language.

The factors modeled as significant at the $p\leq 0.05$ level (in **bold**) are the fixed effect of Origin ($p = 0.007$), and the random effects of Item ($p = 0.005$), and particularly of Subject ($p\simeq 0$). Part of the reason that Subject seems so significant according to this method is that when any of the other factors (except Item) are removed from the model, Subject can 'pick

FACTOR	TYPE	LEVELS		SOMERS' D_{xy}	LL	P-VALUE
(super)	—	—	all included:	0.434	-693	—
gender	fixed	2	one dropped:	0.433	-694	0.51
race	fixed	6	”	0.410	-697	0.25
foreign lang.	fixed	4	”	0.426	-694	0.76
older sibs.	fixed	4	”	0.421	-695	0.35
younger sibs.	fixed	4	”	0.422	-695	0.38
mother	***fixed***	***7***	”	***0.396***	***-699***	***0.10***
father	***fixed***	***7***	”	***0.382***	***-699***	***0.10***
origin	**fixed**	**6**	”	**0.387**	**-701**	**0.007**
item	**random**	**7**	”	**0.418**	**-697**	**0.005**
subject	**random**	**227**	”	—	**-800**	**$<2\times10^{-16}$****
subject std. dev. (null)			subject std. dev. (best)		subject std. dev. (super)	
2.129			1.90		1.789	

*2×10^{-16} is simply the closest number to zero that the author's computer can process.

Table 3.4: Contribution of factors to super-model for 227 Brookline MA 12th graders

up' whatever explanatory power that factor had. Without Origin in the model, for example, all the subject BLUPs shift slightly depending on the origin of that subject. But without Subject in the model, the other effects cannot compensate.

It is the `anova` function that compares models and reports the log-likelihoods (LL) and p-values given here. The fit of the model without individual Subject adjustments is given by the Somers' D_{xy} criterion, which is the rank correlation between the predicted probabilities of the responses and the binary responses themselves.[3] We see that the D-value is substantially lower when the Origin variable is removed (0.387 vs. 0.434).

At the bottom of Table 3.4, the model fit is shown in another way. If there are no fixed effects – call this the *null model* – the Subject random effect will be at its 'widest',

[3]Somers' D_{xy} is a measure of the goodness of fit of a logistic regression model to the data, not unlike R^2 for linear regression. The following sequence is the easiest way to understand the number. For a given combination of predictors, the logistic model gives a probability of the outcome variable being 1. Imagine translating these probabilities into predicted values by choosing a cutoff point below which we always predict 0, above which we always predict 1. If we plot the rate of true positives (correctly predicted 1's / observed 1's) against the rate of false positives (incorrectly predicted 1's / observed 0's) for every cutoff point, we obtain a *receiver operating characteristic* curve. The area C under the ROC curve is .5 for a chance-caliber predictor, and 1 for a perfect one. Somers' D_{xy} is equal to 2(C-.5), so it ranges from 0 (chance) to 1 (perfect).

with a standard deviation of 2.129 in the BR12 case. The so-called *best model* incorporates the significant fixed factors, and since these are between-subject factors, they leave behind a smaller residual Subject effect, here 1.903. The *super-model*, which includes non-significant factors, has a slightly narrower Subject effect, 1.789.

We can view the goal of adding fixed factors as being to reduce the Subject random effect to its smallest possible size, where it only accounts for the actual *individual* variation between subjects. Of course, truly doing this would require identifying every relevant predictor variable, which were obviously not all included on the survey. Still another gap is between the variability in individuals' responses, and that in their underlying linguistic competence, which is likely to be smaller still.

Continuing to build the best model for BR12, we see that the factors of Mother and Father each generate a p-value of 0.10 when removed. This seems to put them at the outer edge of a range, $0.05 < p \leq 0.10$, which will be called ***marginally significant***. But in fact, where subjects' parents grew up (Mother, Father), like where subjects themselves grew up (Origin), is a very significant predictor. Table 3.5 shows why this is so.

factor	Somers' D_{xy}	log-likelihood	p (drop)	p (add)
both	0.434	-693	—	0.024
mother	0.382	-699	0.10	0.041
father	0.396	-699	0.10	0.044
neither	0.341	-705	0.024	—

Table 3.5: Significance of correlated factors Mother and Father compared to models with both and neither (all other super-model factors included)

We see that Mother and Father, together, make a significant ($p = 0.024$) contribution to the model, but that their role individually is unclear. The p-value associated with adding Mother is a tiny bit smaller, indicating a more important effect, but the contribution of Father to Somers' D is slighty greater.

Regardless of their relative sizes, the two effects are not additive; having either one in the model is more than half as good as having both. This can best be seen from the two columns of p-values: the model with “both” is not significantly better than the models with either “mother” or “father” ($p = 0.10$), but having either “mother” or “father” is significantly better than having “neither” ($p = 0.044$).

This type of pattern is commonly encountered when predictor factors are correlated, a situation known as multicollinearity. In this case, Mother and Father are moderately correlated (Kendall’s τ=0.39), which makes sense: many parents are both local, while others have moved to Brookline together from the same city or country.

We want to know if each parent has their own effect, or whether much of the Father effect is due to statistical mediation (Father predicts Mother and Mother predicts the response). Expanding the data set in later sections will enable us to show that there is a significant effect for each parent, so both will be left in here.

We will now explore the nature of these five factors – Mother, Father, Origin, Item, and Subject – all of which help determine the Brookline students’ judgments of whether low back vowel pairs sound “same” or “different”, and probably influence their pronunciation of the vowels as well. Table 3.6 lists each level of these factors from highest coefficient estimate to lowest (except Subject, where a summary is given), and indicates which treatment levels are **significantly** ($p \leq 0.05$) or ***marginally significantly*** ($0.05 < p \leq 0.10$) different from the baseline.

In all regressions with fixed factors, it is necessary to choose how the factor levels will be compared. Here, the baseline vs. treatment level approach is used, although more complex contrast sets are possible. For this analysis, the baseline level for Mother and Father has been chosen to be “distinct”, and the effect of every other category of parents is thus compared to that of distinct ones, which is set to zero. Usually, any significant effect found *in contrast to* “distinct” would show up as a significant effect *of* “distinct” if the

FACTOR	LEVEL	TYPE	SUBJECTS	ESTIMATE	P-VALUE
mother	prob. merged	treatment	9	+0.279	0.74
mother	prob. distinct	treatment	21	+0.234	0.70
mother	unresolved	treatment	10	+0.192	0.81
mother	distinct	baseline	56	0	—
mother	foreign	treatment	73	-0.446	0.44
mother	**merged**	**treatment**	**55**	**-1.301**	**0.01**
mother	unknown	treatment	3	-1.359	0.45
father	foreign	treatment	72	+0.583	0.28
father	distinct	baseline	65	0	—
father	prob. distinct	treatment	16	-0.012	0.99
father	unresolved	treatment	12	-0.723	0.35
father	***merged***	***treatment***	***45***	***-0.894***	***0.08***
father	unknown	treatment	7	-1.102	0.30
father	prob. merged	treatment	10	-1.174	0.16
origin	**distinct**	**treatment**	**9**	**+1.770**	**0.02**
origin	unresolved	treatment	5	+1.577	0.14
origin	***unknown***	***treatment***	***12***	***+1.227***	***0.08***
origin	**merged**	**treatment**	**40**	**+1.013**	**0.01**
origin	foreign	treatment	11	+0.838	0.24
origin	Brookline	baseline	150	0	—
item	*collar∼caller*	random		+0.424	
item	*tock∼talk*	random		+0.399	
item	*Moll∼mall*	random		+0.173	
item	*Otto∼auto*	random		+0.147	
item	mean of BLUPs	random		+0.107	
item	*Don∼Dawn*	random		+0.068	
item	*taught∼tot*	random		-0.147	
item	*caught∼cot*	random		-0.315	
subject	maximum	random	1	+4.088	
subject	>+2 std. dev.	random	1	+3.806	
subject	>+1 std. dev.	random	24	+1.903	
subject	mean of BLUPs	random	227	+0.138	
subject	<-1 std. dev.	random	8	-1.903	
subject	minimum	random	1	-2.545	
intercept: -1.784	degrees of freedom: 20	LL: -702	Somers' D_{xy}: 0.368		

Table 3.6: Best Model (without interactions) for Brookline MA 12th graders

contrast baseline were reversed.

The only significant level of Mother is “merged” ($p = 0.01$). In the Brookline data set, having a merged mother as opposed to a distinct mother – again, the mothers’ speech patterns having been estimated from where they were reported to have grown up – is associated with a coefficient of -1.301. Converting from log-odds to odds, this says that a merged mother ‘makes you’ 3.67 times less likely to mark any given minimal pair “different” than if you have a distinct mother. This is a considerable effect, equivalent to going (for example) from a 50% to a 21% chance, or from a mean score of 3.5 to 1.5.

None of the levels of Father are significant, although “merged” comes fairly close ($p = 0.08$). Because of the collinearity issue mentioned above, it is legitimate to consider the coefficient for “merged”: -0.894. This suggests that the father’s effect is smaller than the mother’s (confirmed by the observation that even if Mother is removed from the model, the magnitude of “father merged” only ‘rises’ to -1.204). In terms of odds, subjects with merged fathers are 2.44 times less likely to answer “different”; in terms of probability, other things being equal, they would go from 50% to 29% (mean score 3.5 to 2).

Unlike their parents, enough Brookline students had never lived anywhere else that “Brookline” could be made a separate Origin category, and this level was chosen as the baseline. There are two significant results here, one unsurprising and one more puzzling. Subjects whose Origin was “distinct” – that is, who had moved to Brookline at some point in their lives from a distinct dialect area – were much more distinct than the locals (log-odds +1.77, $p = 0.02$); the effect is that of going from a probability of 50% up to 85% (or from a mean score of 3.5 to 6).

The above result, though derived from only nine subjects, shows the expected effect of early childhood peers standing out once parental differences are controlled for. It implies that moving to a merged dialect area, and (presumably) intermingling with local peers there, does not erase all evidence of a distinction learned in earlier years. Indeed, the lasting influence of those earlier peers is roughly as great as that of both parents combined, even though contact with parents has continued since the move.

Much more unexpected is that subjects who moved to Brookline from another *merged* community are also significantly more distinct than those with a truly local Origin (log-odds +1.01, p = 0.01). Most of these 40 subjects moved from other nearby towns and cities – Boston, Cambridge, Framingham, Newton, Saugus, Watertown, among others – and such places would be thought to have the low back merger just as much as Brookline, or perhaps even more so, given Brookline's high population of foreign immigrants and upper middle-class immigrants from many parts of the country.

Why would children originally from Brookline show a greater tendency towards merger than those who moved there from other merged communities? Perhaps the Brookline locals tend to be of lower socioeconomic class than the in-movers (despite Brookline's generally higher status), or maybe they are less self-conscious about consistently reporting their merged norm for another reason. But these suggestions are purely speculative and unverifiable, given what was asked on the questionnaire.

The two origin effects can be seen in Table 3.7, which displays mean scores for sub-groups without controlling for parents' origin. It also shows that the effect of a different origin is larger for subjects who left there to move to Brookline more recently.

age moved	to Brookline	from merged	from distinct
native	1.39 (N=150)		
5-8		1.45 (20)	2.00 (2)
9-17		2.65 (20)	3.86 (7)

Table 3.7: Mean scores (0-7) for Brookline MA 12th graders: natives and in-movers

§3.7.2.2, below, shows that the group of seven late in-movers from distinct communities can be divided in another way, one that potentially undermines this one. Of the seven, three had moved from England and Australia, places characterized by the low vowel pattern /ah/

$\neq$ /o/ $\neq$ /oh/, and they had a mean of 6.33. The four who moved at ages 9-17 from the Mid-Atlantic or Inland North dialect areas – characterized by /ah = o/ $\neq$ /oh/ – had a mean of only 2.00, the same as the early-moving group. Removing the British types completely cancels the age-moved effect, at least for Brookline.

Compared to the (fixed) effects discussed so far, the effect of Item on the response is less pronounced. Modeled as a normal distribution with a theoretical mean of zero and a standard deviation of +0.295, the random Item effect has a BLUP for each of the seven items. Two of these were noticeably positive; those items were marked "different" quite a bit more often than the rest: *Collar∼Caller* and *Tock∼Talk*. This follows the general trend for all communities, discussed above.

The phonologically similar pair of items *Taught∼Tot* and *Caught∼Cot* were slightly favored to be marked "same" in the Brookline data, despite the orthographic clue to a difference: the /oh/ vowel is represented by four letters, the /o/ vowel by one. Recall that overall, these two pairs were the 'best-behaved' of the seven, most highly correlated with responses as a whole. That their BLUPs are lower in a generally merged community is another way of stating the same observation, but it is possible that they reflect speech somewhat more consistently than other items.

The scale of the Item effect is such that if *Don∼Dawn* were marked "different" 23.8% of the time (as it was), *Collar∼Caller* would be at 30.8%, and *Caught∼Cot* at 17.6%, according to the model. In the real Brookline data, *Collar∼Caller* is at 30.0%, and *Caught∼Cot* at 17.6%.

Despite the contribution of Mother, Father, Origin, and Item, most of the variability in the Brookline remains unaccounted for. Some of the remainder can be captured by assigning an overall tendency to mark "same" or "different" to each individual subject, over and above the adjustments indicated by their origin and that of their parents, and this is what the Subject random effect does.

Of the 227 individual BLUPs, only one falls outside the range of 2 standard deviations from the model mean of zero (the actual mean of these BLUPs is +0.138). This maximum value of +4.088 represents a subject who marks “different” much more often than the rest of the model expects her to. This subject is a young woman who has attended Brookline schools since kindergarten (preschool is not stated), whose mother grew up in Taunton MA (merged territory), and her father in Boston and Cuba. Despite all these merger-favoring factors, she marked 5/7 items “different”. As noted, there are no other speakers this ‘deviant’, suggesting that the model is fairly accurate.

But a different look at the model fit suggests a more moderated view. The random effect for Subject is supposed to account for ‘true’ individual differences (e.g. Subject 1234 didn’t understand the instructions, Subject 1212 is blinded by spelling) as well as any individual-level differences not captured in the model (e.g. handedness, socioeconomic class, popularity). Subject random effects should not, however, be correlated with the fixed effects already included in the model, as Table 3.8 reveals they are.

ORIGIN	MOTHER	FATHER	N	F + I	AVG. S	P (F,I)	P (F,I,S)	P (OBS.)
Brookline	distinct	distinct	22	-1.677	+0.250	0.16	0.19	0.29
Brookline	distinct	merged	8	-2.571	-0.206	0.07	0.06	0.07
Brookline	merged	distinct	11	-2.978	+0.246	0.05	0.06	0.03
Brookline	merged	merged	17	-3.872	+0.544	0.02	0.04	0.10
merged	distinct	distinct	6	-0.558	-0.842	0.36	0.20	0.24
distinct	distinct	distinct	3	+0.095	+1.433	0.52	0.82	0.86

Table 3.8: Predicted and observed probabilities for selected Origin and Parent subgroups, with and without Subject effect (f=fixed, i=item, s=subject); Brookline data

We can see that the Subject effect usually serves to ‘correct’ the value predicted by the combination of other effects, towards the actual value observed in the data. For three of the four native groups, the subjects are not as fully merged in their responses as the model would have predicted, and so the average subject effect is a positive correction to the negative fixed effect combination.

But for the two in-mover groups, the effects are skewed the other way; the observed responses are *more* extreme than the model predicts, and so the average subject effect has the same sign as the fixed effect combination. So the three in-movers from distinct areas (with distinct parents) all have positive subject effects. And of the in-movers from merged areas (with distinct parents), 5 of 6 are more merged than the model expects from a simple linear combination of Origin, Mother, and Father effects, and so they have negative subject effects.

The most likely explanation for these patterns is that there are substantial interactions among the three fixed effect variables. Since the numbers of Brookline subjects in some of these cells is quite small, and since the nature of these interactions is quite general, they will be discussed later in the context of a community-independent model, where more data can be discussed at once.

3.6.3.2 Attleboro MA 12th graders (AB12)

The filtered data from Attleboro MA consist of 1013 responses: 281 from 12th graders, 402 from 8th graders, and 330 from 4th graders. To facilitate a comparison with Brookline, the analysis will begin with the 12th grade data, obtained during the first week of school at Attleboro's single large public high school.

The average Response probability for AB12 was 27% "different" (BR12 had been 25%), equivalent to a mean score of 1.92 (vs. 1.72 for BR). The distribution of subjects' responses is shown in Figure 3.6. Although the mean is similar to the Brookline data (Figure 3.5), the Attleboro data has fewer fully merged subjects (28% as opposed to 42%) and more intermediate ones, with a more gradual and persistent decline from merged towards distinct. The difference in score distribution is statistically significant even by the fairly conservative Mann-Whitney test ($p = 0.03$).

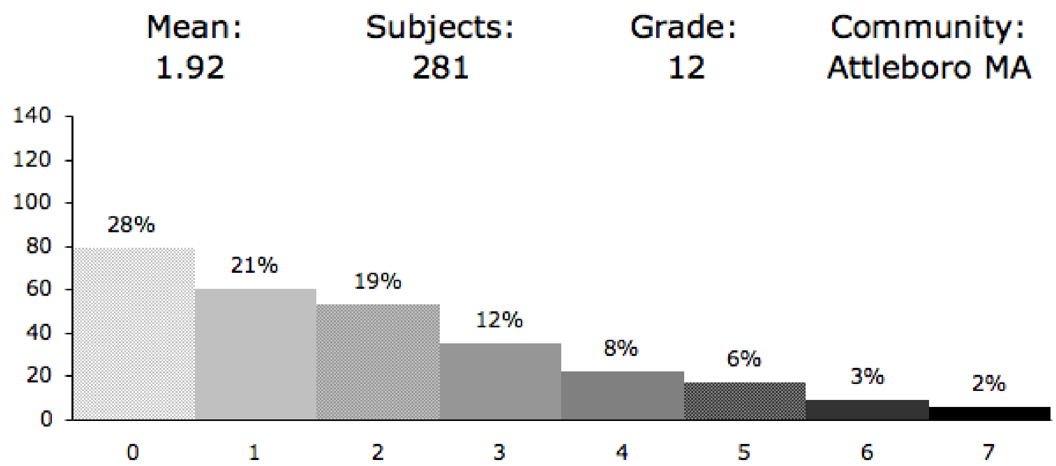

Figure 3.6: Number of Subjects vs. Items Marked "Different" (Attleboro High School)

For AB12, starting with the same super-model and testing the significance of each factor by removing it in turn yields a more complex picture, though one that in places resembles that for BR12. The results of this procedure are summarized in Table 3.9.

Comparing the Subject effect size between the null model and the super-model, we see two things: the standard deviations are smaller in AB12, meaning there is less between-subject variability than in BR12, and the fixed factors cause a much greater reduction in the Subject effect, which could have several interpretations (see below).

The non-significance of Gender and Younger Siblings for AB12 is like BR12, as is the significance of Origin and Subject. The effects of Mother and Father, which were eventually deemed independently significant for BR12, are clearly so for AB12.

Unlike in Brookline, the random Item factor fails to meet the threshold of significance here ($p = 0.09$). Nevertheless, we note that its some of its estimates are similar to before: *Collar∼Caller* and *Tock∼Talk* are more often marked "different," only to less of a degree; *Otto∼Auto* is the pair most often marked "same."

Perhaps more interesting is the emergence of several factors that are significant in

FACTOR	TYPE	LEVELS		SOMERS' D_{xy}	LL	P-VALUE
(super)	—	—	all included:	0.447	-996	—
gender	fixed	3	one dropped:	0.446	-997	0.82
race	**fixed**	**6**	"	**0.425**	**-1000**	**0.04**
foreign lang.	**fixed**	**4**	"	**0.424**	**-1005**	**0.0007**
older sibs.	**fixed**	**4**	"	**0.428**	**-1003**	**0.005**
younger sibs.	fixed	4	"	0.445	-997	0.82
mother	**fixed**	**8**	"	**0.410**	**-1009**	**0.001**
father	**fixed**	**8**	"	**0.424**	**-1005**	**0.014**
origin	**fixed**	**8**	"	**0.408**	**-1016**	**$2x10^{-6}$**
teacher	***fixed***	***4***	"	***0.438***	***-1000***	***0.07***
item	***random***	***7***	"	***0.435***	***-998***	***0.09***
subject	**random**	**281**	"	—	**-1018**	**$7x10^{-11}$**
subject std. dev. (null) 1.316			subject std. dev. (best) 0.837		subject std. dev. (super) 0.809	

Table 3.9: Contribution of factors to super-model for 281 Attleboro MA 12th graders

AB12, though they had not been in BR12: a subject's Race (p = 0.04), whether a Foreign Language is spoken at home (p = 0.0007), and the number of Older Siblings they have (p = 0.005).

In general, there are at least three reasons why factors like these might vary in significance between communities. Simplest, though perhaps hardest to explain, would be a real *structural* difference whereby, for example, Race matters more – or at least matters more with respect to language – in Attleboro than in Brookline.

Second, it could be that the actual *incidence* of particular factor levels differs across community, and the factor effect builds on that. As extreme examples, one could hardly expect to find a significant effect of race in an all-black community, nor of (biological) gender in an all-boys' school. More generally, the fewer members there are of any group, the less precise (hence less statistically significant) the estimate of their effect will be.

A third possibility is that different patterns of the dependent variable *response* naturally enhance or suppress the possible significance of independent variable effects. Again, this is quite clear if we imagine an extreme case. Suppose out of 200 students, 180 marked all seven items "different", 15 scored a 6, four scored a 5, and one scored a 4. Any between-subject effects would probably have to be rather small, considering how little variability they triggered in the data. Of course, if the 180 fully-distinct students were all Hispanic, and the 20 others were all Asian, there would be a significant Race effect. The point is that for more subtle effects to turn out significant, there has to be enough variability in the data to support them. These explanations are not mutually exclusive, which makes deciding between them a harder task.

A variable that could be tested in AB12 but not in BR12 was the possible effect of a subject's Teacher, because some teachers there also filled out the survey. Since the surveys in Attleboro were distributed the first week of school, and since high school students have many teachers anyway, any effect would have to be attributed to either coincidence, improper interference of the teacher in the survey administration (for example, a teacher who said the pairs out loud or commented on how they 'should' be pronounced), or a type of short-term accommodation on the part of the students toward the teacher, who presumably read them the instructions, or had just been talking to them about something else.

Only six of 15 teachers completed the survey, and the Teacher effect overall fails to reach statistical significance ($p = 0.07$). But if the subjects with "unknown" Teachers are removed, the Teacher effect is highly significant ($p = 0.003$) for the 117 students in the remaining six classrooms, and the structure of the effect is in the 'expected' direction: subjects with merged teachers are more likely to be merged, etc.

Moreover, if the Teacher effect is included for these classrooms, it impacts on the other fixed effects. Mother becomes less significant, Father more, and the internal structure of the Race effect changes completely. Quite unfortunately, since it would have been easy enough to do, I did not gather information on what specific classes the surveys were taken in. Therefore, I do not know whether it makes sense to treat them as independent sub-samples – perhaps it would, if they were randomly-assigned homeroom classes – or whether the correlations observed between what classroom a subject was in at the time of the survey, and their race and parental origin, are due to more than chance. With so few teachers reporting, it is possible that teachers 'matched' their students by chance. However, if the Teacher effect is seen in other communities or grades, it will merit reconsideration.

If we remove all the non-significant ($p > 0.05$) factors for AB12, then add back the questionable ones (p = 0.10) in turn, we see that neither Item nor Teacher *clearly* deserves a place in the 'best model' for AB12. Compared to a model with neither of them, the improvement made by adding back Item is associated with a p-value of 0.084, and adding Teacher with p = 0.051. The two factors will be omitted, but only because there are other ones that are much more important to the structure of this particular sub-community's data.

By inspecting the individual factor levels for the best model, shown in Table 3.10, we can see the structure of the most important effects and enable a closer comparison with BR12 (Table 3.6).

As noted above, the effects of Mother and Father (that is, the consequence of removing them from the model) are greater for AB12 than for BR12. However, inspecting the effects of the factor levels does not clearly reveal why this is the case. Several categories of Mother showed a significant tendency to increase the number of "same" responses. Compared to distinct mothers, definitely merged mothers showed an effect of -1.034; "probably merged" mothers also showed an effect (-1.537), as did mothers whose origins were "probably distinct" (-1.296) and "unresolved" (-1.172). A better way of looking at these categories is to reverse them: the "distinct" category had a positive effect compared to all these others.

Mothers (and fathers) from "Attleboro" were placed into a separate category, because while most of the city is merged territory, the name is often extended (especially by younger people) to cover South Attleboro, a solidly distinct area for the generation of these subjects' parents. As they are probably a mixture of these two origins, it is therefore no surprise that the effect of this group of mothers is right in the middle (-0.496).

FACTOR	LEVEL	TYPE	SUBJECTS	ESTIMATE	P-VALUE
race	black	treatment	2	+1.061	0.24
race	white	baseline	227	0	—
race	unknown	treatment	18	-0.232	0.51
race	Hispanic	treatment	8	-0.376	0.55
race	**other (or >1)**	**treatment**	**13**	**-1.501**	**0.01**
race	**Asian**	**treatment**	**13**	**-2.900**	**0.00005**
foreign language	**both parents**	**treatment**	**9**	**+1.490**	**0.006**
foreign language	none	baseline	224	0	—
foreign language	one parent*	baseline	25	-0.312	0.32
foreign language	***everyone****	***baseline***	***23***	***-0.814***	***0.10***
older siblings	**one**	**treatment**	**83**	**+0.624**	**0.001**
older siblings	two	treatment	44	+0.290	0.23
older siblings	none	baseline	143	0	—
older siblings	3 or more	treatment	11	-0.502	0.30
mother	unknown	treatment	15	+0.357	0.66
mother	distinct	baseline	52	0	—
mother	foreign	treatment	30	-0.087	0.87
mother	**Attleboro (all)**	**treatment**	**66**	**-0.496**	**0.047**
mother	**merged**	**treatment**	**87**	**-1.034**	**0.00004**
mother	**unresolved**	**treatment**	**12**	**-1.172**	**0.01**
mother	**probably distinct**	**treatment**	**8**	**-1.296**	**0.028**
mother	**probably merged**	**treatment**	**11**	**-1.537**	**0.001**
father	**foreign**	**treatment**	**30**	**+1.075**	**0.042**
father	probably merged	treatment	12	+0.681	0.13
father	distinct	baseline	51	0	—
father	unresolved	treatment	18	+0.015	0.97
father	Attleboro (all)	treatment	53	-0.136	0.62
father	merged	treatment	91	-0.349	0.20
father	probably distinct	treatment	8	-0.896	0.11
father	unknown	treatment	18	-1.173	0.14
origin	foreign	treatment	1	+14.7***	0.98
origin	**distinct**	**treatment**	**24**	**+1.608**	$\mathbf{7x10^{-8}}$
origin	**South Attleboro**	**treatment**	**62**	**+0.527**	**0.015**
origin	Attleboro (not South)	baseline	124	0	—
origin	unknown	treatment	27	-0.063	0.83
origin	merged	treatment	34	-0.098	0.73
origin	unresolved	treatment	8	-0.482	0.39
origin	Seekonk	treatment	1	-0.856	0.50
subject	maximum	random	1	+1.514	
subject	>+1 std. dev.	random	21	+0.837	
subject	mean of BLUPs	random	281	+0.036	
subject	<-1 std. dev.	random	8	-0.837	
subject	minimum	random	1	-1.170	

intercept: -0.773 | degrees of freedom: 34 | LL: -1003 | Somers' D_{xy}: 0.424

*and/or other relatives **or bare language name ***spurious value

Table 3.10: Best Model (without interactions) for Attleboro MA 12th graders

The individual Mother effects, like the factor as a whole, show a higher degree of significance (lower p-values) in Attleboro than the corresponding ones in Brookline. But this is not because the effects themselves are greater; BR12's merged-mother effect was -1.503. Nor is it because a greater number of mothers of all types enables a more precise estimate of their effect; BR12 also had a good distribution of mothers of all origins.

The explanation must somehow lie in the distribution of subject responses, in particular their more smooth decline from merged towards distinct. If the same effect can be observed in all parts of the spectrum, if merged mothers can be seen to 'cause' score shifts from 6 to 4 *as well as* shifts from 3 to 1 (both of which are equivalent to a log-odds change of -1.5), then the estimates can be more reliable and the p-values lower.

For the Father effect, there is only one significant level: foreign fathers have a distinct-making effect of +1.075. It is hard to understand this result in light of the fact that foreign mothers did not have a noticeable effect (-0.087); in all other respects the mothers' effects were greater. To understand what can lead to a model difference like this, we note that of 30 foreign mothers and 30 foreign fathers, there were 24 foreign-foreign couples. It is the behavior of the 12 unpaired foreign parents that influence the model to assign a different effect to mothers and fathers.

Table 3.11 shows how a small number of subjects in certain cells can cause one factor level to be 'significant' while another is not. Here, the baseline mean score is 3.32, when both parents are distinct. If Father is changed to foreign, the mean score increases to 6.00 (based on only two subjects), but if Mother is foreign, the 'mean' score remains constant, at 3.33 (based on only three subjects). It is these chance-level results from subjects with one foreign parent that cause a positive coefficient to be assigned to foreign fathers only.

This misses the observation from the central cell of Table 3.11, which is that subjects with both foreign parents are on average *less* distinct than subjects with distinct parents, while still more distinct than subjects whose parents are merged. This suggests that foreign parents, in and of themselves, do not influence the development of their children's English vowel system one way or the other. Merged or distinct native parents, on the other hand, influence their children to be more like themselves.

The reason the overall negative effect of (two) foreign parents is not seen in the regression results is the strong correlation occurring with the Race variable, as discussed below.

Table 3.11 also provides an illustration of what that the regression analysis has been reporting: that fathers and mothers have analogous effect, but that the mothers' is greater. When one parent is merged and the other distinct, the subject will be more merged if the mother is merged, more distinct if the mother is distinct. There is not enough data here to prove this – that an average of 2.19 from 16 speakers is truly greater than 1.80 from 5 – but the same pattern appears in almost every community and subdivision of the data.

It is perhaps remarkable that this consistent 'relative parent effect' is visible even in data from high school seniors, who have also had peer group linguistic influence(s) to contend with for 12 or more years.

	mother distinct	mother foreign	mother merged
father distinct	3.32 (N=22)	3.33 (3)	1.80 (5)
father foreign	6.00 (2)	2.12 (24)	2.00 (2)
father merged	2.19 (16)	3.00 (1)	1.24 (59)

Table 3.11: Mean scores for cross-tabulation of distinct, foreign, and merged parents, Attleboro 12th grade data

Subjects who had lived all their school-age lives in Attleboro (excluding South Attleboro) were the baseline group for the Origin factor. Compared to them, subjects from South Attleboro – identified by where they attended elementary and middle school – were significantly more distinct, at +0.527. This is only a vestige of the much more absolute difference between the two areas of the city that is seen in older speakers.

Coming to Attleboro from a fully distinct community (in most cases, from one in

Rhode Island) gives an effect of +1.608, which is comparable in size to the same effect in Brookline (+1.770). Unlike there, however, AB12 subjects whose Origin is a(nother) merged community are not significantly different from Attleboro natives (p = 0.73).

While the factors discussed so far do operate somewhat differently between Brookline and Attleboro, and in ways that are not entirely understood, the next group of AB12 factors were ones not seen to be significant in BR12 at all.

For Race, “white” was the baseline category, and compared to it, both Asian subjects (-2.900) and “other” or mixed-race subjects (-1.501) were judged much more likely to be merged. As alluded to earlier, there is a correlation between Race and parents’ origin, especially in the case of Asian subjects in Attleboro. Of the 13 self-identified “Asian” subjects in AB12, 11 had two foreign parents (and each of the other 2 had one). However, 5 of 8 Hispanic subjects had two foreign parents, and no significant effect was generated for being Hispanic.

Furthermore, in Brookline 26 of 29 Asian subjects had two foreign parents (and the other 3 had one), but neither an Asian effect nor a foreign-parent effect was observed there. It seems unlikely that the Asian population in AB12 (5% of the total) really displays a group-specific tendency towards merger that is not shown at all by the greater number of Asian subjects in BR12 (13% of the total), but perhaps this is a real community difference.

The picture becomes even more complicated when we turn to the next unexpected effect, that of Foreign Language. Compared with subjects who made no mention of anyone speaking a foreign language at home, those who said one parent did, and/or other relatives, did not respond significantly differently. Those who said both parents spoke a foreign language, however, were more distinct (+1.490, p = 0.006).

Responses like “everyone,” “we all do,” or simply “Chinese” were combined as a would-be ‘most foreign language exposure’ category, but rather than showing a greater effect in the same direction, this group showed a non-significant tendency in the opposite direction (-0.814, p = 0.10). It could be that, contrary to the expectation, the "both" group (9 subjects) includes more non-native speakers whose intuitions are perhaps more variable, leading to the higher mean (no FL: 1.93, one parent FL: 1.68, both parents FL: 3.44, "everyone" FL: 1.52). That the difference is actually just a coincidence, despite the supposed significance of the factor level, is another likely possibility.

The regression model assumes that effects are independent and combine linearly, but we especially need to test this in the case of factors that are almost inherently correlated, such as having a father from a foreign country and having parents who both speak a foreign language at home.

If we take an AB12 subject who shares these two traits, we would expect an effect of +1.075 (father foreign) + 1.490 (both parents speak FL) = +2.565, which is to say such a person should be 13 times more likely to answer any given question "different" than a baseline subject who has a distinct father and no evidence of a foreign language spoken in the home.

43 speakers meet the baseline conditions, their responses ranging across the spectrum with a mean score of 3.07 (8x0, 2x1, 0x2, 8x3, 3x4, 8x5, 4x6, 2x7). Calculating crudely, this corresponds to an overall probability of 0.439. With the two combined effects added, the raw probability comes out to 0.910, or a predicted mean score of 6.37.

In the actual data, seven AB12 subjects have foreign fathers and parents who both speak a foreign language at home. Their mean score is only 3.29 (1x0, 0x1, 1x2, 2x3, 1x4, 1x5, 1x6, 0x7). Not only are the two factors not combining linearly, there is little evidence of their positive effects at all.

If we add Race to the picture, we at least see something of an effect. Of the seven subjects just mentioned, the four with the most merged responses are Asian, the three others Hispanic and 'other.' But none of the baseline group are Asian, so the effect cannot be seen there.

The moral of this story is that it can be very difficult to interpret regression results of this type, especially without knowing more about the particular populations and subpopulations under study. For example, the Asians in Attleboro are mainly Cambodian, those in Brookline mainly Chinese, and those different language backgrounds could conceivably cause a difference between the two groups' behavior. Or, the difference could be due to different norms employed by superficially similar groups in different places.

The last fixed factor to be discussed in AB12 is perhaps the most puzzling. While no sibling effects were found in Brookline, in Attleboro the number of older siblings does have an effect. Specifically, having one older sibling (as opposed to none) creates an effect of +0.624 ($p = 0.001$). The reason an effect of this moderate size has such a low p-value is that it is based on a considerable number of subjects in each group (143 with no older siblings, 83 with one).

Because this factor only counts older siblings, there is no real likelihood of correlation with socioeconomic class, as there probably would be with a total sibling count. More importantly, it is hard to think of an explanation for any effect of having one older sibling, that would not apply at least as much to having two, or three or more. But the effects for the higher number of older siblings are not significant, and that for "3+" indeed points in the opposite direction. If other communities show a similar pattern, it will be worth returning to this sibling effect.

The random Subject effect for AB12 has a much narrower distribution than in BR12, ranging only from -1.170 to +1.514 (std. dev. 0.837) as compared to Brookline's range of -2.545 to +4.088 (std. dev. 1.903). Attleboro's fixed effects were more significant, and here we observe the opposite side of that coin: there is less residual by-subject variation.

Table 3.12 shows a better-behaved model than the corresponding Table 3.8, but there is still a clear need to account for interactions.

By observing the trend in the rightmost column, we can see that the Origin (peer) effect,

ORIGIN	MOTHER	N	FIXED	AVG. S	P (F)	P (F,S)	P (OBS.)
Attleboro (not S.)	distinct	20	-0.773	-0.104	0.32	0.29	0.30
South Attleboro	distinct	16	-0.246	+0.191	0.44	0.49	0.55
distinct	distinct	7	+0.835	+0.074	0.70	0.71	0.71
Attleboro (not S.)	merged	42	-1.807	+0.167	0.14	0.16	0.21
South Attleboro	merged	20	-1.280	-0.139	0.22	0.19	0.18
distinct	merged	2	-0.199	-0.550	0.45	0.32	0.14

Table 3.12: Predicted and observed probabilities for selected Origin and Mother subgroups, with and without Subject effect (f=fixed, s=subject); Attleboro 12th grade data

strong when Mother is distinct (0.30, 0.55, 0.71), is entirely canceled, if not reversed, when the Mother is merged (0.21, 0.18, 0.14). There was insufficient data to observe this result clearly in Brookline, but it will emerge to some extent in all communities when modeled with an interaction term. The large average Subject effect, -0.550, in the last row is indicative of the need to account for this interaction between Origin and Mother.

3.6.3.3 Attleboro MA 8th graders (AB8)

The eighth grade students in Attleboro took the school survey in the first week of their fourth and final year in middle school, of which the city has three: Brennan, Coelho, and Wamsutta. Coelho is located in, and strongly associated with, the South Attleboro section of the city. Brennan serves the northern portion of the city and Wamsutta the southeastern part, with the two schools sharing the downtown area.

The distribution of responses from the 8th graders is shown in Figure 3.7. The mean score is only 1.31, with almost half the subjects responding as fully merged. The overall distribution is certainly different from that of AB12; a Mann-Whitney test gives $6x10^{-6}$ as the chance these two sets of subject scores could have been drawn from the same population. That is to say, the Attleboro 8th graders are, on the whole, slightly more merged than their 12th grade counterparts.

Applying the same mixed-effects logistic regression to this data, the non-significant

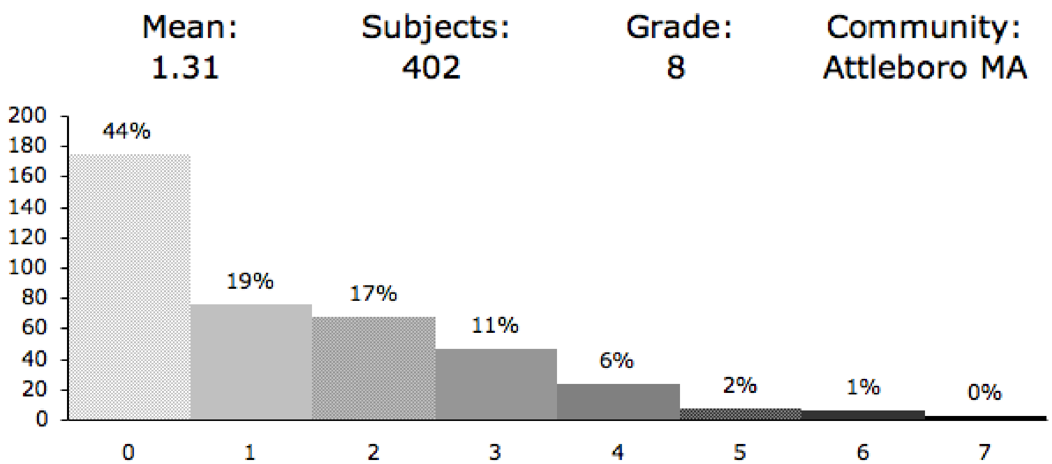

Figure 3.7: Number of Subjects vs. Items Marked “Different” (Attleboro Middle)

factors are: Current School, Teacher, Gender, Younger Siblings, Foreign Language, and Father. Though there are some suggestive school and teacher effects, the factors as a whole do not make a significant contribution to the model.

The significant factors are: Race ($p = 0.012$), Older Siblings (0.03), Mother (0.00064), Origin (0.0002), Item (2.4×10^{-11}), Subject ($\simeq 0$).

The standard deviation of the Subject effect ranges as follows: 1.369 (null model, no fixed effects), 1.150 (best model), 1.045 (super-model), which indicates that the total amount of between-subject variation is very close to that in AB12 (null: 1.316), but in AB12, more of it gets accounted for by the fixed effects (best: 0.837).

The overall intercept of the AB8 model is -1.164, compared to -0.787 for AB12. These numbers are consistent with the overall response being more merged in AB8. A log-odds of -1.164 corresponds to a mean score of 1.67, while -0.787 corresponds to 2.19. As the observed values are 1.31 and 1.92, respectively, we know that the average subject has some factors pointing him or her in the negative (merged) direction.

Looking at the ‘best model’ factors, within Race, being Hispanic had a fairly strong positive (distinct-making) effect of +1.388 (p = 0.0006). The strong negative Asian effect has disappeared (+0.865, p = 0.08). This time, having *two* Older Siblings had a small positive effect (+0.455), but after removing the other non-significant factors in going from the 'super-model' to the 'best model,' neither this level nor the Older Siblings factor as a whole made a significant contribution to the model.

For AB8 subjects, who are younger than the subjects discussed so far, the Mother effect seems very important, although in part this is because the (correlated) Father effect has been removed. Every level of the factor is significantly more merged than the baseline (distinct mothers). Mothers from Attleboro (most of whom are presumably merged, while some are from South Attleboro and therefore distinct) have a coefficient of -0.886 (p = 0.001). Mothers from definitely merged areas have a coefficient of -1.426 ($p = 6x10^{-8}$). And for the first time, subjects with foreign mothers are also much more merged than the baseline (-1.615, $p = 5x10^{-5}$).

Compared with the baseline group whose Origin (during or before middle school) was in the rest of Attleboro, subjects from South Attleboro were not significantly more distinct (+0.241, p = 0.33). This indicates the fading away of the Attleboro/South Attleboro distinction, four years 'later' than when it was still visible in AB12 (+0.527, 0.015). The effect of having moved from a distinct community is still just as strong (+1.724, $2x10^{-5}$).

In the previous two sub-communities, the Item random effect made a fairly small contribution to the model. In BR12, the Item effect's standard deviation was 0.295, and the p-value associated with removing it was 0.005. In AB12, the standard deviation was 0.167 and the p-value 0.09 (the factor was removed from the best model). In AB8, however, the standard deviation of the Item random effect is larger, 0.403, and the p-value associated with removing it much lower, $2.4x10^{-11}$.

Inspecting the individual BLUPs for the AB8 Item effect shows three items well above average (*Tock~Talk* at +0.709, *Collar~Caller* at +0.576, *Moll~Mall* at +0.484), and three somewhat below (*Don*$\sim$*Dawn* and *Otto*$\sim$*Auto* at -0.238, *Caught*$\sim$*Cot* at -0.196). While it is plausible that the younger subjects of AB8 would be more influenced or confused by orthography, the regularity of their response is surprising. Compared to BR12, where the Item effect was also significant, the same three items are most favored as “different,” and two of the same three are most favored as “same”. The effect sizes, however, are stronger on the whole for AB8.

As mentioned above, the residual subject effect for AB8 is larger than that for AB12, though not as large as for BR12. The effect has a modeled standard deviation of 1.150, and while only three subjects fall below -1.150, 37 rise above +1.150. This positive skewing of the Subject random effect has been observed in each case, though not as extremely as here. The explanation may lie in the (negative) interaction of merger-favoring effects, which is being substituted for, in the absence of explicit interaction terms, by these positive Subject effects. Another possible reason is that in a community where most people are predicted to be merged, more people can deviate from that expectation than can exceed it.

Overall, the larger Subject effect is to be expected for younger children, who are likely to understand the instructions less clearly and uniformly and perhaps to deviate more from their linguistic competence in filling out the questionnaire. The larger Item effect and much smaller Father effect are not as expected; indeed, any parental effect would be expected to be amplified in younger children.

3.6.3.4 Attleboro MA 4th graders (AB4)

The 330 survey responses from Attleboro 4th graders came from the city’s five elementary schools. One of these schools, Hill-Roberts, is in South Attleboro; two other schools’ districts, Studley and Thacher, cover part of South Attleboro, along with much of the downtown. The other elementary schools, Willett and Hyman Fine, cover the northern and southeastern parts of the city, each with a portion of downtown.

The distribution in Figure 3.8 shows that the Attleboro 4th graders (AB4) responded to the survey similarly to the 8th graders. The mean is slightly higher (1.55 for AB4, 1.31 for AB8), the distribution only slightly more balanced. Indeed, the difference does not pass the Mann-Whitney test for significance (p = 0.08). If an overall change towards merger was going on in Attleboro, it seems to have leveled off, unless it is balanced by lower accuracy of the younger subjects.

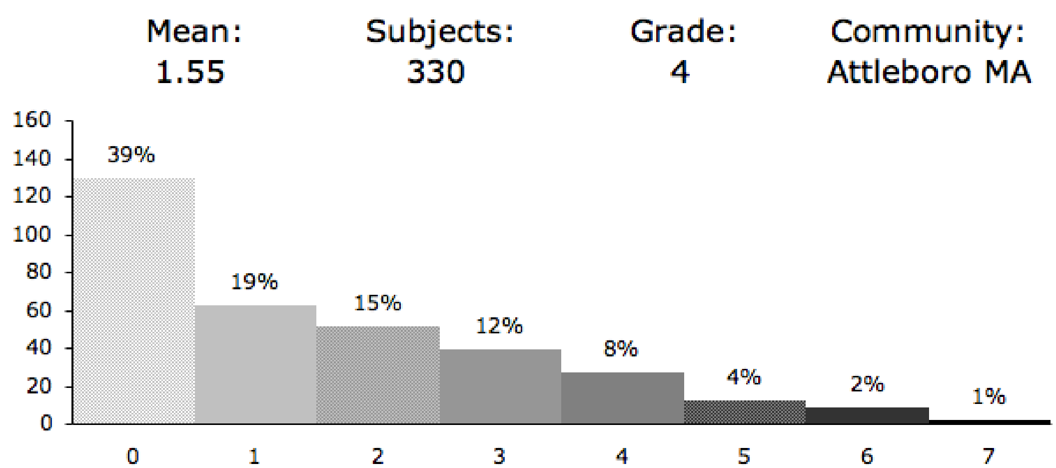

Figure 3.8: Number of Subjects vs. Items Marked "Different" (Attleboro Elementary)

The usual regression analysis procedure indicates that the following factors are not significant for AB4: Current School, Gender, Older Siblings, Younger Siblings, Mother, Father, and Item.

The effects of Foreign Language (p = 0.021), Race (0.013), Teacher (0.0096), Origin (0.0073), and of course Subject ($\simeq$0), are significant when tested against the super-model. However, once the non-significant factors are dropped, Foreign Language (like Older Siblings in AB8) can also be dropped, without significant damage to the model (p = 0.28).

When the factors Mother and Father are present in the model (as they are in the super-model), they enable the Foreign Language factor to emerge as significant (in particular, subjects where "everyone" in the family speaks a foreign language are more likely to be distinct). When Mother and Father are dropped (see below), Foreign Language no longer appears to matter. This statistical phenomenon is known as *suppression,* although here the variables are so correlated – foreign parents being almost a prerequisite for speaking a foreign language at home – that it is hard to analyze clearly.

The standard deviation of the Subject effect went from 1.421 (null model) to 1.180 (best model) to 1.098 (super model). This suggests slightly greater residual subject variation than in AB8, and a model that accounts for about as much of it.

Since the structure of the best model is quite different, it is meaningless to discuss the value of the intercept, which is -1.685. We already know that overall, AB4 subjects are not more merged than AB8 subjects were.

The only familiar part of the AB4 model is the Origin effect. Subjects who came to Attleboro before (or during) elementary school from a distinct community were clearly more likely to be distinct (+1.320, $p = 0.003$). Those who moved from a merged community were no more likely to be merged (+0.014, $p = 0.97$). And unlike the older Attleboro groups, AB4 subjects growing up in South Attleboro as opposed to the rest of the city are not more distinct, and perhaps less so (-0.630, $p = 0.11$).

The effects of Race and Teacher at first seem difficult to interpret. Recall that "white" is always the baseline Race, and that "distinct" is the baseline for factors like Teacher (and parents). The only significant result for Race is that subjects of "unknown" race – that is, who left the question blank – are far more distinct than white subjects (+2.809, $p = 0.0003$). No other racial category is significantly different from the baseline.

However, the "unknown" race group consists of only four subjects. The model is reporting that it is very unlikely that 4 subjects plucked by chance from the population at random would be so distinct. It is perhaps a rare coincidence that these four students (in four different classrooms in three different schools, incidentally), marked 3, 4, 6, and 7 items “different”, for an overall response probability of 0.714, when the overall AB4 probability is only 0.221. However, which is a better estimate of the degree of coincidence, the overall p-value from dropping the Race factor from the best model (0.012), or the one associated with the individual “unknown race” coefficient (0.0003)?

Whatever the answer, we note the danger of obtaining ‘significant,‘ though almost useless, results, especially when the factors within a category are so unbalanced. We are lucky here in that the tiny “unknown race” category probably does not correspond to anything real, or at least nothing that the survey was trying to control for, or explain the effect of.

Leaving the Race question blank might imply a slight unwillingness to participate, or at least inattention; alternatively, it could represent a subject’s sensitivity about an inquiry into race, which might or might not correlate with their race itself. Whether any of these various attitudes really correlates with more distinct low back vowels is hard to say.

Regarding Teacher, more detective work is necessary to determine what is going on. The entire factor was associated with a p-value of 0.0096, i.e. removing it from the super-model made the model significantly worse. And stripping the non-significant factors from the model makes the Teacher factor even more entrenched (the opposite of what happened with Foreign Language). Dropping it from the best model generates a p-value of 0.000058.

Clearly something significant is associated with the value of the Teacher variable, although we should be cautious before claiming that it truly shows accommodation on the part of these 4th grade students to the speech of their teachers. (Most of these students would have had the same teacher in 3rd grade, as Attleboro practices ‘looping’; but the same would apply between 7th and 8th grade as well.)

The model takes the six classrooms with low-back-distinct teachers (as concluded from their own survey responses, combined with their stated geographic origins) as the baseline group. Compared to them, "possibly merged" teachers have an non-significant effect of -0.479 ($p = 0.09$) on the students in their four classrooms, while definitely merged teachers (seven classrooms) have a significant effect of -0.516 ($p = 0.02$). (I include both because the effect size is barely larger; it is simply the greater number of definitely merged teachers that makes it reach significance.)

One possibly distinct teacher's classroom is also more merged than the baseline, but does not by itself reach significance. And reminiscent of the 'unknown race' effect discussed above, the two classrooms where the teacher did not return a survey (hence is "unknown") are significantly more distinct than the baseline (+0.891, $p = 0.003$).

Apart from the 'unknown teacher' effect, the other effects are in the expected direction (less distinct teacher, less distinct students). However, we observe that there is also a correlation between the merged status of the teacher and the school in which he or she teaches. In Hill-Roberts elementary school in South Attleboro, three of the four classrooms have a distinct teacher. In Willett elementary school, north of downtown, all three classrooms have a merged teacher. In the other three schools, there is a mix of merged, distinct, and unknown teachers.

If School is added to the regression, though it does not provide a significant effect of its own, it is enough to eliminate all the putative Teacher effects except for that of 'unknown teacher', and that is really due to a single outlier classroom (25 students with a mean response probability of 0.47, when that of the whole grade is 0.22).

But doing this simply shifts the burden from a Teacher effect, one which may be difficult to believe, to an unexplained and covert School effect. And while it is quite reasonable that the different elementary school populations in town would arrive at slightly different patterns of speech, the simplest way for this to arise would be through differences in the parent populations who inhabit different areas of the city.

Just as most Attleboro teachers with roots to the north teach in the northern and central section of the city, while those from the south tend to teach in South Attleboro, we would expect parents who moved to Attleboro on the whole to have settled closer to the direction whence they came. On top of this, parents who grew up in Attleboro will have tended to stay in their original section, and we already know this corresponds to a linguistic division between merged 'downtown' Attleboro and distinct South Attleboro.

So it is very striking indeed that the AB4 'best model' has no trace of Mother or Father effects. The influence of parents has been consistently present so far (with the mother's being more consistent than the father's), and it is especially surprising for it to disappear when we are dealing with the youngest group of subjects so far, nine- and ten-year-olds who are not only less independent from their parents, but are fewer years removed from the time when, in most cases, they learned their first variety of English from them.

Even if no other fixed factors are included in the data, the information from Mother and Father is not enough to improve the model in a significant way ($p = 0.60$). And even if the model is fit on a subset of the data, such as those subjects who are native to Attleboro (eliminating the Origin effect) and whose parents are either clearly merged or clearly distinct, no statistically significant parental effect emerges from the regression.

However, more than a vestige of the effect can be discerned in the data of AB4, if not the regression results. For 12 subjects native to Attleboro or South Attleboro, who have both parents distinct, the mean score was 1.833. For 16 native subjects with both parents merged, it was 0.875. So there is an overall effect of merged parents – here equivalent to a log-odds change of -0.91 – but it is smaller than that found among older subjects. As a comparison, in AB8 the 24 native subjects with both parents distinct scored 2.583 on average, while the 37 with both parents distinct scored 0.703 (a log-odds change of -1.655).

It may also be relevant that the numbers available for the above comparison are so much smaller for AB4. Though the total number of AB4 subjects is 82% of AB8 (330 vs. 402), we see there are only 28 AB4 natives with both parents either merged or distinct, only

46% as many as the 61 such subjects there were in AB8. So it seems that the parental effect is not only smaller where it is expected to be found, it is also found in fewer places because of demographic changes. This may explain why Mother and Father do not emerge as significant in the regression (but see the discussion of SK4 in §3.6.3.9, below).

A thread that could tie together a greater Teacher effect and less of a Mother and Father effect would be if younger children are more prone to short-term accommodation, such as to a teacher's speech, and less reflective of older influences such as parents (even though they surely saw their parents only hours before). But if this were so, the significant Origin effect, representing peer influences that generally ended years earlier, would not fit comfortably in the picture.

The shrinking of the parent effect in AB4, along with the emergence of a possible teacher effect, are the most puzzling issues raised by these analyses so far.

To illustrate the teacher issue as clearly as possible, Table 3.13 compares mean scores in the Attleboro elementary schools. In each of these school's fourth grades except Willett, there were one or two definitely merged classroom teachers and one or more definitely distinct teachers. The table shows the number of teachers and students in each category, and their responses.

SCHOOL	MERGED TEACHER		DISTINCT TEACHER		P-VALUE
Hill-Roberts	1.38	1 T : 21 S	1.75	4 : 44	0.40
Hyman Fine	0.56	1 : 16	1.57	1 : 23	0.019
Studley	1.33	1 : 15	2.00	1 : 16	0.37
Thacher	0.94	2 : 33	1.27	1 : 15	0.31
Willett	1.54	3 : 37	—	0 : 0	—

Table 3.13: Mean scores of students with definitely merged or distinct teacher, AB4

While the individual p-values from each school are not robust, they could justifiably be multiplied, to arrive at a probability for four 'teacher effects' of these sizes to arise by chance, all in the ‘right direction.” Simply multiplying gives p = 0.0009 for this chance. Even if this data is pooled together (which loses any correlations between teacher type and school), the two types of classrooms are significantly different: by the Mann-Whitney test, p = 0.009. By this measure, which estimates the chance of the two sets of subject scores having been drawn a distribution with the same central tendency, having a distinct vs. merged teacher does make a difference.

But whether teacher influence happens through interference in survey operations, or through a more automatic type of accommodation, is unknown, though the latter seems more likely if it is visible in every classroom comparison made.

3.6.3.5 Summary of Brookline and Attleboro results

Table 3.14 summarizes the results for BR12, AB12, AB8, and AB4. While I am not sure how fairly it can be applied to different datasets, the Somers’ D-value is a calculation of the overall fit of the model, that is, how well it predicts individual responses. The Subject-effect standard deviation shows how much of the variation, within the model, is assigned to residual – that is, unexplained – between-subject differences.

The Subject effect does not interact with the random effect for Item, so the Item effect is the only place where between-Item differences are accounted for. It is not clear why the effect varies as it does, being higher in AB8 than in AB12 or AB4.

The factor of Origin was the most consistently significant. Those of Mother and Father ranged from being independently significant and nearly as strong as Origin (AB12) to being discernable and likely real but not strong enough to reach signficance (AB4). The effect of Race popped up in the Attleboro sub-communities, but was not consistent: Asians were more merged in AB12, Hispanics more distinct in AB8, and “unknown race” more distinct in AB4.

The remaining results are notable, but are either quite inconsistent (only one older

COMM.	N	MEAN	D_{xy}	SUBJ. SD	ITEM SD	SIGNIF. FACTORS*
BR12	227	1.72	0.368	1.903	0.295	origin, mother, father
AB12	281	1.92	0.424	0.837	*0.168*	origin, mother, father, older siblings, foreign lang., race, *teacher*
AB8	402	1.31	0.370	1.150	0.403	origin, mother, *older siblings,* race, *teacher*
AB4	330	1.55	0.297	1.180	*0.151*	origin, *foreign lang.,* race, teacher

*BR12 and AB8 include random effects for subject and item, AB12 and AB4 only for subject; all models exclude *marginally significant* fixed factors

Table 3.14: Summary of 'best models' for Brookline and Attleboro data

sibling promoted a positive effect in AB12, while 2 older siblings had a small effect in AB8) or confusingly correlated with other factors (foreign language), or worse. The possibility of a real Teacher effect is exciting, but there are not enough classrooms to settle the issue definitively.

3.6.3.6 New York City high school students (NY12)

The next group of subjects to be considered is very different from the Brookline and Attleboro students, where fully-merged responses (scores of 0) were the most common single type and the analysis involved identifying which factors caused variation mostly in the score range 0-4. For the New York data, the situation is largely reversed. As expected from the dialect area, fully-distinct responses (7's) are very common, and most of the variation is in the 3-7 range.

The filtered data from New York City consist of 114 responses: 103 from 11th graders at Brooklyn Technical High School (BT), a magnet school of about two-thirds boys, drawing pupils from the entire city, though mainly from Brooklyn and Queens; and 11 from 10th graders at Solomon Schechter (SS), a private Jewish school in Manhattan. Despite their slightly younger ages, the abbreviation "NY12" will still be used to indicate this group of high school students.

The average response probability for NY12 was 69% "different", equivalent to a mean score of 4.81. The distribution of subjects' responses is shown in Figure 3.9. Though slightly more centered, It looks roughly like the mirror image of the distribution for Brookline (Figure 3.5). The New York distribution falls rapidly from its peak on the right – 36% fully distinct – but it levels off somewhat, and indeed there is a much smaller second peak at the left end of the spectrum, where 9% of subjects gave a fully merged response.

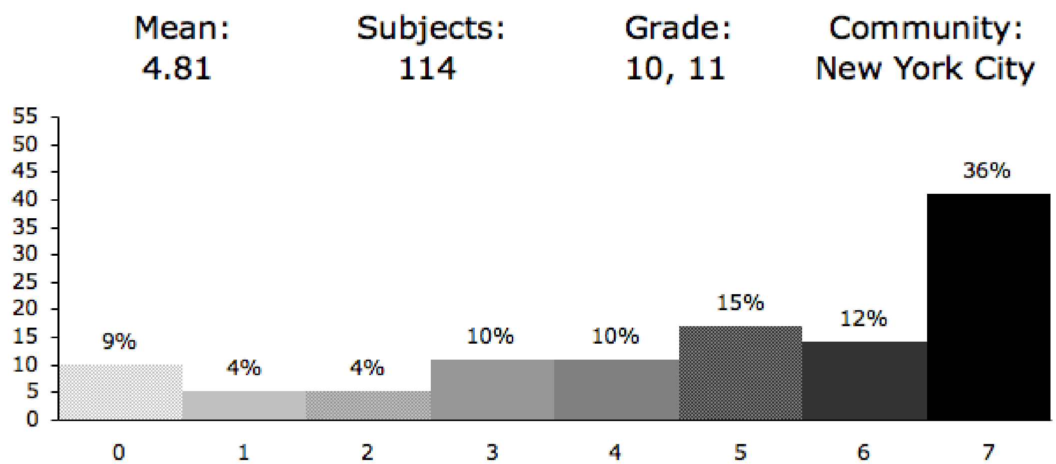

Figure 3.9: Number of Subjects vs. Items Marked "Different" (New York City)

The New York subjects were all students of two teachers, friends of the author. For this reason, any 'teacher effect' would have been constant (both are merged speakers from Brookline) and cannot be tested. On the other hand, any systematic difference between the two schools can be looked for, though with the great imbalance of subjects it will be hard to show significance.

All the other variables can theoretically be used, but bearing in mind that a very high proportion of the NY12 subjects are the children of immigrants (for 74%, both parents grew up abroad). This may change the importance of the parent variables, and definitely the incidence of the Race and Foreign Language variables, since white students are a minority (32%), and most students have a foreign language spoken in the family (72%).

But the kind of in-migration studied earlier, where subjects have moved from another dialect area into the one where they are in school now, is almost non-existent in this urban population. No one at all had moved to New York from a merged area, and only one subject had moved from another distinct community (on Long Island).

However, the Origin variable will take on a new life in testing for any effect of the different boroughs of New York City where the students live, principally Brooklyn vs. Queens. Since ‘Brooklynese’ is a persistent stereotype of the New York dialect, linguists have often taken pains to argue that the accent of Brooklyn is no different from that of comparable speakers in any other borough, or other community close enough to the city.

Actually, there is some evidence here that Brooklyn is retaining the traditional New York City low back vowel distinction more tenaciously than Queens, but the fact that the students surveyed – unlike in Brookline or Attleboro – are not a representative sample of the communities as a whole means the findings here cannot be considered as definitive.

Table 3.15 shows the result of the process of fitting a super-model including all factors, then removing them one at a time and testing for significance.

The NY12 models are run on a data set just half the size of the smallest so far (BR12), and this means that if for no other reason, effects may tend to reach significance levels less easily. That being said, there is one factor that is not even close: there is no effect of the number of Younger Siblings, something which has not been found in any other community either, and indeed makes good sense. One can only imagine a few scenarios of rapid change where someone’s younger siblings would be likely to influence them linguistically.

Nor is the effect of School significant – that is, no consistent difference was observed between the small number of SS students and the large number of BT students.

FACTOR	TYPE	LEVELS		SOMERS' D_{xy}	LL	P-VALUE
(super)	—	—	all included:	0.631	-343	—
gender	fixed	3*	”	0.622	-345	0.13
race	***fixed***	***6***	”	***0.586***	***-348***	***0.087***
foreign lang.	**fixed**	**4**	”	**0.567**	**-351**	**0.001**
older sibs.	*fixed*	***4***	”	***0.615***	***-347***	***0.053***
younger sibs.	fixed	4	”	0.628	-344	0.74
mother	*fixed*	***5***	”	***0.611***	***-348***	***0.052***
father	**fixed**	**4**	”	**0.591**	**-348**	**0.018**
origin	***fixed***	***9***	”	***0.594***	***-350***	***0.10***
school	fixed	2	”	0.627	-344	0.42
item	**random**	**7**	”	**0.575**	**-363**	**$3\text{x}10^{-10}$**
subject	**random**	**114**	”	—	**-383**	**$<2\text{x}10^{-16}$**
subject std. dev. (null)			subject std. dev. (best)		subject std. dev. (super)	
2.560			2.278		1.730	

*3 subjects left Gender blank, and it could not be determined from their first name

Table 3.15: Contribution of factors to super-model for 114 New York City high school students

Significant beyond any doubt here are the random effects of Subject and Item. We observe that both the Subject effect (std. dev. 2.278) and the Item effect (std. dev. 0.803) are larger than any observed before. The details are given in Table 3.16.

Besides being much stronger than those observed before, the Item effects for New York City are also noteworthy in their order, which is roughly opposite to that observed for the mainly-merged community of Brookline. There, the ‘canonical’ o/oh pairs *Caught*∼*Cot* and *Taught*∼*Tot* were the most likely to be marked “same”; here, they are the two pairs most likely to be marked “different”.

On the other hand, the two pairs most likely marked “different” in BR12, *Collar*∼*Caller* and *Tock*∼*Talk*, are in the middle of the pack in NY12, while *Moll*∼*Mall* and *Otto*∼*Auto*, slightly more “different” than average in Brookline (and identified previously as the “worst” pairs overall), are the “samest” of all in New York.

If we translate the Item effects into probabilities, the average NY12 subject was predicted to be over 11 times more likely to answer the *Moll*∼*Mall* question “same” than he

FACTOR	LEVEL	TYPE	SUBJECTS	ESTIMATE
item	*caught∼cot*	random		+1.017
item	*taught∼tot*	random		+0.317
item	*tock∼talk*	random		+0.108
item	*collar∼caller*	random		-0.092
item	mean of BLUPs	random		-0.162
item	*Don∼Dawn*	random		-0.473
item	*Otto∼auto*	random		-0.595
item	*Moll∼mall*	random		-1.415
subject	maximum	random	1	+3.689
subject	>+1 std. dev.	random	3	+2.278
subject	mean of BLUPs	random	114	-0.080
subject	<-1 std. dev.	random	14	-2.278
subject	minimum	random	1	-3.892

Table 3.16: Subject and Item effects for New York City high school students (NY12)

or she was to answer the *Caught∼Cot* question "same," according to the model. However, the observed odds multiplier between the pairs was 'only' 4.8 (*Moll∼Mall*: 49% "same"; *Caught∼Cot*: 17% "same").

Whether these differences principally reflect unfamiliarity with certain 'vocabulary' on the questionnaire, or a type of phonological regularity guiding merger in progress, is an open question. The substantially different ordering between Brookline and New York rules out that universal phonological factors are in play.

Observing the span of Subject effects, which is rivaled so far only by that of AB12, we note that the fixed effect portion of the model certainly does not go all the way towards a good prediction of each subject's behavior. 'Corrections' as great as +/- 2.000, which occur for a quarter of the NY12 subjects, could easily shift predicted scores of 6 to 3's, or turn 5's into 7's.

The Foreign Language factor is also significant (p = 0.001). Specifically, the level of "both parents" speaking a foreign language, as indicated by 12 subjects, has a strong negative effect (-2.313, p = 0.01). Neither "one parent" (12 subjects) nor "everybody" (58 subjects) speaking a foreign language had an effect significantly different from the baseline group of 32 subjects with no home foreign language exposure listed.

In NY12, most effects are in the direction of merger against a community norm of being distinct, and recall that when the Foreign Language effect surfaced earlier, in AB12, it was also the "both parents speak (e.g.) Chinese" group who were different, but in that case having a positive effect against the backdrop of a merged community. Despite the mirror-image parallelism, any explanation would have to deal with the fact that the same effect is not seen in either community for the "everybody" level, which includes e.g. "we all speak Chinese" as well as simply "Chinese" (a conflation which may have been an mistake).

The remaining effects – Gender, Race, Older Siblings, Mother, Father, and Origin – are neither comfortably significant nor clearly not, although Father ($p = 0.018$) reaches the standard threshold, for the first time unaccompanied by Mother. The other five p-values range from 0.052 to 0.13.

Because of the complicated correlations among these variables, and the smaller number of total subjects in NY12, the analysis will be continued in a different manner, looking at different subgroups of the data in turn.

A minority of NY12 subjects (12 of 114, or 11%) had both parents judged "distinct" based on their origins. Except for one subject, these parents were all from the New York City / Long Island area. Five of these subjects attended BT, and three went to SS. Four lived in Brooklyn, three in Queens, two in Manhattan, two in Staten Island, and one's residence was unknown. Eight were boys, three were girls.

Of the eleven subjects with distinct, local parents, ten scored a fully-distinct 7 on the school survey, while one scored a fully-merged 0. Although there is no continuum here, we can calculate a mean score of 6.36 (or a response probability of 0.909). We can generalize and say that most of those who hear the New York City low back distinction from both parents will acquire it fully, although there is no apparent explanation for the one exceptional subject: a 15-year-old boy at SS, white, preschool in Brooklyn, since then in Manhattan, mother from Brooklyn (speaks French), father from Ellenville NY and Brooklyn (speaks Spanish), one younger sibling (a sister, 8).

Another ten NY12 subjects have only one local parent. One has a local mother, an unknown father, and a score of 5 (the subject's gender was left blank too). A boy from Brooklyn/BT and a girl from Manhattan/SS have local mothers and foreign fathers; their scores are 3 and 4. Seven subjects have local fathers and foreign mothers (6 boys from Brooklyn/BT, 1 girl originally from Long Island, who goes to SS); their average score is 6.29 (2 5's, 1 6, 4 7's). That the group with local *fathers* adheres more to the New York City norm than those with local *mothers* is the reverse of expectation, but the numbers are small (and perhaps boys are more influenced by their fathers, which will be explored in §3.6.7.1).

Taken together, the 21 subjects with at least one local parent have a mean score of 6.00 (or 86% "different"). This makes them significantly more distinct than the 84 subjects with two foreign parents, whose mean score is 4.62 (66% different); the Mann-Whitney test gives a p-value of 0.0044 as the chance these two sets of scores are drawn from the same distribution.

This may seem related to the Foreign Language effect identified earlier, where the 12 subjects who said "both parents" spoke foreign languages at home were significantly more merged than the 32 who mentioned no foreign language use in the home. However, the foreign-parents effect is more general, because of 84 subjects with two foreign parents, only 10 placed themselves in the "both parents" Foreign Language category – 58 said "everyone" spoke a foreign language (or just wrote the name of the language), while 32 said no one did, or left the question blank.

Incidentally, if Mother and Father are combined into one factor, MF, it is significant in the regression super-model (p = 0.003) and the level “both parents foreign” is associated with the very large negative coefficient of -5.302 (with respect to both parents being distinct, p = 0.007). The Foreign Language factor is significant on top of this, with a coefficient of -2.431 for “both parents”.

Because the model intercept is so positive (+6.478), it predicts that New York City students with MF distinct (and the other baseline properties) are 99% certain to mark a pair “different” (thereby scoring almost all 7’s), while students with MF foreign, other things being equal, are about 76% likely to say “different” (mainly generating 5’s and 6’s as scores).

Incidentally, the exception to the rule, the subject who scored a 0 despite having distinct parents (the other 11 scored 7’s) received the minimum Subject random effect in the super-model, -3.018. Combined with his other negative coefficients (attends SS, “both parents” speak a foreign language), this leads the model to expect a score of 1.29 on average, a response probability of 0.18 which, strictly mathematically, would generate a score of 0 about a quarter of the time.

Before focusing on the subjects with two foreign parents – the majority of the NY12 data – we see that the remaining, miscellaneous subjects pattern as in Table 3.17.

Although these speakers are a motley crew, at least one regularity can be noted, and pursued with larger groups of speakers. The four girls averaged 1.75 (0, 1, 3, 3) while the five boys averaged 5.2 (3, 4, 5, 7, 7), a significant difference (Mann-Whitney p = 0.033).

The remaining 84 speakers in NY12 are those with two foreign parents. Only three of these attend Solomon Schechter: a girl scoring 1, and two boys scoring 4 and 7 (another small piece of evidence that females are possibly more merged).

This leaves 81 Brooklyn Tech students with foreign parents. Having eliminated a major source of variability, while retaining most of the NY12 data (71% of it), regression analysis was performed again, with the results given in Table 3.18.

SCHOOL AGE		GENDER RACE		MOTHER'S ORIGIN FATHER'S ORIGIN	FOREIGN LANGUAGE	ORIGIN	SCORE
BT	15	F	W	distinct (CT) distinct? (OH)	none	Manhattan	0
BT	16	F	O	merged (Canada, Boston) foreign (Ecuador)	F Spanish	Queens	1
BT	16	F	H	foreign (Dom. Rep.) distinct? (DR, Brooklyn)	Spanish	Brooklyn	3
BT	13	F	?	unknown unknown	MF Russian	Queens	3
BT	16	M	W	unknown unknown	none?	unknown	3
SS	15	M	W	foreign (Israel) distinct? (Israel, England)	Hebrew	foreign*	4
BT	16	M	W	distinct? (IL, Philippines) distinct? (SC, Brooklyn)	none	Brooklyn	5
BT	15	M	O	foreign (Honduras) distinct? (NC)	M Spanish	Brooklyn	7
SS	15	M	W	distinct (St. Louis) distinct (Philadelphia)	none	Queens	7

*in Israel until 10, Cleveland 10-11, Chicago 12-13, Arizona 14

Table 3.17: New York City subjects, parents neither local nor both foreign

FACTOR	TYPE	LEVELS		SOMERS' D_{xy}	LL	P-VALUE
(super)	—	—	all included:	0.555	-267	—
gender	fixed	3	one dropped:	0.546	-269	0.18
race	**fixed**	**6**	”	**0.453**	**-275**	**0.011**
foreign lang.	**fixed**	**4**	”	**0.495**	**-273**	**0.013**
older sibs.	fixed	4	”	0.552	-268	0.62
younger sibs.	fixed	4	”	0.542	-268	0.70
origin	**fixed**	**5**	”	**0.503**	**-272**	**0.04**
item	**random**	**7**	”	**0.485**	**-278**	**$2x10^{-6}$**
subject	**random**	**81**	”	—	**-302**	**$<2x10^{-16}$**
subject std. dev. (null) 2.283			subject std. dev. (best) 1.797		subject std. dev. (super) 1.703	

Table 3.18: Contribution of factors to super-model for 81 Brooklyn Tech HS students with foreign parents

Among the questionably significant factors from the entire NY12 dataset, the factors of Race and Origin emerge here as significant. Foreign Language is still significant and hardly more understandable: “both parents” has a slight effect (-1.324) towards merger, while “everyone” (+1.304) and especially “one parent” (+3.507) favor the native pattern of distinction. The effects of Item and Subject are still strong; both have a slightly less robust spread of estimates, which is in keeping with the smaller, more homogeneous dataset.

The following individual level effects are perhaps more interesting. Within the Race factor, the 12 black subjects – their parents mainly of Caribbean origin – are much more distinct than the 19 whites (+2.786, $p = 0.006$). The lowest score of any black subject was 3, while half of them were fully distinct. The 19 white students, like the 32 Asians, were about one-third fully distinct, and their scores extended down the spectrum to zero (mean score for blacks: 5.92; for whites: 4.74; for Asians: 4.81).

Within the Origin factor, the 28 subjects who live in Queens (recall that Brooklyn Tech is a magnet high school, with admission through an exam) are more merged than the 35 from Brooklyn (-1.356, $p = 0.033$). Both groups ranged from 0 to 7, but the Brooklyn mean was 5.14, the Queens mean 3.71.

These effects cannot be entirely teased apart as there was only one white subject from Queens, but the presence of subjects with “other” race and “unknown” origin help bolster the above results.

Note that the earlier hints that females were more merged than males – something that might be expected if change were in progress – do not carry over to the group of 81 BT students with foreign parents, where the group mean for males (4.57) and females (4.62) are almost identical. The gender ordering of Table 3.17 is likely to be coincidence.

The analysis above may be confusing in that it employs traditional racial categories when describing a population of immigrant origin. It would be important to see if the same racial differences applied to blacks and whites with more generations’ residence in New

York.

Furthermore, many subjects' parents are from countries – Jamaica, Trinidad, India, and Bangladesh, for example – where English is spoken. Rather than lumping these nationalities together with Russian, Chinese, Korean, and Latin American immigrants in a catch-all "foreign" category, it would make sense to find out the status of post-colonial Englishes with respect to the low back vowel merger and see if there was a meaningful relationship. Tentatively, it seems as though the merger is more prevalent in New York City in Indian and Bangladeshi families than in other Asian immigrant groups.

One curiosity of this group of 81 students with foreign parents is that none of them indicated that they themselves ever went to school in a foreign country, which seems extremely unlikely. It would be plausible if some did immigrate along with their parents (and did not indicate it), and if they were the ones who gave the more merged (or random) responses, while those born and raised in New York adhered more closely to the native pattern.

This cannot be the case, however. The 44 subjects who were in New York schools from kindergarten onward averaged 4.25, while the 37 who did not provide any information for kindergarten (and thus might be immigrants) averaged 5.11 – the difference tends in the opposite direction, and is not significant in any case (Mann-Whitney $p = 0.17$).

3.6.3.7 Seekonk MA 12th graders (SK12)

At least in terms of methodology, if the New York data could be seen as the mirror image of Brookline, then the data from Seekonk bear something of the same relationship to that from Attleboro. Like there, three grade levels were surveyed, from high school, middle school, and elementary school. However, comparing the three grades shows much greater evidence of community-wide change than in Attleboro (where a change was observed in the status of one part of the city, South Attleboro). Clearly, the presence of change in progress creates the opportunity to study how it proceeds, and one way of doing this is through identifying the factors that create leaders and 'trailers', through regression analysis.

Though directly adjacent to Attleboro, Seekonk speakers in their twenties and older preserve the low back vowel distinction of the Providence (Mid-Atlantic) dialect. This overall distinct pattern is retained by most older teenagers, as seen in the data gathered from 109 seniors at Seekonk High School, displayed in Figure 3.10. The number of responses compared with total school enrollments suggests a very similar 'sampling rate' as at Attleboro High School: two-thirds of seniors returned surveys in both communities. By comparison, about 55% did so in Brookline, while the proportion of students reached in New York was much smaller even with respect to the two schools (let alone the entire city).

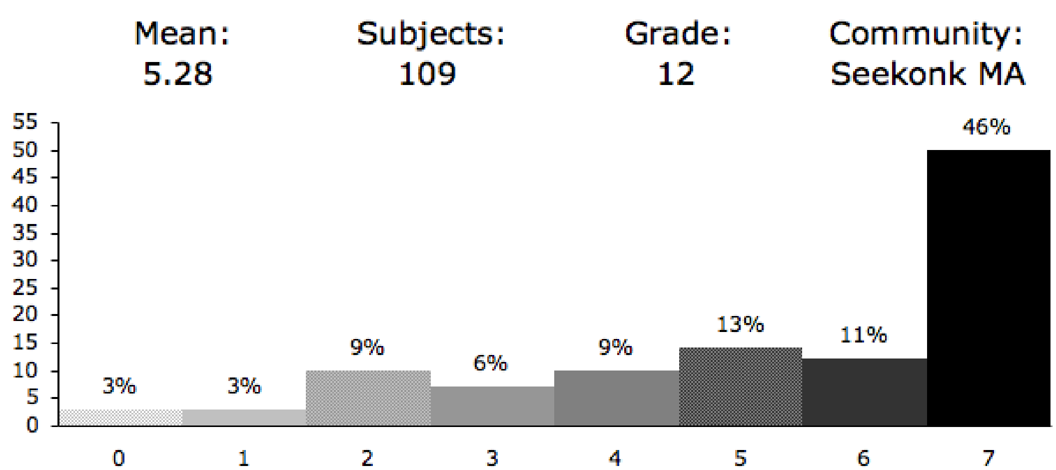

Figure 3.10: Number of Subjects vs. Items Marked "Different" (Seekonk High)

With a mean score of 5.28 (75% "different"), SK12 is more distinct than NY12 overall, and has a higher fraction of invariant subjects than any community or sub-community examined so far: 50 subjects (46%) scored a 7, while 3 (3%) scored a 0. The overall pattern is of a sharp drop from fully-distinct to the almost-fully-distinct scores, then a gradual decline, followed by another drop at the fully-merged end of the spectrum. Like Attleboro, SK12 has very few subjects who completely disagree with the majority pattern; such 'dissent' was more common in Brookline and especially New York (though still rare).

Building a super-model for SK12 and testing the significance of factors as they are dropped from it in turn, according to the same procedures followed above, reveals the structure given in Table 3.19.

FACTOR	TYPE	LEVELS		SOMERS' D_{xy}	LL	P-VALUE
(super)	—	—	all included:	0.635	-306	—
gender	fixed	3	one dropped:	0.620	-308	0.14
race	fixed	4	"	0.629	-307	0.66
foreign lang.	fixed	4	"	0.616	-308	0.24
older sibs.	fixed	4	"	0.626	-306	0.82
younger sibs.	fixed	4	"	0.631	-306	0.76
mother	**fixed**	**7**	"	**0.560**	**-315**	**0.006**
father	**fixed**	**8**	"	**0.590**	**-313**	**0.047**
origin	***fixed***	***6***	"	***0.615***	***-311***	***0.077***
item	**random**	**7**	"	**0.595**	**-315**	**0.00003**
subject	**random**	**109**	"	—	**-323**	**$5x10^{-9}$**
subject std. dev. (null) 2.287			subject std. dev. (best) 1.419		subject std. dev. (super) 1.306	

Table 3.19: Contribution of factors to super-model for 109 Seekonk MA 12th graders

We see that the factors for Race, Foreign Language, number of Older Siblings, and (as always) number of Younger Siblings are not significant. The Gender factor has a lower p-value than usual, which is noteworthy: females may tend to be slightly more merged (the individual effect is -0.651, p = 0.13).

The possible effect of Teacher could not be evaluated in Seekonk as no teachers returned the survey (despite the same request to do so as in Attleboro).

SK12 shows a strong effect of Mother and a lesser effect of Father, and both are independently significant despite their correlation (reminiscent of the situation in AB12).

The factor of Origin is only marginally significant (p = 0.077), but this is related to the incidence of levels. Since SK12 is primarily distinct, we are interested in the differential behavior of subjects who moved from merged communities, and there are only three such subjects. Although their mean score is low (1.33), their fraction of the data is not enough to create a significant overall Origin effect.

However, if Origin were simply dropped, those subjects' unusually-merged behavior would be erroneously attributed to other factors. The Origin factor will therefore be retained. Table 3.20 shows the details of the 'best model' for SK12 with the non-significant factors removed.

For the Seekonk high school seniors, those whose mothers or fathers were definitely merged were significantly more merged in their responses. The effect of a merged mother was -1.63 (p = 0.027), that of a merged father was -2.05 (0.008). This is the first time the father effect has been larger than the mother's, but the difference is not great and the variables are not independent.

But the correlation between Mother and Father in SK12, 0.28, is not as high as in some places: 7 students had just a merged mother and 5 had just a merged father, but only 3 had both. In AB12, by contrast, it was as common to have both parents merged (59 subjects) as to have only one (60).

The small group with merged Origin stands out as significantly more merged (-3.34, p = 0.027) than the Seekonk natives. However, the group that had moved at some point in their lives from distinct communities – many quite recently – were exactly equal to the baseline (-0.001, p = 0.99). Seekonk counts as a distinct community, for this age group.

The details of the Item effect (std. dev. 0.584) reveal exactly the same ordering of items as in New York City, except for *Don*$\sim$*Dawn*, which was more likely than the average item to be marked "same" in New York, but "different" here. Also, the spread of the effect

FACTOR	LEVEL	TYPE	SUBJECTS	ESTIMATE	P-VALUE
mother	distinct	baseline	77	0	—
mother	prob. merged	treatment	1	-0.184	0.99
mother	Attleboro (all)	treatment	6	-0.417	0.66
mother	foreign	treatment	10	-0.457	0.60
mother	prob. distinct	treatment	3	-1.09	0.33
mother	**merged**	**treatment**	**10**	**-1.63**	**0.027**
mother	unresolved	treatment	2	-2.82	0.11
father	unresolved	treatment	1	+1.13	0.61
father	unknown	treatment	1	+0.147	0.99
father	prob. distinct	treatment	3	+0.034	0.98
father	distinct	baseline	79	0	—
father	prob. merged	treatment	2	-0.779	0.62
father	foreign	treatment	9	-0.790	0.37
father	**Attleboro (all)**	**treatment**	**6**	**-1.94**	**0.040**
father	**merged**	**treatment**	**8**	**-2.05**	**0.008**
origin	South Attleboro	treatment	2	+0.174	0.90
origin	Seekonk	baseline	54	0	—
origin	distinct	treatment	45	-0.001	0.99
origin	Attleboro	treatment	1	-0.168	0.99
origin	unresolved	treatment	4	-1.25	0.23
origin	**merged**	**treatment**	**3**	**-3.34**	**0.027**
item	*caught∼cot*	random		+0.366	
item	*taught∼tot*	random		+0.292	
item	*Don∼Dawn*	random		+0.292	
item	*tock∼talk*	random		+0.077	
item	mean of BLUPs	random		-0.140	
item	*collar∼caller*	random		-0.254	
item	*Otto∼Auto*	random		-0.736	
item	*Moll∼mall*	random		-1.014	
subject	maximum	random	1	+1.818	
subject	>+1 std. dev.	random	2	+1.419	
subject	mean of BLUPs	random	109	-0.053	
subject	<-1 std. dev.	random	13	-1.419	
subject	minimum	random	1	-2.663	
intercept: +2.69 degrees of freedom: 21 log likelihood: -312 Somers' D_{xy}: 0.584					

Table 3.20: Best Model (without interactions) for Seekonk MA 12th graders

is greater in NY12. We can now tentatively generalize and say that in mainly-distinct communities, *Caught*∼*Cot* illustrates that distinct tendency best. Interestingly, that same pair was also the best illustration of the tendency towards *merger* in Brookline.

In both New York and Seekonk, it was the pairs *Moll*∼*Mall* and *Otto*∼*Auto* that most frequently deviated from the distinct norm, while in Brookline and Attleboro, *Collar*∼*Caller* and *Tock*∼*Talk* were the likeliest items to go against the merged trend.

The details of the Subject effect also showed a similar pattern to New York, though like the Item effect the spread was less extreme. There is a similar skewing, where many more subjects have large negative effects than positive ones. Probably this is because this model predicts very few people to be very much merged (especially since some of these were removed), which is something of a prerequisite for being more distinct than expected.

Altogether, the Seekonk model is among the simplest observed so far. The sense of SK12 as essentially a distinct community is supported by the absence of any quantitative difference between native Seekonk subjects and those who moved there from solidly distinct communities, mainly the close-by urban areas of Pawtucket and East Providence RI.

3.6.3.8 Seekonk MA 8th graders (SK8)

For reasons not entirely understood, a lower proportion of students completed the school survey at Seekonk Middle School than anywhere else it was administered. Though the eighth grade population is probably slightly larger than that of the 12th grade, only a quarter as many responses were obtained: 27. The fact that the school administration required parental permission for students to participate explains only some of the shortfall.

This was unfortunate in several respects. First, because it is not clear which 8th graders did complete it, it is unknown how representative the ‘sample’ was. Second, because as Figure 3.11 shows, the pattern of SK8 scores appears to be very different from SK12. The mean is 3.67 (close to the central point, 3.50), and the distribution is fairly flat, with a hint of a bulge in the middle (19% of subjects scored 4). Remember that if people were choosing "same" and "different" purely randomly, 54% of any large sample would score either 3 or 4 (here it is 34%), while only 1.6% would score 0 or 7 (here, 26% do).

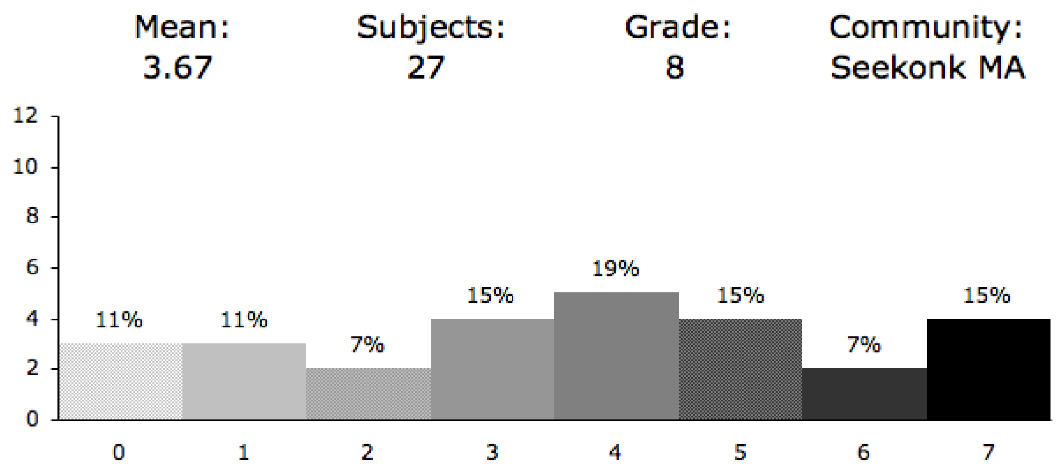

Figure 3.11: Number of Subjects vs. Items Marked "Different" (Seekonk Middle)

Despite the uncertainty that comes from having fewer subjects, the near-flat distribution of SK8 is very unlikely to represent the same population as the mainly-distinct SK12 distribution (Mann-Whitney, $p = 0.0006$).

Clearly there has been an overall change towards merger, a change that should show up primarily in the intercept value of the regression model (though in practice is mixed up with the Subject effects too). Whether there is also a change in the factor structure during a period of change – parental effects might become less important, gender or sibling effects more so – remains to be seen.

One change had to be made to the data before the `lmer` function would run without crashing, a problem caused by factor level combinations with too few subjects. For the factors Mother and Father, the levels other than "definitely distinct" and "definitely merged" were combined as "other". Also, since all SK8 subjects were white, the factor of Race was necessarily omitted from the model.

FACTOR	TYPE	LEVELS		SOMERS' D_{xy}	LL	P-VALUE
(super)	—	—	all included:	0.481	-109	—
gender	fixed	2	"	0.484	-109	0.32
foreign lang.	fixed	3	"	0.486	-109	0.99
older sibs.	fixed	4	"	0.486	-109	0.96
younger sibs.	fixed	4	"	0.471	-110	0.45
mother	fixed	3	"	0.455	-109	0.67
father	fixed	2	"	0.476	-109	0.77
origin	fixed	4	"	0.472	-109	0.79
item	**random**	**7**	"	**0.411**	**-111**	**0.057**
subject	**random**	**27**	"	—	**-116**	**0.0002**
subject std. dev. (null) 1.661			subject std. dev. (best) n/a		subject std. dev. (super) 1.226	

Table 3.21: Contribution of factors to super-model for 27 Seekonk MA 8th graders

The SK8 super-model (Table 3.21) shows that *none* of the fixed effects contribute in a significant way to modeling this response. In fact, the Somers' D-values show that for several factors, the model actually fits better when leaving them out.

The problem is interpreting this negative result: is the lack of significance mainly because the number of subjects is so much smaller, or it is also that the fixed effects that have been seen to operate in most sub-communities are not at work here? The latter explanation would be akin to saying that social factors not measured here, or else just chance, influences whether a subject scores at one end or the other of the flat distribution, or in the middle.

However, it appears as though the lack of significance is mainly due to the small number of subjects. What suggests this is the coefficients for individual factor levels, the largest of which are: origin merged, -1.484; origin Attleboro, -1.325; mother merged, -1.304; gender female, -0.963; origin distinct, +0.690. These effect sizes, and signs, are roughly the same as found in other communities. While any of them individually could have arisen by chance (as their p-values, around 0.50, suggest), such a constellation of effects more likely reflects a similar structure governing the linguistic behavior of the SK8 population as found elsewhere, and showing up only faintly due to a sampling deficiency.

Note that the absence of any merged-father effect simply follows from there not being any subjects in the SK8 sample with merged fathers.

The effect of Item is clear enough: SK8's pattern is exactly the same as SK12's, though the BLUPs are smaller (the standard deviation is the same). *Taught*∼*Tot* is the most likely "different" pair, followed by *Caught*∼*Cot* and *Don*∼*Dawn*, while the most likely "same" pairs are *Moll*∼*Mall* and *Otto*∼*Auto*.

The relatively small Subject effect standard deviation estimated for SK8 – 1.661 without the 'non-significant' fixed effects, 1.226 with them – is likely related to the small number of subjects, and also to the fact that fewer of them are 'extreme' in their responses. An individual subject 'adjustment' need not be that large to shift predictions within the middle of the response spectrum. Unpredicted 0's and 7's must motivate the largest subject BLUPs.

3.6.3.9 Seekonk MA 4th graders (SK4)

Seekonk has three elementary schools, which students attend through fifth grade. For better comparability with Attleboro, the surveys were administered to the fourth grade, but at one of the schools it was given to the fifth graders instead. For simplicity, all this data will be referred to as SK4.

The filtered data consists of responses from 72 subjects, representing the three schools rather unevenly. North Elementary, near the Attleboro town line, returned 36 surveys, about half of which had most subject information left blank (inquiries into the reason for this were not fully successful). Aitken Elementary, in the central part of town, returned 21 surveys; these were the 5th graders. Martin Elementary, in South Seekonk, returned only

15 surveys.

Because it is plausible that different demographic elements in the community would be differentially likely to sign permission slips for their children to participate in a linguistic survey, the SK4 data is not only sparser but also probably less representative of its population than AB4, the corresponding data from Attleboro.

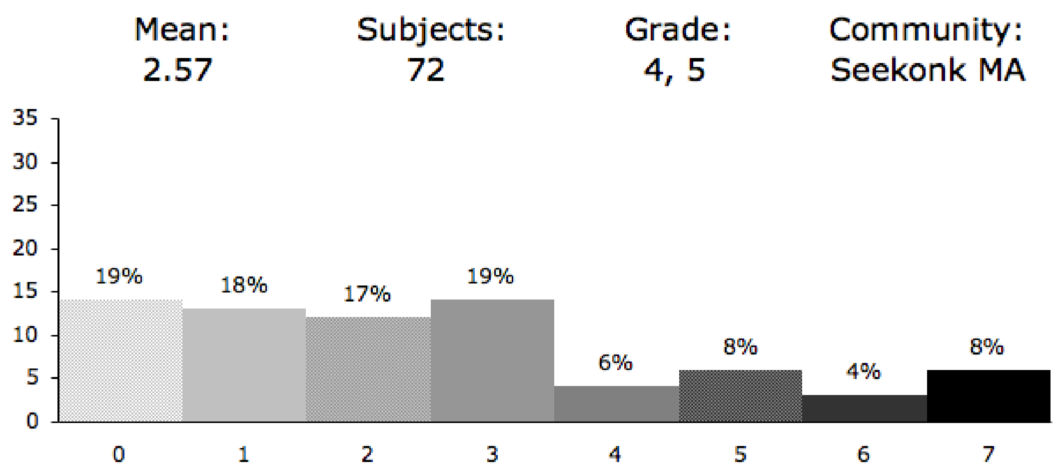

Figure 3.12: Number of Subjects vs. Items Marked “Different” (Seekonk Elementary)

Figure 3.12 shows the distribution of subject scores for SK4. The pattern is somewhat unlike any that has been seen before. Three fourths of the subjects marked more pairs “same” than “different”, but of these, equal numbers scored 0, 1, 2, and 3. Only a quarter of subjects were on the distinct side of the midpoint, and again, they divided rather evenly between the score categories from 4 to 7.

This suggests that the low back merger has continued to spread through the Seekonk community, continuing the trend observed from SK12, where the mean score was 5.28, down through SK8, where it was 3.67. Measured by its mean score of 2.57, SK4 has not achieved the degree of merger of Brookline or any of the Attleboro grade levels – compare

AB12 at 1.92, AB8 at 1.31, AB4 at 1.55 – but it is not particularly far off.

As one would expect from looking at the distributions, the change between SK8 and SK4 is measurably significant (Mann-Whitney $p = 0.026$), but much less dramatic than that between SK12 and SK8 ($p = 0.0006$).

Of the 72 SK4 subjects, one had originated in neighboring Attleboro, having moved after first grade. Three had just moved from merged communities; the surveys were completed in December 2005, so these students had only spent a few months in a Seekonk school. Another four students had an "unresolved" background, meaning they had lived in both merged and distinct places before coming to Seekonk, or in single places whose low back vowel status is not clearly known.

Logistic regression cannot accurately model invariant responses within groups. Because they contained too many subjects with scores of 0, these three Origin categories ("merged", "unresolved", and "Attleboro") had to be combined into one level called "other" before the `lmer` software could run the regression successfully. The factor-level results from this analysis are shown in Table 3.22.

While none of the fixed factors cross the $p = 0.05$ threshold of significance, Older Siblings and Origin are quite close, while the rest are not. The Origin factor has been consistently relevant, while the appearance of Older Siblings is more of a surprise.

Also unexpected is the non-significance of Mother and Father, although it will be recalled that the other elementary school group, AB4, had the same characteristic.

In the super-model, a merged mother is associated with an effect of -0.484 ($p = 0.54$) and a merged father an effect of -0.661 (0.45). These coefficients are negative, as in the older Seekonk communities, but are too small here to reach significance.

We saw for SK12 that a small number of subjects with one or both merged parents was sufficient to establish highly significant effects, because their responses were substantially more merged than the remainder of the group. Those 9 high school students had a mean

FACTOR	TYPE	LEVELS		SOMERS' D_{xy}	LL	P-VALUE
(super)	—	—	all included:	0.524	-267	—
gender	fixed	2	”	0.522	-267	0.40
race	fixed	5	”	0.521	-267	0.92
foreign lang.	fixed	4	”	0.525	-267	0.80
older sibs.	***fixed***	***4***	”	***0.492***	***-270***	***0.068***
younger sibs.	fixed	3	”	0.519	-267	0.67
mother	fixed	7	”	0.500	-271	0.30
father	fixed	8	”	0.503	-270	0.54
origin	***fixed***	***4***		***0.504***	*-270*	***0.085***
school	fixed	3	”	0.521	-267	0.71
item	**random**	**7**	”	**0.439**	**-270**	**0.008**
subject	**random**	**109**	”	—	**-278**	**4x10^{-6}**
subject std. dev. (null)			subject std. dev. (best)		subject std. dev. (super)	
1.605			1.177		0.972	

Table 3.22: Contribution of factors to super-model for 72 Seekonk MA 4th and 5th graders

score of 3.33, compared to 5.81 for the 89 others (a log-odds change of -1.68).

For the SK4 subjects who gave their parents' origin, the 6 students known to have a merged parent scored 1.50 on average, against a backdrop of 2.69 for the 39 others (log-odds -0.83). The combination of a smaller difference and fewer subjects on either end result in a loss of significance, that is to say, a parental effect that does not rise above the level of 'background noise.'

Just as in AB4, it is probably going too far to say that parents have *no* effect in SK4. But for some reason, the elementary school subjects in two very different linguistic environments – Attleboro, where two-thirds of parents are merged, and Seekonk, where 80% of them are distinct – responded to the survey in a manner that was fairly independent of their parents' linguistic systems. Meanwhile, in both places, older children's responses *did* reflect a significant parental influence. To find a difference in this direction is unexpected and quite difficult to account for.

In building a 'best model' for SK4, we drop the non-significant factors, and then test the improvement made by adding back the questionable ones, Origin and Older Siblings.

In this case, the procedure leads to their retention. While dropping Origin from the super-model was associated with the unimpressive p-value of 0.085, adding it to the null model generates a robust p-value of 2.6×10^{-5}. This suggests that Origin is important, but the effect was masked by correlation with less important predictors, such as parental origin, in the super-model.

Dropping Older Siblings from the super-model led to a p-value of 0.068, but adding it to the model with Subject, Item, and Origin yields a p-value of 0.034, sufficiently low to keep it in the model. The results of doing so are given in Table 3.23.

FACTOR	LEVEL	TYPE	SUBJECTS	ESTIMATE	P-VALUE
older sibs	***three***	***treatment***	***3***	***+2.073***	***0.074***
older sibs	two	treatment	10	+0.232	0.67
older sibs.	none	baseline	34	0	—
older sibs.	**one**	**treatment**	**25**	**-0.817**	**0.046**
origin	***unknown***	*treatment*	***20***	***+0.878***	***0.054***
origin	***distinct***	***treatment***	*19*	***+0.779***	***0.085***
origin	Seekonk	baseline	25	0	—
origin	**other**	**treatment**	**8**	**-3.531**	**0.002**
item	*Don∼Dawn*	random		+0.575	
item	*caught∼cot*	random		+0.353	
item	*taught∼tot*	random		+0.241	
item	mean of BLUPs	random		+0.030	
item	*Moll∼mall*	random		-0.045	
item	*tock∼talk*	random		-0.103	
item	*collar∼caller*	random		-0.405	
item	*Otto∼Auto*	random		-0.405	
subject	maximum	random	1	+2.601	
subject	>+1 std. dev.	random	7	+1.177	
subject	mean of BLUPs	random	72	+0.020	
subject	<-1 std. dev.	random	8	-1.777	
subject	minimum	random	1	-1.844	
intercept: -0.782 degrees of freedom: 9 log likelihood: -276 Somers' D_{xy}: 0.458					

Table 3.23: Best Model (without interactions) for Seekonk MA 4th and 5th graders

Under Origin, the group of 8 subjects with merged or unresolved backgrounds, grouped as “other,” were severely more merged in their responses than the average Seekonk native (-3.531, p = 0.002). Seven of them, in-movers from various parts of eastern Massachusetts, Las Vegas, and Pittsburgh (via Rhode Island), scored a fully-merged 0, while one who had lived in England and Massachusetts scored a 2. Overall, their average score of 0.25 (out of 7) contrasted noticeably with the native baseline of 2.20.

The 19 subjects who moved from distinct communities – again, mostly nearby – were slightly more distinct on average (+0.779, p = 0.085), suggesting an abiding influence of their former peers, who would presumably have been more uniformly distinct than the mixed, mainly-merged situation for this age group in Seekonk.

The group of subjects with unknown origins were also somewhat more distinct (+0.878, p = 0.054). Almost all of this group of surveys (18 of 20) were the ones returned with no information about the background of students or their parents, the story being that the permission slips (where SK4 and SK8 parents recorded this information) were signed, but then lost. In any case, one would expect these students to mainly have a mix of distinct and native Seekonk backgrounds, and thus to have a slightly more distinct average response than SK natives, as they do. It is difficult to say more about this group with so little information about them.

The pattern of effects for the Older Sibling factor is complex. The baseline group consists of 34 subjects with no older sibling, who averaged 2.77 on the survey. Compared to them, the 25 with one older sibling were significantly, though not very much, more merged (-0.817, p = 0.046), with a mean of 1.96.

Those with two older siblings (10 subjects with a mean of 2.90) were not significantly different from the baseline group. But those with three older siblings (3 subjects) were substantially more distinct, averaging 4.33 (+2.073, p = 0.074), although the effect does not meet the standard criterion for significance.

In the AB12 data, the pattern of levels for the Older Sibling factor was the reverse;

there, those with one older sibling were significantly more distinct, those with two not much different from those with zero, and those with three or more possibly more merged. While it is tempting to read something into the mirror image pattern, the Seekonk effects have the following appealing, though convoluted, explanation.

Suppose uncontroversially that the oldest children in families have their parents as primary lingusitic models; in Seekonk, this means a distinct input. Those with older siblings, however, probably listen to them as well in acquiring language. Among Seekonk natives, the median age of single older siblings was 14. This is only slightly older the SK8 subjects, and therefore we can assume that the low back merger has affected some of them.

According to Herold's theory of merger-by-expansion, if people need to understand the speech of merged speakers, whose /o/ and /oh/ words occupy a wide joint range, they may stop attending to the distinction made by others of their interlocutors. In this case, the merged (or variably merged) speech of the older siblings could sometimes interfere with acquisition of the distinction from the parents. This would not have to happen very often to account for the moderate effect of having a single older sibling.

Children of this age growing up in Seekonk with two older siblings would have three kinds of family influences: second-oldest siblings (median age 13, hence affected by the merger), oldest siblings (median age 16, so probably only slightly affected), and parents (generally distinct). Especially if the next-oldest siblings had been affected by the oldest ones, the sum of the effects favoring merger and distinction could possibly cancel out, leaving the group not much different from the baseline.

The more older siblings a child has, the older those siblings would be, hence (in the Seekonk context) more likely distinct, and more likely to 'dilute' any effect of one merged older sibling. There are only three subjects here with three older siblings. One actually had a merged origin and scored a 0, which makes the 6 and 7 scored by the other two stand out more. They both had an oldest sibling in their twenties – older than the SK12 group, hence likely to be distinct.

Assuming some amplification of their oldest sibling's influence by means of the intermediate brothers and sisters – aged 19 and 15 in one case, 15 and 11 in the other – it is plausible that these SK4 subjects would have acquired and maintained the low back distinction more thoroughly than those who had no older siblings as quasi-peers.

Of course, this is a lot of explanation for not much data; and as the p-value reminds us, the effect of three older siblings could be due to chance. On the other hand, at least the earlier half of the argument, as to why one older sibling could make an SK4 subject more merged, seems solid.

The Item effect for SK4 is not much different from that of the other Seekonk age groups, despite the very different overall response percentages. In this youngest age group, *Don*∼*Dawn* has moved up to become the most "different" pair; *Moll*∼*Mall* has also moved up, leaving *Collar*∼*Caller* and *Otto*∼*Auto* tied for most often being marked "same." Otherwise, the ordering is just as in SK12, though with a smaller spread of effects.

Compared with AB4, the more thoroughly (and less recently) merged students only a few miles away, the Item effect is large, and several pattern quite differently. *Collar*∼*Caller* has the biggest positive item effect in AB4 but, as noted, is tied for biggest negative effect in SK4. *Caught*∼*Cot*, *Taught*∼*Tot*, and *Don*∼*Dawn* are close to zero in AB4, but markedly positive in SK4.

The 'residual' Subject effect is smaller than in the other Seekonk grade levels, and it is also more balanced around its mean, which is likely related to the more evenly balanced response distribution. Given the small number of fixed effects included in the model, and their relative mildness, it is somewhat surprising that more between-subject variability is not found 'left over' in the Subject effect. It may be that since there are fewer extreme responses (scores of 0 or 7) than in any other age group except SK8, fewer large subject BLUPs are needed to maximize the fit of the model.

3.6.3.10 Summary of New York City and Seekonk data

Table 3.24 compares the best models fit for New York City and Seekonk, communities in which most older children maintain the low back distinction, while the younger subjects in Seekonk show an increasing degree of merger.

COMM.	N	MEAN	D_{xy}	SUBJ. SD	ITEM SD	SIGNIF. FACTORS*
NY12	114	4.81	0.437	2.278	0.803	*origin, mother,* father, *older siblings,* foreign language, *race*
NY12	81	4.64	0.524	1.797	0.716	origin (borough), foreign language, race
SK12	109	5.28	0.579	1.487	0.582	*origin,* mother, father
SK8	27	3.67	0.260	1.661	0.605	—
SK4	72	2.57	0.458	1.177	0.447	origin, older siblings

*all NY and SK models include random effects for subject and item and exclude *marginally significant* fixed factors

Table 3.24: Summary of 'best models' for New York and Seekonk data

Subject and Item effects are relatively constant across these subcommunities. Compared with the mainly-merged communities of AB and BR (compare Table 3.14), the Subject effects are somewhat larger, and the Item effects are quite a bit larger. Practically speaking, this means it is more predictable *which* items a given subject in New York or Seekonk will mark "same" than it is which ones a Brookline or Attleboro subject will mark "different" – but less predictable how many.

The larger Subject effects in NY and SK go together with the fact that on the whole, fewer significant fixed effects were found for those communities. Several things could explain this, one being that the number of responses was much smaller than it had been in BR and AB, leading to higher significance thresholds.

Fundamentally non-linguistic trends – such as that there are many more parents of distinct origin who settle in Brookline and Attleboro than merged parents who move to

New York or Seekonk – create imbalances in the levels of certain factors, changing their apparent importance.

And there may be structural differences, meaning that one thing matters more in one place, another in another. But it is also likely that different overall response probabilities, or the position of a subcommunity along the path of a change towards merger, can cause different factors to be important. While certain factors – particularly Older Siblings, Foreign Language, and Race – have manifested themselves only in certain places, rather than across the board, there is no strong evidence that contradictory models are needed for different communities.

An exception to this is in the Item effects, where there were two general patterns, one for BR and AB and one for NY and SK. Since every subject here answered all seven items, these results can be considered more robust than some of the others, and the identity of ordering within each group was quite striking. It seems no coincidence that *Cot*∼*Caught* is the canonical pair selected when linguists discuss the low back merger. Of the seven on the survey, that pair (and the similar *Tot*∼*Taught*), patterned most consistently.

A few negative findings are also clear. Given these results, it seems impossible to argue that Gender plays a *large* role in guiding or mediating the progress of the low back merger in these communities, since the factor was never found solidly significant and was usually not even close – although, to be fair, the coefficient for female gender was almost always negative, in the expected direction if girls did lead merger after all. In a clearer example, the effect of Younger Siblings also seems to be roughly nil.

3.6.4 Analysis by community: secondary communities

The five other places where the survey was administered will be addressed more briefly, as befits the smaller number of subjects studied there.

3.6.4.1 "Massachusetts State College" students (MS15)

In the course of my fieldwork, I heard several times about a local college professor who taught students to eliminate their New England accents. And although this was not the entire purpose of the "voice and diction" course in question, as I learned when I met with the professor, the rumor was not wholly inaccurate.

Part of the subject matter addressed the low vowels, although the emphasis was on the phonetic realization of particular sounds, rather than the phonological issue of mergers and distinctions. As Labov (1994: 344) has noted about sociolinguistic interviewees in New York and Philadelphia, "no speakers without linguistic training cited these splits or mergers . . . complained about them, or stigmatized others for showing differences in inventory."

To respect the professor's avowed desire for privacy, I am trying not to identify their place of instruction, but suffice it to say that the course had some students who supposedly needed work on their raised and rounded /oh/ vowel, while others needed to learn to retract their /ah/, and usually learn to pronounce an /r/ after it.

There was no advice about word pairs to keep distinguished (or keep identical); indeed, this would have led to contradictions because of the different systems present, whereas an approach focused on phonetic problem areas was more consistent.

The professor had devised colorful and reportedly effective methods for correction of these and other accent features, mainly for the benefit of students who wanted careers in broadcast journalism, where a strong local accent could be an impediment.

So the questionnaire responses from the students in this course, one would imagine, were at least as self-conscious as those from younger students discussed so far. They would probably reflect norms of standard or believed-to-be-standard pronunciation, rather than directly reflecting the students' own vernacular vowel systems.

If this is the case, then there is not much of a belief, in Eastern Massachusetts, that the low vowels should be anything but merged. Figure 3.13 shows the pattern of the 35

“Massachusetts State” college students who returned a complete survey that passed the same filtering criteria described above.

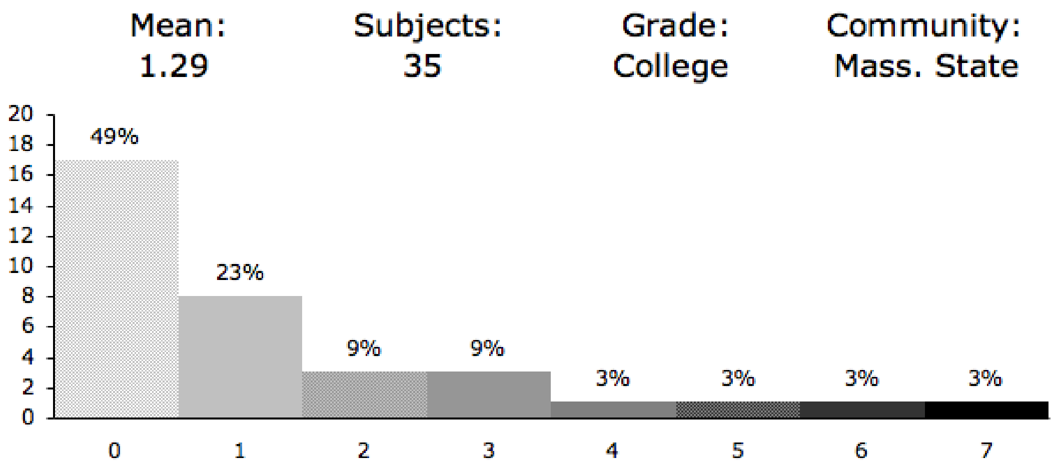

Figure 3.13: Number of Subjects vs. Items Marked “Different” (“Mass. State College”)

The results for MS15 show the most skewed distribution so far, with the lowest mean (1.29), and the highest peak (49% fully-merged 0’s), falling off the most rapidly (only 12% of subjects scored above the midpoint, with one person having each score from 4 to 7). Clearly, this college campus is a mainly-merged environment.

There are few enough subjects to discuss some of the outliers individually, and see how the factors identified in the earlier analyses play out in those specific cases.

The 21-year-old woman who scored a fully-distinct 7 grew up in New Jersey (with NJ parents), and moved to MA three years previously, for college. Evidently, the college experience has not affected her response.

The 20-year-old woman who scored a 6 grew up in New York State (with NY parents) and moved to Cape Cod after one year of high school; she has thus spent five years in merged communities.

The 22-year-old woman who scored a 5 lived until college in Western Massachusetts, an area that traditionally distinguished the low back vowels but was treated as "probably distinct" for the regression analyses above. Her parents were from the same region.

So we see that the three highest scorers have distinct origins, and removing them brings the mean of the remaining 32 down to 0.84. Of these, 29 have their origins in merged areas, so the three that do not are of interest.

One 21-year-old student grew up in Somerset MA, near Fall River, a city whose dialect is historically distinct, like Providence's. He only scored a 2. But knowing the effect of a merged mother – his is from Pittsburgh PA – the score seems much less surprising.

A 21-year-old grew up in Illinois at least through elementary school. She did not record any middle school information, and went to high school in a merged part of Massachusetts. In addition, her parents were both from a merged community near Boston. The combination of parents' origin and her own high school (and possibly middle school) peers make her score of 0 less surprising, despite her own origins in a mainly distinct state.

And a 20-year-old woman grew up in a part of Central Massachusetts where I had no reliable information about the precise location – if there is one – of the boundary between merged and distinct communities. This is an example of what I called an "unresolved" origin. Her parents were from slightly further west; she scored a 0. There is no reason to consider her case anomalous, but without knowing anything about the norms in the precise area she comes from, it is impossible to say.

As noted, the other 29 students had merged origins. Their scores were distributed as follows: 15x0, 8x1, 2x2, 3x3, 1x4. No information collected in the survey seems to distinguish those who had, or 'admitted', to a full merger from those who marked one or more items different.

In the group who scored from 1 to 4, one had a parent from Connecticut (distinct) and two had parents from Indiana (unresolved). But in the group that scored 0, there was a parent from New York City (distinct) and one from Miami FL (probably distinct), so this effect is not regular.

In each group, exactly two-thirds were female, one-third male. All were white (except one who did not say). There seems to be no great difference in their having older or younger siblings. There may be no systematic difference between the subjects, unless it is something more personal, having to do with how they respond to this kind of task.

Looking at the particular items marked "different," one observes the pattern already seen in Attleboro and Brookline. *Collar∼Caller* and *Tock∼Talk* are marked "different" the most. Six of the eight subjects who scored 1's did so by marking one of these two items "different," and all four who scored 3 or 4 included both of them.

The theory was advanced above (p. 105) that *Collar∼Caller* is not an ideal minimal pair for non-rhotic subjects, and is therefore often marked "different" even if the subject's vowel quality might be the same in the first syllable of the two words. A possible analogous story would involve *Tock∼Talk* differing because subjects pronounce the *l* in *talk,* or think they do, or think they should.

The rhoticity theory can be tentatively tested by comparing the specific backgrounds of the MS15 subjects with merged origins who marked *Collar∼Caller* "same" vs. "different." Doing so reveals plenty of overlap – some students in each group grew up in the same town, or type of town – but it seems potentially confirmatory, unless just coincidental, that the three students from big-city backgrounds (two went to high school in New Bedford, one in Boston) all marked the Item "different".

Of course, any explanation of this type would not account for the virtual implicational hierarchy where a "different" *Collar∼Caller* is almost a prerequisite for other deviations from the merged norm.

While Item effects such as these show that subjects are not simply treating the seven questions as repeated instances of a probabilistic binary choice, the distribution seen in

Figure 3.13, like most of the previous ones, suggests that some deviations from the mean (or perhaps the mode) are a form of error, rather than requiring explanation in all cases.

3.6.4.2 Eastman School of Music students (EA15)

The other college-age community studied was more diverse in its geographic origins, and also in its survey responses. It consisted of 16 students at the Eastman School of Music in Rochester NY, who ranged fairly evenly from 0 to 6 in score (mean 2.63). Being students at a music school, they are more likely to have been exposed to singing training, which could have made them more conscious than average people their age – most were 18 – of norms of standard pronunciation (whatever those might be).

One student was from a merged background and scored a 1; another from a foreign background scored a 4; neither is surprising. Since subjects come to Eastman from all over the country, quite a few were from places whose merger status is not as clear as most places in New England. So a student from St. Louis MO (with parents from TX and NC) scored a 0, as did one from South Carolina (parents from OR and DC). Another from the South indicated merger there, scoring a 1; he grew up in Georgia (parents Canada/NJ and NY). A Washington state native (with WA parents) scored a 2, consistent with what is known of widespread merger in the Far West. A subject from Colorado (with NJ parents) scored a 3. And a subject from Florida (with FL parents) scored a 5.

These eight individual results do not do much to add to our knowledge of the geographical distribution of the merger, but are sometimes suggestive. For example, the above tends to contradict an aspect of my coding of parents' origins, which considered Florida more merged than other Southern states (following Labov *et al.* 2006: 61).

What was more interesting in the EA15 data were the results from the other eight subjects, those of distinct Origin. Instead of patterning symmetrically to MS15 – that is to say, essentially like SK12 or NY12 – the score distribution is flat, and there is no one at all who marked the questionnaire in a fully-distinct manner, which ‘should’ be the most frequent score, given the origin of the subjects: 1x0, 0x1, 2x2, 2x3, 1x4, 0x5, 2x6, 0x7.

The score of 0 and one of the 3’s come from subjects whose mothers have definitely-merged origins (the subjects grew up in New York State, the mothers in Canada and Western Pennsylvania). The other 3 and the 4 had maternal origins which *might* be consistent with the low back merger (the mothers grew up “everywhere” and in “Scotland and England,” the subjects themselves near Chicago IL and in NY State (NYS).

This leaves 2 subjects who scored 6’s, which is unexceptional (they grew up in NYS with parents from the same), and two who scored 2’s, unexpectedly low given their distinct origins. One grew up in Simsbury CT (with parents from NYS), the other in Annapolis MD and NYC (with a mother from NYS and a father of unknown origin).

While there were subjects who scored this low, and lower, in SK12 and NY12, without any apparent ‘explanation’, there they were greatly outnumbered by scores of 5, 6, and 7, of which there are few here (of 7, none). While the number of observations is small, it is sufficient for a Mann-Whitney test to reject the hypothesis that the distribution is the same as those who grew up in Seekonk with distinct origins: $p = 0.002$ (relaxing the parental restrictions, this compares 8 scores from EA15 with 45 from SK12).

Whether these subjects’ musical training has altered their norms of pronunciation, or whether their presumably above-average socioeconomic standing associates with the low back merger in their home communities, or whether indeed, my perception of those home communities as distinct – more ‘precisely’, of the entire states of CT, NY, and MD as distinct – needs to be revised, or some combination of the above, is unclear. What seems less likely than any of these, is that we are dealing with a ‘college-freshman effect’, whereby contact with students of merged background leads to abandonment of the distinction, as in the mechanism proposed for merger-by-expansion.

Besides, if such drastic change was common among young adults who move away for college, one would have expected to see it in the MS15 data. Students from distinct backgrounds there, such as the ones from NJ (age 21, score 7), NYS (20, 6), and western MA (22, 5), had been immersed for much longer in a much-more-predominantly-merged sea of voices than the above speakers from CT and MD, who only recently arrived in the environment of Eastman, which is mixed at most, and located in a distinct city, anyway.

3.6.4.3 Jersey City NJ 4th graders (NJ4)

A class of 4th grade students was surveyed at a charter school in Jersey City NJ. No information was obtained about their backgrounds before attending this school. Evenly mixed in terms of race, their parents are a mixture of foreign-born, NYC-area native, and from other parts of the United States.

The students' teacher (whose low back vowels are merged) mentioned that the students had difficulty with the task, something that was not reported in AB4 or SK4. Nevertheless, their response pattern was a surprise, given the geographical location of the school, directly across the Hudson River from Manhattan, well within the known New York City dialect area (Cohen 1970).

Half of the 12 NJ4 students who passed the filter circled "same" for all seven items, scoring 0 (by contrast, in NY12 only 9% of subjects scored 0). One person each scored 1, 2, and 3, two scored 4, and one scored 5. No one scored either 6 or 7, categories which together accounted for 48% of the subjects in NY12. It might be suggested that the small number of NJ4 subjects makes such a different distribution something that might arise by chance, but the Mann-Whitney p-value for the comparison, 6×10^{-5}, rules out that account. For one reason or another, the fourth graders from Jersey City (mean score 1.58) are significantly more merged than the high schoolers in New York City (mean 4.81).

It is interesting that even a 10-year-old girl with two New Jersey parents, and two 9-year-old boys with a local father (the mother was foreign or unknown), were fully merged.

These three were of unknown or "other" race. The other subject with a local parent, a 9-year old African-American girl (father from NJ, mother from Mississippi), scored a 1. The subject who scored a 2 gave his parents' origins only as "USA"; the higher-scoring subjects had parents from Florida, Nigeria, Puerto Rico, and India.

NJ4 students with native parents had lower average scores than those with foreign parents, a pattern that stands out in sharp contrast to NY12. Recall that there, the mean score for subjects with local parents was about a full unit (one item, on average) higher.

Since New York City did show some students with 'inexplicable' merger, and remembering the huge change (in apparent time) that occurred in Seekonk between the high school and elementary school cohort, it is natural to wonder whether these results suggest Jersey City has left the NYC dialect area, or whether a similar change towards merger would be observed among younger children in New York as well, were they surveyed.

A third possibility, that younger children simply do not report the low back distinction, although they do make it in their speech, can be discounted through independent evidence that the merger among young people in Seekonk is real (see Chapter 5).

3.6.4.4 Providence RI high school students (PR12)

Fewer total surveys (14) were collected in Providence, from a magnet public high school, than in any other place; in addition, the percentage eliminated by the two filter – 8 of 14, or 57% – was the highest of all communities.

Of the eight subjects who were eliminated – for saying that *pause* and *paws* sounded "different" – five answered "different" to all seven /o/∼/oh/ items, one marked six "different" and left the other blank, one scored a complete 6, and one a 5. But of the filtered subjects, the distribution was much less skewed towards the distinct end of the spectrum: 1x3, 3x4, 1x5, 0x6, 1x7.

Although in all previous analyses the eliminated subjects were simply ignored, it is worth considering them here in trying to decide whether high-school-age students in Providence retain the low back distinction that is universal among adults from that city, and Rhode Island generally.

The reason subjects were screened with the *Pause*∼*Paws* question was the assumption that that anyone who thought those two words sounded "different" – although they contain the same vowel in all modern dialects of English – would be equally likely, or perhaps even more so, to mark other pairs "different" when they do not actually distinguish the relevant low back vowels in their speech.

So it is only to be expected that the subjects in any group eliminated by *Pause*∼*Paws* would tend to have higher mean scores than those retained, as seen dramatically for PR12, where eliminated subjects' mean is 6.50 and the retained subjects' is 4.50.

In general, the lower mean is almost certainly a more accurate reflection of the community's actual linguistic performance. In other historically-distinct communities, however, the difference was smaller, as was the number of subjects eliminated by *Pause*∼*Pause*. For example, in SK12, only nine subjects with a mean of 5.67 were eliminated, while 109 with a mean of 5.28 were retained. In NY12, 19 were eliminated (mean 5.53) and 114 retained (mean 4.81).

It is clear that the PR12 subjects (as well as those of NJ4, where 40% of responses were eliminated) had more difficulty with the survey task than most other communities. That many of the PR12 students do not have English as their first language, especially the two-thirds of them who are Hispanic, may account for this.

Since even subjects with no knowledge of English at all would theoretically have a 50% chance of passing the *Pause*∼*Paws* test, it is likely that any community where a high proportion of subjects failed it contains a number of others who gave equally questionable responses, but passed it.

It is therefore hard to conclude anything with great certainty about Providence from this data. With only six subjects, the intermediate distribution of PR12 (mean 4.50), is not statistically different from nearby SK12 (mean 5.28), by the Mann-Whitney test ($p = 0.19$).

Although the primary problem here is a lack of data, it should be noted that the image of the inner city as the place where a dialect (or accent) of English is strongest is challenged when the majority of the city's population consists of non-white groups, often speaking English as a second language. Certainly, on the whole, immigrants' children (and some immigrant children) adopt the local dialect, but as the data from NY12 showed, they are not indistinguishable from natives. If the proportion of immigrants is very high, it can have profound effects on a city's dialect (Herold 1990, Baranowski 2006). Meanwhile, the majority-white suburbs may continue the evolution of the speech patterns traditionally associated with the city.

3.6.4.5 Dayspring Christian Academy 4th and 8th graders (DS4, DS8)

The final school surveyed was somewhat different from the other elementary and middle schools, which were public schools serving the children of single municipalities (Attleboro and Seekonk MA). The private Dayspring Christian Academy, located in South Attleboro about half a mile from the Rhode Island border, serves K-8 students from a much wider area in MA and even more in RI.

The filtered data contains 15 surveys from eighth graders at Dayspring (DS8), and 25 from fourth graders (DS4). The mean score for DS8 was 3.53, with a flat distribution slightly higher at each end of the spectrum, as shown in Figure 3.14. The mean for DS4 was 1.48, with a typically-skewed, mainly-merged distribution, as shown in Figure 3.15.

Because DS students do not live in the same neighborhood or city (or even state) as their classmates, the likelihood is that they have some peers in their home communities, who would represent another set of influences on their speech, along with their school peers and family influences. But with the limited number of subjects, it is somewhat difficult to

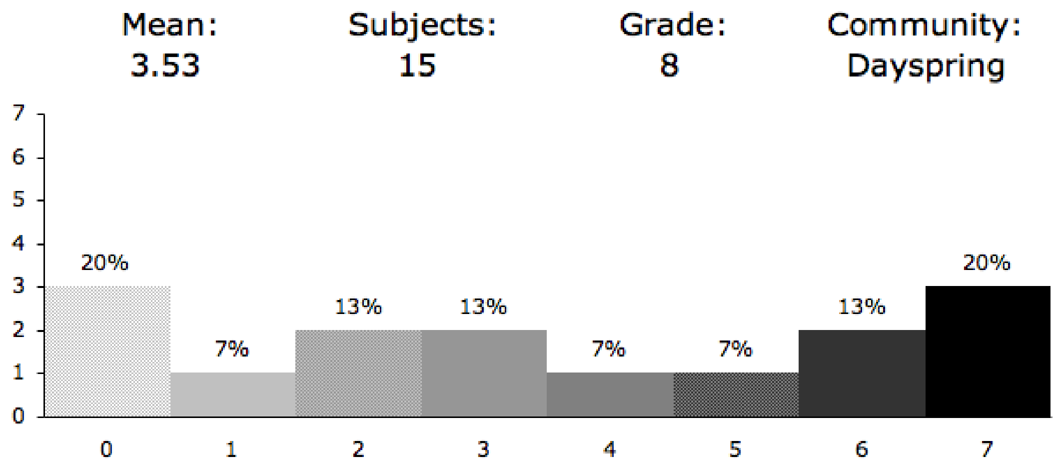

Figure 3.14: Number of Subjects vs. Items Marked “Different” (DS8)

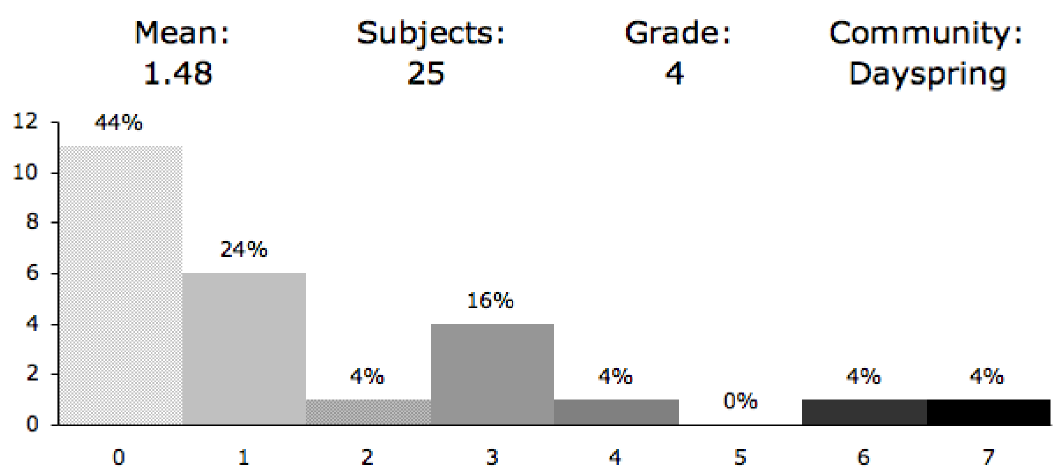

Figure 3.15: Number of Subjects vs. Items Marked “Different” (DS4)

disentangle the effects of these influences, because they are highly correlated.

For example, of the 4 eighth-grade subjects who have attended Dayspring from kindergarten (or even preschool) on, the two who live in Attleboro each scored 0, while the two who live in Rhode Island (two in Pawtucket, one in North Providence) scored 6 and 7.

But the two from Attleboro each have a merged parent, while the two from RI have distinct or foreign parents, so the influences cannot strictly be separated here.

Those eighth graders who used to attend school in Rhode Island, and have attended Dayspring for the past few years, actually have more merged responses than the RI residents who have always attended Dayspring. Some are fully distinct, such as a girl who moved from Warwick RI after 5th grade and a boy who moved from Providence after 3rd. Three others are mixed (scoring 2, 3, and 5), while one boy who had only moved recently from Cumberland RI submitted a fully merged response.

Without conducting interviews in many Rhode Island communities, it is difficult to know whether the indications of merger shown by these subjects signals that the merger is going on in their home communities, or whether it is the influence of the Dayspring community that has triggered it. The score of 0 from the subject who had only spent a few months at Dayspring is likely due to more than just recent accommodation, and interviews in Cumberland (see Chapter 5) suggest that some children are indeed merged there.

The fourth graders gave less precise information about previous schooling, but there were 16 subjects who gave no indication of any previous school other than Dayspring. Here too, there was little correlation between town of residence and score. Nine scored a 0, including six from Rhode Island. And of the three who scored a 3, the highest score, one lived in Attleboro.

Two other fourth grades have been considered above: Attleboro and Seekonk. In AB4, the population was drawn from two parts of the city: South Attleboro, where the distinction characterizes adults but generally speaking, not children, and the rest of Attleboro, which has been merged for decades. In Seekonk the fourth grade is in the process of merger, but with substantial variability. Both places show community-wide change, especially SK.

At Dayspring, the situation is different: a melting pot of students from communities on both sides of the (perhaps former) linguistic boundary. The speech community of the school, if such a thing exists, may be evolving differently than that of children in the public schools in those communities.

In DS4, two students live in historically-merged towns in Massachusetts, three in Attleboro, and one in South Attleboro, while 19 (76%) live in Rhode Island. The two from deeper in Massachusetts both scored 0, as did two from Attleboro; the others scored 1 (South Attleboro) and 3 (Attleboro).

This leaves the 19 students who live in Rhode Island, whose distribution was 7x0, 5x1, 1x2, 3x3, 1x4, 0x5, 1x6, 1x7. Of these, the highest scores came from those who had not attended Dayspring for more than a year or two, having previously gone to school in Rhode Island. Some who did this had low scores, however, as well as most of those who gave no indication of any previous school.

The response of the 19 DS4 subjects who live in Rhode Island (mean 1.74), is somewhat more merged than the mean for SK4 (mean 2.57, Mann-Whitney $p = 0.06$), even though in the SK4 analysis, subjects who had moved from Rhode Island (mean 3.00) were seen to be slightly more distinct than Seekonk natives (mean 2.20).

Most likely, two things are going on. Community merger, such as was seen happening in Seekonk, is probably also taking place in other communities that historically had the ‘Rhode Island’ low back distinction. But in addition, the melting pot of Dayspring seems to have an effect. Even though the fraction of students from merged backgrounds is small – in this data, about one quarter – their classmates from distinct backgrounds partially or completely acquire the merger from contact with them.

But as in all the schools studied, there is no coalescence of a *strict* group norm. Considerable diversity in responses, or unexplained between-subject variation, remains.

3.6.5 Comparison across communities

In every primary community, including a random effect for individual Subject differences made a substantial improvement to the model. A random effect for Item was found to be significant in most models, and close to the significance threshold in the others.

Among the fixed effects, the Origin factor, indicating differences between in-movers and subjects native to the place in question, was the most often significant.

The other widely important factors were those of Mother and Father's origins. However, these influences did not show up as significant in the analysis of the youngest subject groups, AB4 and SK4. Parental effects genuinely seem smaller in this data.

Various effects of Older Siblings, Foreign Language, and Race appeared in some of the communities. And where Teachers were surveyed, there was at least a marginally significant effect, although it was sometimes uninterpretable (e.g. when the "unknown" group was the significantly different one). Table 3.25 displays a selection of these effects, intended to show trends and patterns across communities. The convention will be continued of indicating **signficant** ($p \leq 0.05$), ***marginally significant*** ($0.05 < p \leq 0.10$) and non-significant ($p > 0.10$) effects in bold, bold italic, and normal type. The p-value in each case is the chance an effect at least that large would be generated by chance; therefore real effects near zero will never be 'significant', and even real effects far from zero may not appear 'significant' if insufficient data supports the relationships.

The effect sizes here are taken from the super-models, which makes for a more fair comparison between communities than the individually-fitted best models. The numbers thus differ somewhat from some of the figures quoted in tables earlier in the chapter. Empty cells in this table reflect factor levels that did not occur in the relevant community, or where the information (such as from teachers) was missing. There is one 'knockout', where there is no variation within a cell, and the regression cannot calculate an reliable estimate.

	BR12	AB12	AB8	AB4	SK4	SK8	SK12	NY12
mean score	1.72	1.92	1.31	1.55	2.57	3.67	5.28	4.80
# of subjects	227	281	402	330	72	27	109	114
distinct origin	**+1.70**	**+1.62**	**+1.68**	**+1.17**	+0.45	+0.69	-0.04	k.o.
merged origin	**+1.12**	-0.09	-0.10	+0.15	***-2.40*****	-1.48	**-3.37**	**-1.34****
merged mother	**-1.15**	**-1.03**	**-1.19**	-0.34	-0.93	-1.30	**-2.03**	-4.06
merged father	**-1.00**	-0.39	**-0.60**	+0.17	-0.87	—	**-2.09**	—
1 older sib.	-0.48	**+0.70**	-0.19	-0.02	-0.74	0.27	-0.09	+0.20
2 parents FL	+0.49	**+1.41**	+0.08	+0.45	+0.14	—	+2.49	**-2.02**
race	***-1.52***[b]	**-2.79**[a]	**+1.15**[h]	**+2.67**[u]	no large race effects			**+2.33**[b]
female gender	-0.26	+0.03	-0.17	+0.08	+0.35	-0.96	-0.65	-0.41
merged teacher	—	**-0.61**	+0.01	-0.4 0	—	—	—	—
caught∼cot (rank)	-0.32 (7)	+0.05 (3)	-0.21 (5)	+0.09 (4)	+0.35 (2)	0.24 (2.5)	+0.381 (1)	+1.08 (1)
collar∼caller (rank)	+0.42 (1)	+0.24 (1)	+0.56 (2)	+0.20 (1)	-0.41 (6.5)	-0.15 (4.5)	-0.24 (5)	-0.04 (4)
Moll∼mall (rank)	+0.17 (3)	+0.03 (4)	+0.47 (3)	+0.03 (5)	-0.05 (4)	-0.66 (7)	-1.01 (7)	-1.37 (7)

*merged level combined with other small levels ****Queens vs. Brooklyn

[a]Asian [b]black [h]Hispanic [u]unknown

Table 3.25: Selected factor levels compared across all primary communities, in log odds (**bold:** $p \leq 0.05$; ***bold italic:*** $0.05 < p \leq 0.10$; FL = foreign language, k.o. = knockout)

The analysis has been carried out community by community in order not to assume that the same factor structure was important for each one (and in addition, because the number of subjects, and some of the factor levels, varied widely between communities). But if similar things seem to influence subjects' low back vowel inventories in different places, a better model can be built by combining all the data together.

Table 3.25 shows a mixed report on this point. Some factors behave similarly across communities, but others show several patterns, or are more chaotic.

The positive effect of distinct (vs. local) origin is clear in Brookline and Attleboro, and the negative effect of merged (vs. local) origin is even larger in Seekonk, although based on few subjects. There were no in-movers from merged areas in the New York data; the effect of Queens origin vs. Brooklyn origin is shown in that position in the table.

Brookline MA behaves as though it is more merged than the known-merged places people move from, which is unexplained. There is no significant effect of merged origin in Attleboro, or of distinct origin in Seekonk (again, New York lacked data). This makes sense, if Attleboro is considered a merged community itself (other than the diminishingly 'independent' South Attleboro), so subjects who moved from neighboring places, mainly closer to Boston, would encounter a similar peer environment on arrival in Attleboro.

For the oldest age level in Seekonk, the reverse holds. SK12 is an essentially distinct community and children moving there from other distinct communities should not show any greater degree of distinction. However, the younger Seekonk communities are merged to greater and greater degrees, so one might expect that in-movers from Rhode Island (or other distinct places) would on the whole be more distinct than their peers who never lived anywhere but Seekonk.

Briefly, three things could be interacting here: a) the in-movers *are* more distinct, though not significantly so (for SK8 in-movers score 4.5, natives 3.4; for SK4 in-movers score 3.0, natives 2.2); b) the places they moved from may be undergoing merger as well; c) they may have been more distinct when they moved, but accommodated to the Seekonk norm before being surveyed.

To summarize, the effect of origin, which stands in for early community and peer influences before moving to one of the survey community, seems to be fairly well-behaved. There are many cases of subjects retaining these early influences after many years in the survey community. Others fully accommodate to the local norm, and others partially. Overall, the lack of accommodation stands out, resulting roughly in an effect of +1.5 log-odds for the response of a distinct-origin person after several years (about 6, on average) in a mainly-merged school.

This is what happens when distinct speakers move to merged communities. Unfortunately, the important question of whether subjects who start their lives merged can learn the distinction under peer influence, cannot be addressed very well with this data. There were 61 subjects with distinct origins who moved to AB and BR, and they ended up all over the response spectrum, as noted. But there were only 6 subjects with merged origins who moved to Seekonk (and no such movers to NY). Three of these are in SK4, which is hardly a mainly-distinct environment.

In any case, none learned the distinction well; one scored a zero despite 8 years in Seekonk. The regression coefficients associated with this small group of merged-origin in-movers is roughly -2.5. The patterns and limits of learning the merger vs. the distinction will be discussed further below, when the age that a person moved (and hence, how long they have been in the survey community) is added to the equation.

The effects of merged parents (compared to distinct) are quite constant from community to community. The father effect is never much greater than the mother effect, and is usually slightly smaller: around -0.7 (father) vs. -1.2 (mother) for BR12 / AB12 / AB8. The attrition into insignificance of the parental effects for the two youngest groups, AB4 and SK4, is still unexplained.

For SK12, we see much larger effects for both parents; each is close to -2.0 in log-odds. The difference can be looked at several ways. One is to say that in Attleboro, the effect of the mainly-merged peers works to partially level out the range of patterns inherited from parents who are both merged and distinct. In Seekonk, although very little of the data consists of subjects with merged parents, it seems as though the mainly-distinct peer group has had less of an effect on them.

This could be because phonological distinctions not learned from parental input are difficult to acquire, while mergers can be acquired more easily. This would underlie an observation to be made in §3.6.7, that there are negative interactions between most of the factors in the study. In general, factor levels favoring merger constrain the effects of other factors. So the effect of merged peers is greater when the parents are distinct, a merged father's effect is greater when the mother is distinct, and so on.

The Older Sibling, Foreign Language, and Race effects have been selected to show that some factor effects are idiosyncratic to certain communities. For example, the positive effect +0.695 of one older sibling in AB8 does not fit into a larger pattern. Indeed, it should be remembered that for every twenty effects examined, one on average will be spuriously significant at $p = 0.05$.

Other effects do appear in more than one community but point in the opposite direction. For example, both parents speaking a foreign language has a substantial positive effect (+1.408) in merged Brookline, but an even stronger negative one (-2.019) in distinct New York. In both cases, we can say that these children probably spoke a foreign language at home, and therefore acquired the local patterns less completely than English-only children.

One might suggest that they are simply closer to the midpoint of random choice. This works for BR12 (no foreign language, mean 1.57; both parents foreign language: 2.43) but falls short as an explanation in NY12, where the treatment group has crossed the midpoint (no foreign: 5.06, both foreign: 2.83). Here it seems more likely that foreign speakers have an actual tendency towards merger (echoing Herold 1990) rather than just less facility with the survey or less consistent intuitions.

Various race effects have been strong in individual communities, most notably Asian (-2.792) in AB12; two directly 'contradict' each other. In Brookline, the few black subjects were marginally significantly more merged (-1.487), while in New York, the black subjects (most of whom were of Caribbean descent) were significantly more distinct (+2.331).

Again, a plausible explanation can be concocted, that black subjects are more 'urban' (in Brookline schools, many of the black students actually live in Boston) and therefore are *more* likely to fully acquire local city patterns. Of course, this would go against the view that blacks do not participate in white dialect patterns (Labov 2001: 506-7); in any case, most of the BR12 black subjects are not African-Americans with family history in Boston, but immigrants from Africa and the Caribbean. As noted above, the low back vowel status of African and Caribbean English needs to be incorporated into this picture.

In the above cases, although contradictory effects can be reconciled, it is then not clear why they do not surface in more communities. Although many places did lack black subjects, the foreign-parent effect, at least, should have been able to occur more widely.

The effect of female gender is given to show that it is non-significant ($p>0.10$) in all eight primary communities, but that five of the six coefficients of any size are negative (although this could be a coincidence; $p = 6/2^6 = 0.09$).

The merged-teacher effect is observed only in Attleboro, but simply because only there was the relevant information recorded. It may be an artifact, or reflect the short-term accommodation of student to their teachers, who administered the survey.

It is in the inner workings of the Item effect that the clearest differences are observed between communities. Three items have been selected to exemplify this; their BLUPs are given along with their rank out of seven.

Caught∼Cot is at the bottom in Brookline, favoring merger, and fairly low-ranked in Attleboro; in Seekonk and New York it is at the top, favoring distinction more than any other item. *Collar∼Caller* is at the top in BR and AB, in the middle or lower ranks in SK and NY. *Moll∼Mall* is in the middle in BR and AB, at the bottom in SK and NY.

It would be interesting to dissect these effects further, and try to determine if different populations within each group contribute different patterns to the complex whole. At most, these item-effect patterns could be a kind of phonological ‘fingerprint’ that is stable across a large dialect area. At the least, it shows that communities like Brookline and Attleboro on the one hand, and Seekonk and New York on the other, share more in common than low vs. high mean scores on the response variable.

3.6.6 A combined model

The previous section suggests on multiple grounds that the Brookline and Attleboro data have similar structures, and that the Seekonk and New York data do too. This divide is also natural because subjects' current peers are majority merged in BR and AB, majority distinct in SK12 and NY. In SK8 and SK4, peers are intermediate, and this will form a third category of a new factor called Current Peers.

Of the secondary communities, the college students of Mass. State belong with AB / BR, and will be grouped with that data as having "merged peers". The subjects from Dayspring Academy are similar to SK8 / SK4, and will join that category ("other peers"), but the other secondary communities (EA, NJ, PR) are not comparable and will be discarded from this point forward.

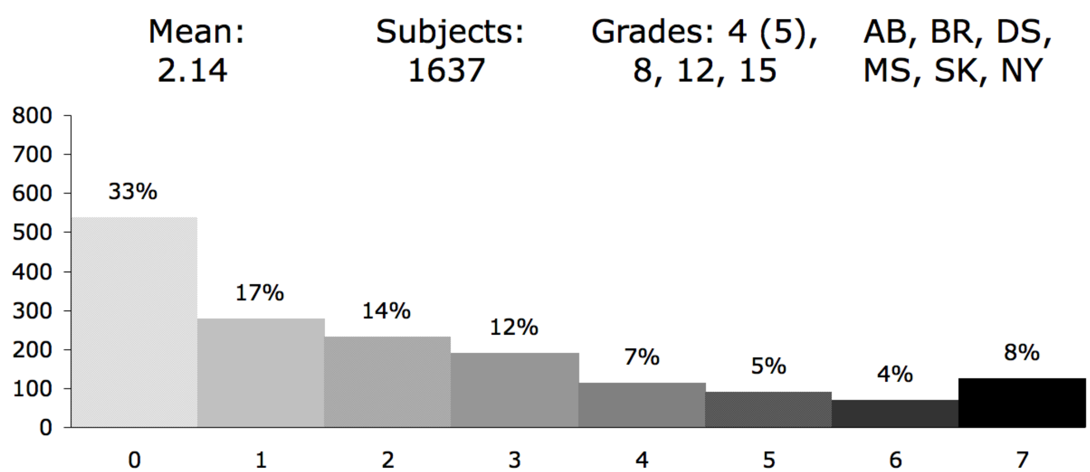

Figure 3.16: Number of Subjects vs. Items Marked "Different" (Attleboro, Brookline, Seekonk, New York City, Mass. State College, Dayspring)

Before running a combined model for these 1637 subjects, whose score distribution is shown in Figure 3.16, the levels of the other most relevant factors – Origin, Mother, and

Father – will be reduced. For the parental factors, the levels from now on will be "distinct", "other", and "merged". The "other" category includes probably distinct, probably merged, foreign, unresolved, and unknown parents.

The Origin factor will also be divided into "distinct", "other", and "merged" along the same lines as peers. Foreign, unresolved, and unknown origins are grouped as "other". Table 3.26 and 3.27 show the distribution of subjects within these factor combinations.

	mother distinct	mother other	mother merged
father distinct	253	115	53
father other	98	672	109
father merged	46	85	206

Table 3.26: 1637 subjects cross-tabulated by parents' origin

	current distinct	current other	current merged
origin distinct	194	59	67
origin other	25	65	438
origin merged	4	15	770

Table 3.27: 1637 subjects cross-tabulated by origin and current peers

Clearly, these factors have very unbalanced distributions, reflecting both the numbers of surveys that were administered (and returned) in different places, as well as the migration patterns in the area, which seem to flow more from distinct dialect areas towards merged ones, rather than in the reverse direction.

This bias tends to force the analysis into discussing how the various factors promote the *merger,* rather than looking at it the other way around. If there had been a large number of subjects with merged parents or early origins currently living in distinct peer groups, factors promoting the acquisition of the *distinction* could have been dealt with more explicitly.

In any case, it is the *difference* between factor levels that is modeled as causing effects, and these effects apply equally – assuming logistic regression is an accurate model – along the spectrum from merged to distinct.

The Item random factor will be removed for the time being, since it is already known that no single item-effect structure is valid for all communities.

Table 3.28 shows the results of a regression performed with these renovated factors. Because of the larger number of subjects, all effects are significant at a much higher level than previously. For each factor, the "merged" level has a negative (merged) effect on the response, while the effect of the level "other" is intermediate between "distinct" and "merged."

FACTOR	LEVEL	TYPE	SUBJECTS	ESTIMATE	P-VALUE
mother	distinct	baseline	397	0	—
mother	**other**	**treatment**	**872**	**-0.488**	**0.0002**
mother	**merged**	**treatment**	**368**	**-0.984**	**8x10^{-10}**
father	distinct	baseline	421	0	—
father	**other**	**treatment**	**879**	**-0.321**	**0.013**
father	**merged**	**treatment**	**337**	**-0.615**	**0.0002**
origin	distinct	baseline	320	0	—
origin	**other**	**treatment**	**529**	**-0.891**	**2x10^{-7}**
origin	**merged**	**treatment**	**788**	**-1.259**	**2x10^{-12}**
current	distinct	baseline	223	0	—
current	**other**	**treatment**	**139**	**-1.791**	**<2x10^{-16}**
current	**merged**	**treatment**	**1275**	**-1.931**	**<2x10^{-16}**
subject	maximum	random	1	+3.629	
subject	>+2 std. dev.	random	9	+3.000	
subject	>+1 std. dev.	random	183	+1.500	
subject	mean of BLUPs	random	1637	+0.104	
subject	<-1 std. dev.	random	62	-1.500	
subject	<-2 std. dev.	random	3	-3.020	
subject	minimum	random	1	-3.384	
intercept: +2.079	df: 10	log likelihood: -5528	Somers' D_{xy}: 0.445		

Table 3.28: Combined model (no interactions): 1637 AB, BR, SK, NY, MS, DS subjects

The largest effect size (merged vs. distinct log-odds: -1.931) is of Current Peers, reflecting the community where the subject attends school and was surveyed. This is followed by Origin (-1.259), reflecting where a subject lived in earlier years. The effect of Mother is slightly smaller (-0.984), and the effect of Father the smallest of the four (-0.615).

The difference in effect size between Current Peers and Origin is hard to interpret, as the way the factors are defined cause them to overlap. For 12th graders, elementary and middle school experience counts as their Origin (unless they are known to have attended kindergarten or preschool somewhere else), but for 4th students, the location of the elementary school defines their Current Peers. The correlation between the two factors is 0.32.

It can be said that the two peer effects combined are roughly twice the size of the parent effects combined, but this suggests that any of them *can* be combined and compared without interaction. The skewing observed in the subject effect, where there are more (and higher) positive BLUPs than negative ones, might indicate such interactions. (In fact, as seen below, the subject effect is changed little by the addition of interactions.)

The Mother effect is approximately 1.5 times as big as the Father effect. The correlation between the factors is 0.48, but there are enough subjects in each combination of levels that we can be sure that mothers and fathers each have legitimate main effects. The issue of assessing the interaction between them will be addressed in the next section, 3.6.7.

To summarize the combined results, they tell us that if we could only have one of these four pieces of information, Current Peers would be the best choice; it predicts the most about a subject's survey response. But as will be seen, this is misleading: in some circumstances, the influence of current peers is actually the least important of the four.

3.6.7 Interaction between factors

The main factor effects are all negative, as they represent the effect of having (e.g.) a merged mother compared to a distinct mother. This favors merger in the subject, hence is represented by lower response probabilities and mean scores, and a negative coefficient.

But most of the effects do not combine linearly; instead, there are negative interactions between them. The effect of having both merged parents, for instance, is less than the sum of the mother-merged effect and the father-merged effect. Since the main effects are both negative, the interaction effect is actually a positive term, reflecting that the group with both merged parents is more distinct (less merged) than one would expect from simply adding the individual parent effects.

Regression models were fit using the combined data set from §3.6.6 (1637 subjects) but only a subset of the results will be reported, those concerning the effect of the "merged" factors levels compared to the baseline "distinct" levels. The results not shown, for the "other" levels and their interactions, are mostly comprehensible in similar terms.

The interaction between parents and current peers did not generate significant results for the merged levels. The other four factor pairs generated positive interaction terms – Mother x Father (log-odds +0.750, p = 0.10), Mother x Origin (+1.385, 0.02), Father x Origin (+1.460, 0.03), and Origin x Current (+1.787, 0.05) – indicating a negative interaction in all cases. Any factor that makes a subject more merged also decreases the effect of the other merger-inducing factors.

The new model with interactions (log-likelihood -5501, 26 d.f.) is much preferred to the model without them (-5528, 10); the p-value associated with the difference is 5×10^{-6}.

As a consequence of the interactions, the 'main effect' terms for each factor have become much larger (in absolute value). The main effect for Origin, for example, is -4.122, larger than any coefficient previously in the analysis. But this value now represents the effect of merged Origin assuming the level of the other factors is "distinct" (always represented by a coefficient of 0).

Table 3.29 illustrates these relationships. It shows the MFOC (Mother, Father, Origin, Current) effects, their interactions, and how they add to create a total effect, for each of several MFOC 'types'. The totals are with respect to 0, when each factor is "distinct".

MFOC	MOTHER	FATHER	ORIGIN	CURRENT	INTERACTION	TOTAL
mmdd	-2.56	-2.09	0	0	+0.75	-3.90
mdmd	-2.56	0	-4.12	0	+1.39	-5.29
dmmd	0	-2.09	-4.12	0	+1.46	-4.75
ddmm	0	0	-4.12	-1.55	+1.79	-3.88

Table 3.29: Effect of merged levels of principal factors and their interactions (m=merged, d=distinct; current=current peers; no intercept)

The main effect of a merged mother, everything else being distinct, is -2.56 ($p = 5 \times 10^{-6}$); that of a merged father is somewhat less extreme, -2.09 (.002). If both parents are merged, however, the combined parental effect is not the sum, -4.65, but a more moderate -3.90.

Similarly, when the effect of merged origins, -4.122 ($p = 5 \times 10^{-5}$) combines with that of current merged peers, -1.55 (1×10^{-9}), rather than adding up to -5.67, the combined peer effect for someone who has always lived in a merged community is 'only' -3.88.

Note that in the second example (last row of Table 3.29), the interaction is large enough to cancel the effect of Current Peers completely. This has a sensible interpretation; it suggests that current peers have no effect on subjects who had merged peers earlier in childhood, but they do have a medium-sized effect (-1.55) on subjects whose original peers were distinct.

Another way of stating this is that subjects with distinct origins who move to merged communities score lower than those who never left the distinct region; they acquire the low back merger, at least to some extent. However, there is no corresponding evidence that subjects with merged origins who move to distinct communities acquire the low back distinction at all. While this confirms expectations, the number of subjects who moved in that direction is quite small, making the estimate of the Origin main effect and Origin x Current interaction effects quite imprecise.

Table 3.30 shows how the model with interactions fares with the most common combinations of factors in the data (restricted to those which do not have "other" as the value of any variable). The sum of the intercept (+2.556), the four factor effects, and any interactions are given under "total". The mean score *predicted* with such a log-odds is then compared with the predicted once score *adjusted* by the subject BLUPs, and with the the mean score actually *observed* for the group in question.

MFOC	TOTAL	PREDICTED	ADJUSTED	OBSERVED	# OF SUBJECTS
dddd	+2.56	6.50	6.47	6.17	77
dddm	+1.00	5.12	4.74	4.41	17
ddmm	-1.33	1.46	1.69	2.11	53
dmmm	-1.97	0.86	1.05	1.53	32
mdmm	-2.51	0.53	0.53	0.77	26
mmmm	-2.39	0.59	0.68	1.01	149
subject	maximum	+3.314			1
subject	>+2 std. dev.	+2.94			6
subject	>+1 std. dev.	+1.47			173
subject	mean of BLUPs	+0.100			1637
subject	<-1 std. dev.	-1.47			52
subject	<-2 std. dev.	-2.94			3
subject	minimum	-3.686			1
intercept: +2.556	df: 26	log likelihood: -5501	Somers' D_{xy}: 0.449		

Table 3.30: Model predictions vs. observed means for common combinations of levels (mfoc=mother, father, origin, current peers; m=merged, d=distinct)

The model does a fairly good job of predicting the response probabilities of the different sub-groups here. Note how when Mother is "distinct", the value of Father has an effect in the expected direction (row 3 vs. row 4), but when Mother is "merged", Father appears to have a reverse effect (row 5 vs. row 6). An actual 'dissimilatory' Father influence seems unlikely, but certainly when someone's mother *and* peers favor merger, the additional effect of Father is minimal, or even zero. This illustrates the negative interaction between factors.

Presumably with the addition of other fixed factors, or complicating it further, this model could be improved, but this might not affect a certain structural pattern that is visible in Table 3.30.

In all cases, the observed group mean is *less extreme* than the predicted value, that is, farther from 0 and 7 and closer to the middle of the spectrum. The subject effects do not do much to address this, which in a way is as it should be; subject effects are supposed to be individual, not acting to ‘correct’ overall trends.

There are several things that could cause a pattern like this. First, there could be more, higher-order negative interactions between the factors in the model. This could have a very general explanation: parallel behavioral influences on behavior might never be cumulative, perhaps because contrary influences are more salient than ones in the same direction.

But this would not necessarily explain the symmetry of this pattern at both ends of the spectrum. We actually expect an asymmetry under the theory outlined above. If influences favoring merger interfere with each other, it assumes that influences favoring distinction would interact positively, one amplifying the effect of the other.

There may be a type of floor / ceiling effect, where as people approach one extreme or the other of response probability, the effect of any factor is simply lessened. But this is unlikely, simply because so many subjects actually are at one end of the spectrum or the other (see Figure 3.16), and in fact the regression effects get smaller, not larger, if these invariant subjects are dropped.

Perhaps the most likely explanation for the ‘centering’ effect is simply to think of it as a kind of noise, a reflection of the tendency on some subjects’ part not to mark all items alike, or simply to depart from whatever underlying invariability there may be. Since the behavior is a repeated binary choice, any kind of *constant* error – rather than error whose rate is linked to the frequency of the response – would serve to bring the mean of any group towards the midpoint of 3.5.

It may also be that since each type of community had a particular Item that tended to buck the trend (usually *Moll∼Mall* in the case of distinct communities, and *Collar∼Caller* in the case of merged ones), these discrepancies are causing the shift. Even if the positive and negative Item effects are balanced, they will bring the average score towards the midpoint, at least somewhat. This hypothesis should be easy to test by reintroducing the Item factor in a form allowing it to vary between the two community types; this has yet to be done.

3.6.7.1 Interaction between Gender and Parents' Origin

Since both parents have independent but interacting effects on a subject's response, it seemed worthwhile to investigate whether children of either gender are more influenced by one or the other parent. Although mothers are generally primary caretakers, perhaps young sons identify more with fathers and absorb more linguistic influence from them.

This turned out to be supported by a regression incorporating the factor Gender. It was necessary to remove Origin and Current Peers, because empty cells among the intersecting factors were causing `lmer` to crash. Subjects with parents with "other" origins were removed, to focus on merged and distinct parents, and subjects with unknown gender were also removed.

In this analysis there remained 254 male subjects, who were the baseline group for Gender, and 297 female subjects. In the model for these 551 people, 'merged mother' had an effect size of -2.515 ($p = 3x10^{-7}$). Merged father had a slightly larger effect size, -3.076 ($2x10^{-8}$). And there was a large negative interaction – positive in sign – between them: +2.178 (0.004).

Since males were the baseline group, these parental effects apply to males without modification. For boys, the father's effect is slightly more important than the mother's, and if both parents are merged, the effect is only slightly larger than if the father alone is.

Being female in and of itself was associated with a small negative coefficient, -0.380.

More interesting is the interaction of female gender with the parental effects. The merged-mother effect, if the subject is female, becomes larger (more negative) by -0.827. The merged-father effect, on the other hand, becomes much smaller; the interaction term is +1.443. There is also a small second-order interaction term, close to zero.

Although these individual Gender interactions are not statistically significant on their own, adding them all at once does meet that standard (p = 0.048). They support a common-sense view whereby same-sex parental influences are stronger. According to this data, mothers influence their daughters slightly more than their sons, and fathers influence their daughters quite a bit less than their sons.

These results, summarized in Table 3.31, are intriguing in light of previous work (Foulkes *et al.* 1999, Smith *et al.* 2007) suggesting that younger children of both genders hew closely to their mothers' speech in acquiring their dialects.

MFG	M + F + INT.	G + INT.	TOTAL	PREDICTED	OBSERVED	SUBJECTS
ddM	0	0	+0.53	4.40	3.98	106
ddF	0	-0.38	+0.15	2.75	3.63	145
mdM	-2.52	0	-1.99	0.84	1.44	27
mdF	-2.52	-1.21	-3.20	0.28	0.81	26
dmM	-3.08	0	-2.55	0.51	1.21	24
dmF	-3.08	+1.06	-1.49	1.29	1.90	20
mmM	-3.42	0	-2.89	0.37	0.90	97
mmF	-3.42	+0.36	-2.52	0.52	1.10	106
intercept: +0.53	df: 9	log likelihood: -1802	Somers' D_{xy}: 0.436			

Table 3.31: Model predictions vs. observed means for parent-gender interaction (INT.)
(M = mother, F = father; m = merged, d = distinct; G = gender: M = male, F = female)

Note that although origin, current peers, and everything else is disregarded here – except via any correlations they may have with parents or gender – the observed group means for the eight parent-gender categories are in the same order as the model predicts, except for one pair that is predicted to be very close (predicted 0.51 and 0.52, observed 1.21 and 1.10).

All the observed values are closer to the midpoint of 3.5 than the predicted ones, by between one-half and one full unit. This makes seven of the groups score higher, and the one group predicted to be above the midpoint score lower than predicted.

While this ‘centering’ remains mysterious – note that the shift is no greater at the extremes than towards the middle – the interaction of gender and parental effects in the model seems to account elegantly for these major influences on subjects’ responses.

3.6.7.2 Learning the merger: effects of age and siblings on relative peer influence

The community-by-community analysis found sporadic evidence of older siblings having an effect on survey responses. Although the analysis was rather intricate, there was a pattern in SK4 where one older sibling appeared to have a merger-favoring effect, while having three older siblings favored the distinction. This made some sense, because of the changing norms in that community; much-older siblings were very likely distinct, while an older sibling close in age could serve as a counterweight to distinct parental influence.

A situation in which older siblings could show a clearer influence is when a subject has moved from one dialect area to another. In this case, older siblings – younger ones too, perhaps – might act as peers and help a child retain their first dialect, compared to children who move with only their parents in tow, and who only have peers with the new dialect.

Because the data barely contains any subjects who moved from a merged to a distinct community – and they are not seen to acquire the distinction – this analysis will be restricted to subjects with distinct Origin and merged Current Peers.

This ‘mover’ sub-group has too many empty cells in the interaction of Mother and Father to include these factors. The data will be further restricted by removing the 7 subjects who have a merged parent. The remaining 60 have either distinct or ‘other’ parents (in the full version of the main interaction analysis, the ‘other’ parental levels had only small negative effects).

Of these 60 movers, 23 are from AB12, 13 from AB8, 12 from AB4, 9 from BR12 and 3 from BS15. Their mean score is 3.63 and their distribution is fairly flat, though slightly higher in the center of the spectrum (the most frequent scores are 3, 4, and 6).

A regression was performed to determine if the number of siblings (older and younger) has an effect on the response for these subjects, along with another factor that is equally likely to be important: the age at which the subject moved.

There are three reasons to expect subjects who moved to a merged community later in life to be less merged in their responses. First and probably foremost, the person will have spent less time exposed to the new dialect. Second, the person will have been older when they moved and thus perhaps less able to adopt the new pattern (results discussed above in §3.3.5, and below in Chapter 4, indicate that most people who move as adults do not acquire the merger at all, despite many years of exposure to it). Third and perhaps least likely to matter, subjects who moved later had more years of exposure to the first, distinct system before moving.

Because there are subjects of different ages here, it is possible to tease apart the potential effects of the Age a subject Moved and the number of years they have been in a merged environment (Years Since Moving), while also considering the number of older and younger Siblings they have.

The results of the regression (performed with random Subject and Item effects) show that Age Moved is significantly related to the subject's response, in the expected direction. The youngest known Age Moved was 5, between preschool and kindergarten. If this is taken as the baseline, the model assigns a coefficient of +0.163 ($p = 0.007$) to Age, which is a continuous variable rather than a factor.

This means that a compared to a child who moved at age 5, one who moved at age 6 is predicted to be +0.163 log-odds more distinct, and likewise, someone who did not move until age 16 will be +1.63 more distinct. The effect, or slope, is small, but we see that multiplied by 10 (or more) years, it becomes sizable. Adding the intercept of -1.61, we obtain a total effect of +0.02 and a mean score of 3.53.

Once Age Moved is controlled for, there is no significant effect of the number of Years Since Moving (and almost no interaction). Both the effect and the interaction are very close to zero, so the Years Since Moving factor was not used. The number of years spent in the new, merged community seems not to matter.

It is possible that a transformation of the Age Moved factor would achieve an even stronger effect; as it is, it suggests that the ability to learn the merger decreases steadily with years spent in the distinct home community. Since amount of time spent in the merged dialect area is apparently not important, it must be that subjects learn the merger to the extent they can – given their age and other possible factors – relatively quickly.

However, it should be noted that many subjects who moved late may have acquired the merger to some extent; at least, they are not fully distinct now. Of 13 subjects who moved after age 12, only four scored a fully-distinct 7, and one subject scored as low as a 2, this being a girl who moved at age 17 from Rochester NY to Brookline MA, less than a year before being surveyed. The mean score for these 13 late-moving subjects is 4.77.

Those who moved early, though they score lower than the late-movers, are hardly fully merged. In the group of 22 subjects who moved before age 9, the mean is 2.96. No one scores a full 7, although 3 subjects score a 6. Two subjects do score a 0, both of whom moved at age 8. In general, the picture is quite chaotic, with a general trend but copious variation on either side of it, especially for earlier movers, as seen in Figure 3.17.

Adding Siblings to this mix is somewhat complicated. The most careful way to analyze sibling effects would be to have access to the ages of each sibling, because a brother one year older is likely to have a different relationship with a subject than one 10 years older; in addition, when community changes are underway, they may have different systems. Further, since we are dealing with movers, knowing exact ages would help distinguish

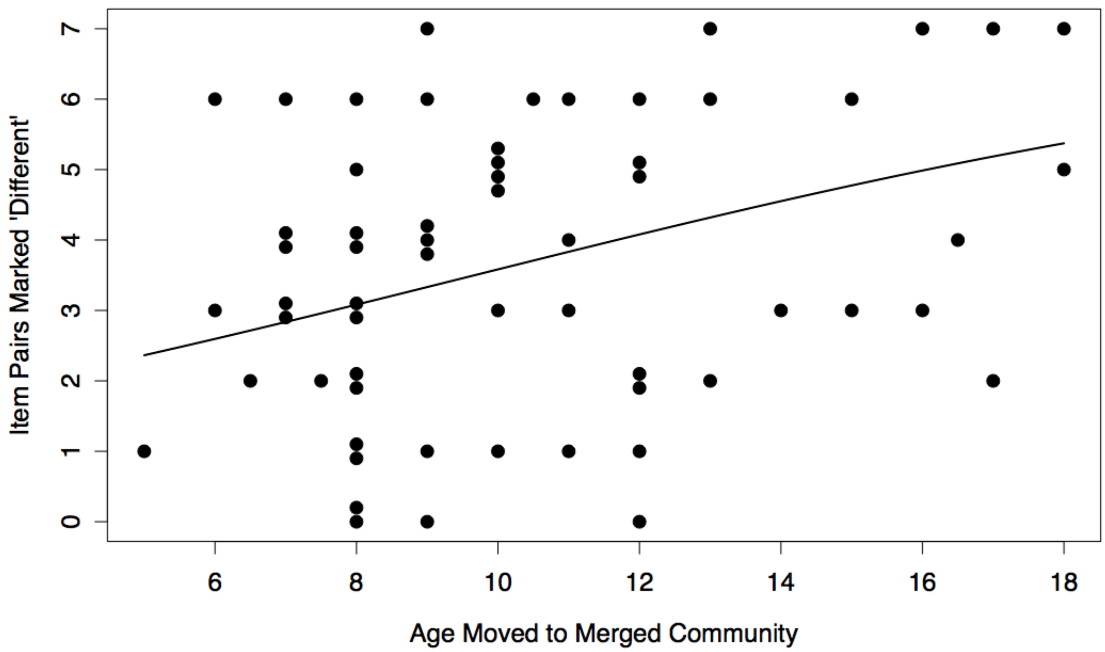

Figure 3.17: Age Moved (distinct to merged) vs. Items Marked “Different” for 60 movers (the superimposed curve is the model’s prediction based on Age Moved and Item effects)

siblings who would have been of school age before the move from ones born afterwards.

Although sibling ages were collected, they have not been made ready for use yet. Also, relating siblings' gender to subjects' gender would probably be important, considering the results of §3.6.7.1.

But even using a simple count of siblings reveals a certain effect. Having one sibling favors merger by +1.363 (p = 0.03). It does not matter whether it is an older or a younger sibling; in fact, having one of each has a similar conservative effect. These 'peers' of like dialect background, close in age to the subject, do apparently inhibit acquisiton of the merger to some extent.

But at was seen several times in this chapter, having multiple siblings does not guarantee an effect that is greater (or even in the same direction) as the effect of one. In the analysis here, having two siblings is assigned a coefficient of +0.934 (p = 0.13) and having three or four has an even smaller effect which is not significantly different from zero (+0.416, 0.57). Perhaps the strongest and most influential sibling relationships are with those close in age, and especially when there are no more distant siblings 'competing' for anyone's attention.

The most common factor combination in this data set are the subjects who moved at age 8, with one sibling – there are 7 such subjects. This is hardly a rigorous test of the model, but to demonstrate how the prediction works, we add -1.61 (the intercept), 3 x +0.163 (moved at age 8, 8 - 5=3), and 0.934 (one sibling). The total is -0.187 log-odds, for an expected mean score of 3.17 (3.19 when adjusted for Item effects). In the observed data, these seven subjects average 2.71 (1x0, 2x1, 1x2, 0x3, 1x4, 1x5, 1x6, 0x7).

Bearing in mind that this model has no fixed factors other than age Moved At and number of Siblings – in other words, a subject with two parents from Timbuktu is not distinguished from one with parents from Indiana or one who left that information blank – it does fairly well.

After all, a model with just Subject and Item effects obtains a Somers' D-value of 0.228

(without incorporating the Subject adjustments). Adding the Moved At factor brings the value to 0.320, and adding the Sibling factor brings it up to 0.360.

If we add the information distinguishing between merged and "other" parents, the coefficients already discussed change little, and the D-value rises to 0.435. But adding a factor indexing which particular merged sub-community (BR12, AB4, etc.) the subject moved to only increases Somers' D to 0.438, an insignificant increase ($p = 0.95$). This suggests that the task of learning the merger is basically the same everywhere.

There are many other factor interactions (defined variously) that would be worth investigating in this rich data set. Among these would be the effect of foreign-born parents, who presumably do not influence a subjects' speech as much as native parents do. If this is true, which other influences – the other parent, siblings, or peers – account for such subjects' vowel inventories?

Based on the finding that children are more influenced by their same-sex parent (boys slightly, girls more so), it would be worth checking whether other effects interact with Gender, which was essentially ignored above as it never seemed to have a main effect.

Another area of investigation would be the random effects. Does every sub-population in a community reproduce the same pattern of item effects – and what causes there to be two main orderings of these?

The behavior of the Subject effect is perhaps the least understood so far. Although this has not been tested, some models probably leave residual subject effects that are roughly normally distributed, as random effects are supposed to be. These can perhaps be usefully compared by size, but when numbers of subjects, average response, and other parameters are changing, this may be difficult or meaningless.

In the cases where the subject BLUPs are clearly far from a normal distribution, it would be important to understand why this is happening. If, in some way, the quasi-linguistic survey response here – seven binary choices on the same items for each subject – systematically deviates from what *any* logistic model predicts, then at the very least, some adjustments will have to be made to the method of analysis.

3.7 Factors affecting vowel inventory: evidence from /ah/

Besides the two questions used for screening purposes and the seven minimal pairs of /o/$\sim$/oh/, there were three other questions on the school survey, designed to investigate subjects' behavior with respect to the other low vowel, /ah/.

In most dialects of present-day American English, the historical /ah/ of *father, balm* is identical to the /o/ of *bother, bomb*. A phonemic difference based on /ah/ having greater length, such as in Moulton's 1990: 126 self-description of "two low central vowels that are identical in quality and differ only in quantity", is no longer supported by data collected from young speakers.

And in most areas where /o/ and /oh/ have merged, whether recently or long ago, all three historical word classes are now united as one category, /ah = o = oh/, with identical vowels in *father, bother,* and *daughter.* This 'three-way merger' has occurred in Western Pennsylvania and adjacent areas (Kurath and McDavid 1961: 7), it characterizes Canadian speech (Boberg 2006), and it is becoming more widespread wherever /oh/ falls together with an already-merged /ah = o/. This has happened in the American West, for example, and is ongoing in the Midland and also the South (Labov *et al.* 2006: §9.1).

However, it is not historically true in Eastern New England (ENE), where the /ah/ class, at least until very recently, was distinct from the combined /o = oh/ class. In Scotland /ah/ is also distinct from /o = oh/, but there it is often merged with /æ/ (Wells 1982: 399-403).

3.7.1 The status of /ah/ where /o/ and /oh/ are (historically) distinct

Of the communities surveyed, it was expected that in New York and Seekonk (as well as EA, NJ, and PR), there would be no systematic evidence of subjects making a distinction between /ah/ and /o/. The only ones there who might conceivably do so – barring reversal of a merger –would be in-movers from ENE, of whom there are almost none in the data.

Though younger speakers in Seekonk are certainly merging /o/ and /oh/, something that their ENE neighbors did long ago, it cannot be exactly the same process, nor is it likely to lead to the same result. Older Seekonk speakers have two phonemes, /ah = o/ and /oh/, so the merger is likely to be between these two categories, leading to /ah = o = oh/.

The alternative, whereby younger Seekonk speakers separate the /o/ words from the /ah = o/ class, and merge them with /oh/, thus replicating the ENE pattern, seems extremely unlikely, or even impossible. Even though anyone so close to the boundary is familiar (sometimes intimately) with the speech patterns on the other side, and even if the inter-dialectal contact has been increased recently by people recently moving to Seekonk from Greater Boston, the ENE pattern is not expected to arise there; the three-way merger is.

Within the Eastern New England dialect area, the high school students in Brookline and college students of Mass. State are expected to show evidence of an /ah/∼/o = oh/ distinction. But assuming this distinction is not ubiquitous, the analysis will investigate the between-subject factors governing it. Also, in-movers to the area will be examined to see if they have acquired anything of this local split – the expectation is that they will not have.

Attleboro is located right on the dialect boundary (while Dayspring's students live on either side of it). The situation for South Attleboro speakers is the same as that described for Seekonk, but South Attleboro is farther along in the process. They are not expected to have acquired any degree of /ah/-split, even though they have merged /o/ and /oh/.

The most interesting question concerns the remaining Attleboro speakers, from the other parts of the city. Historically these speakers have the ENE pattern. But with so much contact with South Attleboro and Rhode Island, it is conceivable that AB subjects will have merged /ah/ with their longstanding /o = oh/.

This could happen in BR or MS as well, since there are in-movers there with the same Mid-Atlantic low vowel configuration as Rhode Island. But since Attleboro is only a few miles from Pawtucket RI and Providence, where hundreds of thousands of people have the opposite pattern, it seems likely that any decline of the /ah/∼/o/ distinction would be more advanced in AB.

Instead of seven equivalent pairs, the data here come from three questions, one of which had two versions. The first was a minimal pair that asked whether *la* and *law* – /lah/ and /loh/ sounded the same. This was intended as a diagnostic for the three-way merger, as both the traditional ENE system (/ah/ ≠ /o = oh/) and the traditional Mid-Atlantic system (/ah = o/ ≠ /oh/) should pronounce this pair differently.

However, since *la* is not a typical word of English, it may be that not everyone necessarily pronounces it – or imagines pronouncing it – with /ah/, the vowel of *father*. Therefore, the proportion of *La*∼*Law* marked "same" overall (30.5%) might not match the actual incidence of the three-way merger. If anything, it would probably underestimate the amount of three-way merger, at least in former ENE communities or subjects.

After *La*∼*Law*, subjects answered two questions on whether word pairs *rhymed*. One of these, *Father*∼*Bother*, was used in all communities, while another pair, *Comma*∼*Osama*, was used in Attleboro and New York before being abandoned (when a number of students wrote to indicate they were unfamiliar with the first name of the Al-Qaeda leader so familiar to adults). *Tommy*∼*Salami* was substituted in the remaining communities.

Deciding if two words rhyme is not the same as saying whether a minimal pair sounds the same or different. While the concept of rhyme was thought to be familiar even to the youngest children surveyed, a higher 'error rate' was expected here than for the /o/∼/oh/ minimal pairs.

We begin by examining the communities where /ah/ and /o/ were expected to be merged. In New York City, 93% of the 114 subjects said *Father∼Bother* rhymed, and 89% rhymed *Comma∼Osama*. Only 3 subjects (3%) said neither pair rhymed.

The percentage who agreed that *La∼Law* sounded different was equally high, 93%. Only eight subjects disagreed. Since we would expect the three-way merger if anyone in New York City merged /o/ and /oh/, we can start by investigating the relationship between mean score on the /o/∼/oh/ items and performance on *La∼Law*.

Among NY12 subjects below the /o/∼/oh/ midpoint, 6 of 31(19%) marked *La∼Law* the same. Subjects with this pattern – especially the four of them who scored 0 – are likely to have the three-way merger. Others are likely to have it as well, but as noted, *La∼Law* may resist being marked "same" because of the nature of *la*. But note that among NY12 subjects above the /o/∼/oh/ midpoint, only 2/83 (2%) marked *La∼Law* the same (chi-square, p = 0.002). The correlation (Kendall's τ) between /o/∼/oh/ and *La∼Law* is 0.27.

The non-rhyming responses should probably be attributed to error. Although the subjects who said neither rhyming pair rhymed all scored high on /o/∼/oh/ items (5, 7, 7), this simply reflects the highly-distinct distribution of NY12 overall.

The NJ4 subjects are useful for observing the performance of younger people on the rhyming task. Of these 12 fourth graders, 75% judged *Father∼Bother* to rhyme, and only 50% said *Comma∼Osama* did. This combination of scores likely reflects an incomplete understanding of what rhyme is, as well as ignorance of the foreign name (though hopefully not the punctuation mark as well).

Note that six NJ4 subjects scored fully merged on /o/∼/oh/, but only one of them marked *La∼Law* the same. Since it is very unlikely that subjects in this dialect area would have a distinct /ah/, the likely explanation is that the particular form *la* can have a vocalic quality different from any vowel used in regular speech.

Moving to SK12, the community where the /o/∼/oh/ pairs were most consistently marked "different" (75% overall), we see that an even higher percentage of responses say the /ah/∼/o/ pairs "rhyme": 91% for *Father∼Bother*, 90% for *Tommy∼Salami*. Only 3 subjects (3%) said neither pair rhymed. They scored 5, 6, 7 on /o/∼/oh/, compatible with the overall SK12 distribution in which over two-thirds scored 5 or higher.

In SK12, 95% marked *La∼Law* "different", and the 5 who disagreed scored 3x2, 1x4, and 1x5 on /o/∼/oh/. This score distribution seems flat and unexceptional, but remembering the severe skewing of the response as a whole, it translates into the same parallel relationship between /o/∼/oh/ and *La∼Law*. This is because *la* is already identified with the /o/ class, so the three-way merger is the result when /o/ and /oh/ begin to merge in these communities. In SK12 the correlation is +0.23.

As we move downward in age through the Seekonk community, this correlation increases. The /o/∼/oh/ scores go down, the rate of "different" on *La∼Law* goes down as well, and within the younger age groups, the lower a subject's /o/∼/oh/ score, the less likely they are to mark *La∼Law* "different" either. For SK8, the correlation is +0.39, and for SK4, it is +0.40.

For example, in SK8, there were 15 subjects who responded as more distinct on /o/∼/oh/ than not (a score of 4 or higher). Only one of them (7%) said *la* and *law* sounded the same. But of the subjects who were more merged than not on /o/∼/oh/, 5 of 12 (42%) marked *La∼Law* "same". For this comparison, $p = 0.05$ by Fisher's Exact Test (one-tailed), indicating a correlation between behavior on the two types of items.

In SK4, there were 19 subjects who were more distinct than not, and *none* of them said *la* and *law* were the same. Of 39 subjects whose /o/∼/oh/ scores were between 4 and 1, twelve marked *La∼Law* as "same" (31%). The difference between the two groups is significant ($p = 0.005$). And of the 14 subjects who were fully merged on /o/∼/oh/, nine (64%) said *la* and *law* were the same. The increase between the middle group and this last group is also significant ($p = 0.04$). This indicates a continuous advancement of the three-way merger, but with *La*∼*Law* perhaps lagging the /o/∼/oh/ pairs as an indicator of it.

But the younger Seekonk subjects show an increased tendency to say *Father*∼*Bother* and *Tommy*∼*Salami* do not rhyme. The 10% rate of 'non-rhyming' in SK12 becomes 15% in SK8, and 26% in SK4. Because of the comparable results from NJ4, it is possible that this reflects nothing about linguistic patterns, but a decrease in ability to judge rhymes and complete the task as intended.

If the non-rhyming percentages were based on vowel inventories, if their increase meant some subjects were really acquiring the distinction between /ah/ and /o/, it would at least be more likely to be those subjects who were also adopting the /o/∼/oh/ merger.

In that case, one could imagine that the ENE pattern is invading Seekonk, without interacting with the native pattern there. The alternative is that subjects are acquiring a three-way distinction, a pattern that disappeared from the region almost a century ago (see Chapter 4), and is contradicted by the *La*∼*Law* trend in any case.

In fact, there is virtually no correlation between /o/∼/oh/ (the sum of seven items) and /ah/∼/o/ (the sum of two) in this data, any more than there was for NY12 (τ = -0.07) or SK12 (+0.02). In the (small) SK8 dataset, the variables' correlation is -0.08, and in SK4 it is +0.03. Therefore, it is possible to include that increased non-rhyming in the younger Seekonk age groups is likely to be unrelated to the progress of linguistic change.

The Dayspring subjects show a similar pattern to the younger Seekonk subjects. The progression is from the Mid-Atlantic pattern to the three-way merger (although a fair number continue to say *La*∼*Law* is different). The younger subjects report more non-rhyming, but there is no sign that this augurs the ENE distinction.

Indeed, subjects who say that neither /ah/∼/o/ pair rhymes and that *La*∼*Law* is "different", as Eastern New Englanders would, are not only rare in these historically Mid-Atlantic communities – 3% of NY12, 8% of NJ4, 3% of SK12, 0% of SK8, 7% of SK4, 0% of DS8, 8% of DS4, and 0% of PR12 – they are slightly more distinct on /o/∼/oh/ than their peers (3.57 vs. 3.06), rather than more merged, like the ENE norm. Such patterns may instead reflect an overall tendency of some subjects to 'over-distinguish,' one which extends across the question types. But there are communities where some people actually distinguish /ah/ and /o/, and we will turn to those now.

3.7.2 The status of /ah/ where /o/ and /oh/ are (mainly) merged

3.7.2.1 Massachusetts State College

Since the traditional ENE pattern which keeps /ah/ and /o = oh/ distinct may be on the wane, it makes sense to begin with the oldest subjects surveyed there, the 35 Massachusetts State College students(MS15). Overall, 91% of them distinguished *La∼Law*, 60% said *Father∼Bother* did not rhyme, and 66% said *Tommy∼Salami* did not rhyme. Nearly half the students (17, or 49%) said *La∼Law* was distinct and that neither /ah/∼/o/ pair rhymed.

Most of the MS15 students (28) have origins in Eastern Massachusetts. Besides them, one from Attleboro was fully three-way-merged – scoring 0 on /o/∼/oh/, marking *La∼Law* "same", and saying both /ah/∼/o/ pairs rhymed – and one from Central Massachusetts had this pattern as well. Of five with Mid-Atlantic or Inland North backgrounds, none consistently adopted /ah/∼/oh/ distinction, though they may have adopted the /o/∼/oh/ merger to varying degrees.

Taking the 28 students with local origins as a group, we see that 93% marked *La∼Law* "different" and 64% said neither /o/∼/oh/ pair rhymed. As noted above, 17 (now 61%) did both, and 11 of these students (39%, 31% of the MS15 total) exemplify the traditional ENE pattern perfectly by also scoring a 0 on the 7 /o/∼/oh/ pairs.

Although no one in this dataset scored above 4 on /o/∼/oh/ pairs, a correlation of -0.30 still shows that higher /o/∼/oh/ scores go along with less 'non-rhyming' of the

/ah/∼/o/pairs. Both represent deviations from the ENE pattern, but we cannot be sure how much three-way-merging is really indicated by the rhyming (probably some), or if any real separation of /o/ and /oh/ lies behind the ‘higher’ scores (probably not).

If less-fully-merged /o/∼/oh/ scores partially ‘predict’ /ah/∼/o/ rhyming, this might be because the same subjects are failing to represent their true linguistic competence in both areas. Are there also independent, non-linguistic factors influencing /ah/∼/o = oh/, which is a potential merger in progress within Eastern New England? There are too few subjects in MS15 to obtain significant regression results, but some relationships are suggestive.

Gender was all but inert in the /o/∼/oh/ analyses, but here it seems to play a role. The 12 local young men at Mass. State had a 88% non-rhyming rate, while the 16 women had a 66% rate. The numbers are too small, though, and this large coefficient does not have a significant p-value (+2.50, p = 0.16).

Having siblings, either older or younger, appears to favor rhyming (merger of /ah/ and /o/) but again, the number of subjects in MS15 is too small to be certain.

There were also no obvious differences between the specific towns in which the 4 rhyming, 6 semi-rhyming, and 18 non-rhyming locally-raised MS15 students had grown up, either socially or geographically.

3.7.2.2 Brookline MA

In the larger dataset of BR12, it should be more possible to identify factors that affect the merging (rhyming) of /ah/ and /o = oh/. The most that can be said for MS15 is that a large proportion of these state college students appear to retain the traditional ENE pattern.

In BR12 as a whole, there is a 23% rate of non-rhyming among the 227 subjects, much lower than in MS15. At the same time, the rate at which *La*∼*Law* was marked “different” was 61%, the lowest observed so far. Together, these facts would suggest a high rate of three-way merger in Brookline. Indeed, 47 BR12 students (21%) scored 0 on /o/∼/oh/ and marked *La*$\sim$*Law* "same", and 36 of these (16% of the total) rhymed both /ah/$\sim$/o/ pairs, indicating a sure three-way merger.

There are also students in the same grade who show the full ENE pattern, though only nine of them (4%). All have local origins (7 from Brookline, 2 from nearby in Eastern Massachusetts). This is a far cry from the 31% of MS15 who showed this pattern. Indeed, in BR12 almost as many people show the full Mid-Atlantic pattern, and these six (3%) are natives of the Boston area as well.

If we ask the difference between the parental backgrounds of subjects with these systems, we see that all of the 6 Mid-Atlantic-type subjects (/ah $=$ o/ $\neq$ /oh/) have one or more parents from "distinct" (with respect to /o/$\sim$/oh/) dialect areas, except one whose parents are from Kuwait and Palestine.

By contrast, the 9 ENE speakers (/ah/ $\neq$ /o $=$ oh/) do not all have local parents, as might be thought. Four of them do have parents who are both local, and all have at least one local parent, but two have one parent from NYC, and one has both parents from Long Island. One would expect the three-way merger to result from such a combination of Mid-Atlantic parents and ENE origin, but here at least the ENE pattern has emerged. It seems that the /ah/$\sim$/o/ contrast, indicated by non-rhyming, can in principle be acquired from peers, along with the /o/$\sim$/oh/ merger.

The nine students who moved to Brookline from other dialect areas provide an interesting test of which Eastern New England features are usually acquired. Six students had moved from either the Mid-Atlantic or Inland North (MAIN) – where the pattern is /ah $=$ o/ $\neq$ /oh/ – and their parents had similar origins. None of them learned to 'un-rhyme' both /ah/$\sim$/oh/ pairs; five rhymed both, and one rhymed only *Tommy*$\sim$*Salami*.

As far as their /o/$\sim$/oh/ is concerned, the score pattern was 1x0, 2x1, 1x2, 1x3, 0x4, 1x5. The mean is 2.00, higher than that of the BR12 natives (1.39), but substantial loss of the low back distinction has nonetheless obviously occurred.

The three other in-movers retained the /o/∼/oh/ distinction better, scoring 6, 6, 7. Though they moved somewhat later than the others (at median age 13.5 rather than 10), a more important difference may be where they moved from: England and Australia. The more distinct accent of those countries is most likely lost slower (for cultural as well as linguistic reasons). And with such origins, we cannot ask about the acquisition of the /ah/∼/o/ distinction, since they probably already had it. Nevertheless, only one of the three said neither pair rhymed (further evidence of the weakness of the rhyming questions); they did all mark *La*∼*Law* "different."

3.7.2.3 A dialectological aside

When a speaker with an originally English (or other Commonwealth) low vowel system, /ah/ ≠ /o/ ≠ /oh/, encounters any form of American English, they will be exposed to at least a two-way merger that is not in their variety, if not a three-way merger. But when a MAIN speaker moves to ENE, or vice versa, the learning task is different. Leaving phonetic details aside (as throughout this chapter), their first dialect has two low vowel categories, and so does the new, 'target' variety. But the assignment of words to these categories is different between the dialects, and unpredictable.

Based on just a few speakers, it appears that three-way-distinct speakers may resist the /o/∼/oh/ merger, although if they did acquire it, it would result in accurately adopting the ENE pattern (although the ENE pattern does not seem to be common enough for it to really be the model in Brookline). MAIN speakers, with their complementary pattern, do not even have the option of accurately adopting the ENE pattern, unless they can un-merge /ah/∼/o/ at the same time as merging /o/∼/oh/ (stated otherwise, unless they can transfer the /o/ word class, and it alone, from one phonological category to another). The likely outcome, one would think, is either retention of the original pattern, or else the three-way merger. However, perhaps nothing is impossible, as the case noted above shows, where at least one Brookline native with Long Island parents apparently acquired the ENE system.

It should be noted here that what happens, both individually and to the target community, when young children move from one dialect area to another, is not necessarily equivalent to what happens when those same two dialects are in geographical contact along a dialect boundary. Chapter 4 attempts to show that the ENE and MAIN dialects, at least as judged by their low vowel systems, were formerly in very stable contact for many years, within Massachusetts and between MA and Rhode Island.

Indeed, some recent changes that the school survey has revealed – especially in Seekonk – and evidence of mixed and conflicting patterns in all communities, may not even be attributable to dialect contact in the usual sense. What usually interferes with the believabiity of contact accounts is that the contact in question is not new, while the linguistic change is (or sometimes vice versa). And among children, the question is how much 'contact' is necessary to affect the evolution of a speech community. This should go alongside questions like the ones asked here, such as how much speakers of different ages and backgrounds accommodate to second dialects.

3.7.2.4 Brookline MA (continued)

The bulk of the BR12 data consists of those 190 subjects whose origins were in Brookline or other nearby communities. Their parental origin is very varied, however. If we look only at the 21 whose parents are both local, the ENE pattern is more visible: *La*∼*Law* 81% "different," /ah/∼/o/ pairs 50% non-rhyming, to go along with a low /o/∼/oh/ score of 0.86. Five 'pure' ENE subjects come from this group, and 5 three-way-merged responses.

For the 28 natives whose parents are both distinct, however, *La*∼*Law* drops to 46%, non-rhyming goes down to 13%, and the /o/∼/oh/ mean score rises to 1.93. One pure ENE pattern arose from this group (mentioned already), along with 8 three-way mergers.

Regression on the native Brookline subjects confirms this: having a /o/∼/oh/-merged (that is, probably local) mother has an effect of +1.32 ($p = 0.003$). A low-back-merged father also favors the distinction between /ah/ and /o/, to a milder degree. Having one or two younger siblings, or three or more older ones, also has a 'significant' positive effect (all the sibling coefficients are positive), which could be related to social class. Unlike the hint of it in MS15, gender appears to have no effect in BR12.

There are two subjects here with low-back-merged parents who are not local; somewhat improbably, both parents in each case came from Pittsburgh PA. In keeping with this, their children were three-way merged, calling *La∼Law* the same and rhyming *Father∼Bother* and *Tommy∼Salami* (their /o/∼/oh/ scores were 0 and 1).

BR12 seems to be a mixture in terms of the relationship of /ah/ to the basically-merged /o = oh/. Some students retain the ENE pattern of their (local) parents, probably more than are identified strictly by their survey performance. But the 3-way-merged pattern is more common. Since Brookline is a community where many students have Mid-Atlantic parents with the merger of /ah/ and /o/, contact between them and the locals with their merger of /o/ and /oh/ results in some in each group having the three-way merger, as well as many intermediate responses. Because of the nature of the survey, it would be risky to use its results to argue for the existence of real intermediate vowel systems.

Since Brookline uses a K-8 elementary school system, students had been members of a single peer group for up to nine years, before arriving at the high school. They have since spent 3.5 years mixed in the high school environment, before being surveyed. The regression analysis identifies at least one former elementary school, Lawrence School, that is significantly different from the others in being more merged in terms of /ah/∼/o/. However, a school-by-school breakdown (Table 3.32) suggests that the actual difference is in the background of the parents who live in that section of the town. Many of the subjects who came from Lawrence had parents from the New York area, while few families of pure Eastern New England pedigree reside in that school district.

K-8 school	Baker	Devotion	Heath	Lawrence	Lincoln	Pierce	Runkle	Total

Table 3.32: Native Brookline 12th graders categorized by parental and school background, note: table not yet prepared!

What is clear is that the Brookline high school experience – where students, judging from personal experience, do not typically retain a peer group from their former elementary school – does not completely level out differences that can be traced back to earlier years. Whether some leveling has occured cannot be known, without comparing the high school students with younger BR subjects, ideally eighth graders.

Less clear is whether parents' influence is an ongoingly relevant process as children grow up, or whether what we see of their effect on high schoolers – which is substantial – is a lasting effect from when the children first learned English, some 15 years before.

While it is hard to measure peer effects within a population that grew up in the same town, it seems likely that within each elementary school, a process of mixing and accommodation takes place, where parental influences are reduced greatly (though not eliminated). Based on its proportion of students from different family backgrounds, each elementary school probably develops a slightly different dialect.

If these micro-dialects have any reality, one way of observing it is to see what happens to foreign students who joined those sub-communities. Students whose parents both come from non-English-speaking countries lack the bias towards the Eastern New England (ENE), Mid-Atlantic / Inland North (MAIN), or other native vowel pattern inherited by native Americans from their parents.

Although the numbers of subjects are not large enough to be sure of it, something like this can be derived from the data in Table 3.32. The 150 subjects who grew up in Brookline marked 20% of the /o/∼/oh/ pairs "different" (a mean score of 1.40 out of 7). 59% marked *La∼Law* different, but only 20% of the /ah/∼/o/ pairs were said not to rhyme. Although this is inconsistent – if a subject merges /o/∼/oh/, then if *La∼Law* is different, *Father∼Bother* should not rhyme – it identifies a Brookline average for the three types of pairs.

Note that students whose parents are both from a known dialect background deviate from this baseline in the expected direction, on all measurements. Those whose parents are from MAIN scored higher on /o/∼/oh/ (.27) and lower on /ah/∼/o/ (.13), while those whose parents are from ENE scored lower on /o/∼/oh/ (.10) and much higher on /ah/∼/o/ (.54). Having one parent from each dialect area, that is to say, one with each merger, results in below-average scores on both /o/∼/oh/ (.03) and /ah/∼/o/ (0.16), which makes sense. Note that the *La∼Law* score is always 'stubbornly' high, even in this group (.56).

As a whole, the subjects with foreign parents match the community averages very closely: .23, .58, .15 for the children of immigrants, .20, .59, .20 for all subjects. If we take the four schools that are slightly more merged on /o/∼/oh/, the average score is .17, and the foreign-descended subjects at those schools scored .19. For the other four schools, the average /o/∼/oh/ score was .23, and the foreign-descended subjects there scored .33. (Note: while the foreign-descended subjects are included in both averages, which is not ideal, their number is not sufficient to be causing this effect.)

The same thing can be seen involving the *La∼Law* score. The school with the highest overall *La∼Law* score is Devotion (.70) and that with the lowest is Pierce (.40). Both schools have similar numbers of subjects, and many with both native and foreign parents; in fact, these are the schools with the most foreign-parented students. The eight at Devotion scored .63 on this criterion and the nine at Pierce scored .40 – illustrating again that the peer group 'enforces' very subtle norms (unless this could be coincidence). However, the differences in norms are not subtle enough that they cannot be seen at an impressive distance, more than three years after all these subjects were mingled in one high school.

3.7.2.5 Attleboro MA

As the first community surveyed, Attleboro subjects were asked whether *Comma∼Osama* rhymed (as well as *Father∼Bother*). A handful of comments about the difficulty of this item led to it being changed to *Tommy∼Salami* in some of the later communities. Although *Comma∼Osama* did not pose substantial problems in New York City, where 91% of high school students judged it to rhyme (vs. 93% for *Father∼Bother*), in Attleboro the performance of this item was definitely unacceptable, and even worse than that among younger subjects. A comparison of the correlations between the /ah/∼/o/ rhyming pairs in Attleboro and Seekonk shows this clearly (Table 3.33).

community	% "don't rhyme"	% "don't rhyme"	Kendall's τ
	Father∼Bother	*Comma∼Osama*	
AB12	32%	28%	-0.003
AB8	23%	34%	-0.082
AB4	28%	54%	-0.152
	Father∼Bother	*Tommy∼Salami*	
SK12	9%	10%	+0.210
SK8	15%	15%	+0.120
SK4	25%	29%	+0.011

Table 3.33: 'Non-rhyming' percentage and correlation between *Father∼Bother* and *Comma∼Osama* (AB), *Father∼Bother* and *Tommy∼Salami* (SK)

These items are intended to be measuring the same thing – the status of the distinction (if any) between /ah/ and /o/. It seems that the rhyming pairs fall short of that goal in Attleboro, where the high school subjects treated *Comma∼Osama* completely independently of *Father∼Bother* (zero correlation), and the younger subjects even had a slight tendency to mark them differently from each other.

In Seekonk, by contrast, it was only the youngest subjects for whom the rhyming pairs were uncorrelated to the point of uselessness (0.01). The eighth grade has a mild correlation (0.12), while that for the twelfth grade was perhaps 'good enough' (0.21). After all, the correlation between the same pairs for the twelfth graders in Brookline was similar (0.18). For comparison, the correlation between /o/∼/oh/ pairs was usually in the 0.30-0.50 range.

Although none of the rhyming pairs are a very good tool – the increase in non-rhyming among younger speakers shows their failure, because the /ah/∼/o/ distinction is surely not on the rise – every indication is that *Father∼Bother* is the best among them. And though *La∼Law* also tends to be marked "diffferent" more often than would be expected were it a 'real' pair of words, the combination of the two items can still reveal trends regarding /ah/ in Attleboro vowel systems.

The 281 Attleboro twelfth graders (also see §3.6.3.2) are a mixture of Attleboro natives and in-movers from both sides of the historical dialect boundary. Indeed, even the natives can be divided into two groups, those from South Attleboro – where the Mid-Atlantic pattern, with its /o/∼/oh/ distinction, is widespread among people just a few years older – and those from the rest of the city, where the Eastern New England pattern prevailed historically. (For clarity, ABS will be used refer to South Attleboro and ABN to refer to the remainder of the city).

Among the AB12 students, the pure MAIN (Mid-Atlantic / Inland North) pattern – all 7 /o/∼/oh/ pairs different, *La∼Law* different, *Father∼Bother* rhyme – is rare. Three subjects from ABS have it (out of 61), as do two who moved from the south (out of 24).

The pure ENE pattern – all 7 /o/∼/oh/ pairs same, *La∼Law* different, *Father∼Bother* different – is more common. 11 ABN natives (of 125) have it, as do 5 ABS natives, and five subjects who moved from the north (out of 34). One subject who moved from Rhode Island after middle school also shows this pattern. His parents are both from ENE, which downgrades the case from unbelievable to merely surprising. Two other students with "other" or unknown origins before high school also exhibit the ENE pattern.

The three-way merged pattern – all 7 /o/∼/oh/ pairs same, *La∼Law* same, *Father∼Bother* same – also shows up in AB12. Nine subjects from ABN show it, as do four from ABS and four more who moved from ENE.

So together, 46 of the AB12 subjects (16%) can be claimed to definitely possess, according to a fairly strict standard, one of the three main vowel system types found in the area. Five subjects have the Mid-Atlantic / Inland North (MAIN) system of nearby Providence (/ah = o/ $\neq$ /oh/), 24 have the Eastern New England system of Boston (/ah/ $\neq$ /o = oh/), and 17 have the three-way merger (/ah = o = oh/), the system found in Canada, the American West, and 'spreading' elsewhere (3-M).

The 402 eighth grade subjects in Attleboro (§3.6.3.3), who were even more merged overall on /o/∼/oh/ than the high schoolers, show a similar number of ENE and MAIN patterns, but many more 3-M.

One student from South Attleboro and one from 'regular' Attleboro exhibit the MAIN system, using the same reduced criteria as above. One from ABS and 13 from ABN, along with two in-movers from the north and 9 with other / unknown origins, have the ENE pattern. Eight from ABS and 37 from ABN, along with eight in-movers from the north and eight subjects with other / unknown origins, display the fully-merged 3-M system.

All together, 88 AB8 subjects (22%) have one of the three canonical patterns: 2 MAIN, 25 ENE, and 61 3-M. The proportion of the first two is fairly constant with respect to AB12; the fraction of three-way-merged subjects about twice as high (69% of those with a clear pattern, vs. 37%, $p = 0.0003$ by chi-square).

The 330 Attleboro fourth graders (§3.6.3.4) displayed a slight retreat from the degree of /o/∼/oh/ merger shown in AB8, but no similar retrenchment is visible in the estimate of overall vowel patterns. Possibly the trend towards three-way merger would have seemed even more extreme, were it not for the worse performance of younger subjects on the survey, particularly on *Father∼Bother*.

Only one MAIN system was observed for AB4, from a girl who had moved from Rhode Island only a year before. Five subjects from ABN had the ENE system, one from ABS, two with origins to the north, and three with unknown / other origins. The 3-M system was attested from 22 subjects from ABN, 5 from ABS, 7 from northern in-movers, and 22 from unknown or other-origin subjects.

Combined, AB4 had 1 MAIN system, 11 ENE, and 56 3-M. The proportion of 3-M out of AB4's total for the three known canonical systems is 82%, an increase, though not quite a statistically significant one, over AB8 (p = 0.06 by chi-square).

Table 3.34 summarizes the above results.

		ORIGIN						
COMMUNITY	SYSTEM	ENE	ABN	ABS	MAIN	O / U	TOTAL	
AB12	ENE	5	11	5	1	2	24	52%
AB12	3-M	4	9	4	0	0	17	37%
AB12	MAIN	0	0	3	2	0	5	11%
AB8	ENE	2	13	1	0	9	25	28%
AB8	3-M	8	37	8	0	8	61	69%
AB8	MAIN	0	1	1	0	0	2	2%
AB4	ENE	2	5	1	0	3	11	14%
AB4	3-M	7	22	5	0	22	56	82%
AB4	MAIN	0	0	0	1	0	1	1%

Table 3.34: 202 of 1013 Attleboro subjects by origin and vowel system (ORIGIN: ENE ≃ Eastern MA, NH, ME; ABN = Attleboro (not South); ABS = South Attleboro, MAIN ≃ RI; o/u = other or unknown origin; VOWEL SYSTEM: ENE = "same" on seven /o/∼/oh/ pairs, *La*∼*Law* "different," *Father*∼*Bother* "rhyme"; 3-M = "same"... "same"... "rhyme"; MAIN = "different"... "different"... "rhyme")

If the criterion for defining the major patterns is relaxed so that one discordant /o/∼/oh/ pair is allowed, the numbers increase by half, with the proportion of types remaining constant in AB12, edging slightly towards an even distribution in the younger age groups.

For AB12: 40 'ENE' (51%), 29 '3-M' (37%), 9 'MAIN' (12%);

For AB8: 38 'ENE' (31%), 77 '3-M' (63%), 7 'MAIN' (6%);

For AB4: 21 'ENE' (20%), 77 '3-M' (73%), 7 'MAIN' (7%).

It is hard to say whether this summary or the one in Table 3.34 is more accurate. The almost-identical percentages for AB12 are encouraging, and the overall trend, of 3-M increasing at the expense of the other two patterns, is clear.

The total number with the three systems, 305, is still only 30% of the grand total of Attleboro subjects. Because of the results of the geographic study and especially the family study (Chapters 4 and 5), I believe that many subjects who do not show one of these three systems clearly on the survey would do so in their speech, although not necessarily in the same proportion. And if others do exhibit truly intermediate or variable low vowel behavior, it would be understandable especially given the clear evidence of change between the age groups in Attleboro.

These changes in apparent time have to be given the 'generational change' interpretation, in Labov's (1994: 83-84) terms; they show how the 3-M system is winning out over time, as the Attleboro population evolves from the (attested) point when it was split between the other two systems, with approximately 25% having MAIN (South Attleboro) and 75% ENE (the rest of the city).

An 'age-grading' view, saying that Table 3.34 shows children starting out heavily three-way-merged in fourth grade, but some of them reversing one or the other merger to arrive at the historically earlier patterns later in childhood, is not plausible.

Suggesting that the change is an artifact of younger subjects' poorer performance on the survey makes more sense. But referring to Table 3.33, we see that the type of poor performance younger children exhibited on the rhyming items took their average responses towards chance (50%), not towards additional 'rhyming' that is linguistically unsupported. (Indeed, it may be failure to report actual rhyming on *Father*∼*Bother* that keeps 3-M from climbing as much as ENE did when the system criteria were expanded to slightly-less-consistent subjects.)

3.8 Conclusions

The school survey was an unsophisticated questionnaire that simply and straightforwardly asked how a dozen pairs of words sounded. Not surprisingly, there was a large amount of variation in the responses obtained. But by administering the survey to a very large number of students, it was possible to see through this variation and some plain error, and obtain quantitative results bearing on a number of questions regarding what factors influence the low vowel inventories of young people in several parts of New England and New York.

The findings were generally not surprising in themselves, although the regularity and robustness with which they emerged from the data were perhaps better than expected. The main analytical tool used, mixed-model logistic regression, enabled the separation of effects into three categories: individual (or residual) subject variation, item-by-item variation, and between-subject variation.

Subject variation was substantial everywhere, meaning that a subject's total score on the 7 /o/∼/oh/ pairs could never be predicted with great accuracy, let alone their response to any individual Item. Almost by definition, the residual subject variation could not be explained by any of the information collected on the questionnaire. Conceptually, it covers both between-subject regularities (such as known important factors like a subject's degree of integration into the peer group), individual linguistic deviations from community low vowel norms, and individual non-linguistic deviations relating to differential performance on the survey itself.

The type of variation observed among seven items designed to ask the same phonological question ('do you distinguish /o/ and /oh/?') was a surprise. There was not a single pattern of items favoring and disfavoring the merger, as any one phonological analysis might predict. Rather, the same items – *Caught∼Cot* and *Taught∼Tot* – seemed to perform best everywhere, being most correlated with a subject's total score. They were also the most often marked "different" where the distinction was the norm, and among the most often marked "same" in merged communities.

The worst-performing Items were *Otto*∼*Auto*, more "same" than the average item everywhere, and *Moll*∼*Mall*, above-average "same" in distinct communities particularly. *Collar*∼*Caller* and *Tock*∼*Talk* were above-average "different" in merged communities.

A reasonable justification was provided only for *Collar*∼*Caller,* where the vowel following *caller* in the survey context – *caller i.d.* – could have ensured the pronunciation of the final /r/, while it was more exposed to deletion in sentence-final position: *a shirt has a collar.* But the fact that the item was unusually "different" only in Brookline and Attleboro, and not in Seekonk and New York, where non-rhoticity is also historically present, suggests a dialect-internal explanation.

Since in-person interviews have not actually shown that speakers in New England or New York regularly merge /o/∼/oh/ in certain environments or words but not others, these patterns are as likely to represent peculiarities of the methodology as ones of the subjects' vowel systems. More precisely, the anomalous items must derive from the intersection of subjects' dialects with the survey instrument.

By controlling for the Item effects in each place, the regression software was better able to estimate the between-subject effects. There were several minor effects that showed up in only a few communities: some miscellaneous effects of Race, and of Older Siblings, in particular. The possibility that subjects were influenced by the speech of their Teacher was discussed favorably but skeptically. The information from teachers was too sparse to be certain, and teachers could have had an influence through improper, perhaps unintentional, interference with the survey, as well as just by talking.

The most ubiquitous between-subject effect was that of Origin. The responses of those who had moved to a community from a different dialect area were always distinguishable from the natives, although the in-movers were usually distinguishable from natives of the place they came from as well.

The age at which a subject moved from a /o/∼/oh/-distinct dialect area to a merged one had a small effect on the amount of accommodation they showed; those who Moved At a younger age ended up more merged as a group, though variation was substantial. But surprisingly, how long ago they moved was statistically unimportant to their response.

The conclusion is that people learn a merger relatively quickly after being exposed to it. Almost everyone acquires it to some extent – though what that means in actual production is unclear – and subjects vary in how much they assimilate beyond that. Although no measure of peer group integration was attempted, it is hard to reconcile the likely importance of that factor with the absence of any effect of Years Since Moved.

Having siblings lightly impedes the acquisition of a second dialect's vowel system.

The origin of a subject's Mother and Father was also a significant predictor of their response. This was the case even for high school students who had lived in one place all their lives. If their initial parental input – presumably supplemented by ongoing parental and other family relationships – was different from their peer group with respect to the low vowels, there was almost always a significant quantitative effect on their survey responses. For fourth-grade students, parental effects proved weaker, possibly as a consequence of overall worse performance on the survey.

It is not that peers have no effect on such subjects – on the contrary. But the peers are not the only influence; they do not override or obliterate subjects' original vowel systems, or at least not all subjects'. The effect here is mostly seen for parents who are distinct on /o/∼/oh/ raising children in mainly-merged Brookline and Attleboro. The children do acquire the merger, but not as much, on average, as those with merged parents. Some children do acquire it completely, but some hardly acquire it at all.

For example, among native Brookline twelfth graders, 11 with distinct parents and 11 with merged parents scored a 0 on /o/∼/oh/ pairs (that is, they marked all 7 pairs "same").

A further five with merged parents and four with distinct parents scored either 1 or 2. What caused the overall difference in mean scores (merged parents: 0.70, distinct parents: 1.91) was that only one subject with merged parents scored higher than 2, whereas eight subjects with distinct parents scored that high, including two 7's.

But near the dialect boundary in Attleboro, where fewer subjects with distinct parents had not themselves lived across the line – the merger was partially acquired, with many more intermediate scores. 33% of the 24 Attleboro natives with distinct parents scored either 3 or 4; only 17% had fully acquired the merger. In the analogous Brookline group of 23 subjects, 17% scored 3 or 4, while 48% scored a fully-merged 0.

Simply comparing AB12's mean scores (merged parents: 1.11, distinct parents 2.42) with BR12's shows the parallel trend, but not the difference. Most likely, what accounts for it is that Attleboro subjects, because of their location, are more frequently in contact with speakers of the distinction, outside their immediate family. But it would be instructive here to know just what kinds of production systems go along with the survey responses of such 'intermediate' subjects as these, who furthermore have conflicting parents and peers.

The factors promoting vowel merger – a merged mother, father, or peers – all interact negatively, meaning their effects are not fully cumulative. Having merged parents restricts the apparent effect of peers, and vice versa. This follows from two points: that a distinction is much harder to learn than a merger, and that learning a merger has an endpoint, after which a speaker cannot become more merged. Given these points, we can see that any influence towards the merger reduces the amount of other influence that can subsequently occur in the same direction, and if influence in the other direction is essentially ineffectual, this gives us the interaction.

The regression analyses demonstrate this clearly, but it can be shown informally as follows. The Seekonk 12th grade is mostly distinct on /o/∼/oh/, and the 60 native subjects with two distinct parents even more so: 25 of them (42%) scored a fully-distinct 7. But of

11 natives who had even one merged parent, only one (9%) scored a 7; the most frequent score was 1 (45%). We just saw that Brookline and, to a lesser degree, Attleboro natives with two distinct parents learned the merger noticeably better than that.

The data concerning the vowel /ah/ was of inferior quantity and quality, but appeared to support the same conclusions regarding multiple influences, partial accommodation, and the greater ease of merging over un-merging. While a couple of subjects may have learned not to rhyme /ah/∼/o/ from peers in BR and AB, the evidence of children in SK learning to rhyme them is (slightly) stronger.

Labov (1994: 354) has written that "[A]t present, there is no firm evidence that judgments on rhymes are less reliable than 'same' and 'different"'. For judges of pre-high-school age, there is now fairly clear evidence that rhymes are inferior to minimal pairs.

Although as a main effect, Gender never played a significant role, it interacted significantly with the parental effects. Boys were influenced by both parents approximately equally, while girls were much more influenced by the vowels of their mothers' speech.

In Seekonk, where the survey was administered to three grade levels, it indicates the rapid advancement of the low back merger in that community. And in all communities, including Attleboro which was formerly geographically divided between two systems, Eastern New England's /ah/ ≠ /o = oh/ and the Mid-Atlantic's /ah = o/ ≠ /oh, the survey shows the advancement of a 'new' system of three-way merger (/ah = o = oh/), where only one low non-front vowel remains.

The school survey has provided a wealth of information on low vowel patterns in the communities where it was administered. It shows that there are no absolute rules regarding the acquisition or non-acquisition of mergers in various situations of exposure. Even qualified statements such as Chambers' may be too strong:

> A person seven or under will almost certainly acquire a new dialect perfectly, and a person 14 or over almost certainly will not. In between those ages, people

will vary. (Chambers 1992: 689)

But in lieu of almost-deterministic implications, there are many regular tendencies, most of which run in comprehensible directions.

Perceptions of how word pairs sound, which are more accurate than precise with respect to patterns of speech production, reflect some legitimate amalgam of linguistic competencies in any case. Those competencies, in turn, are sensitively governed by both recent and distant exposure to various influences in the life histories of these young subjects.

Chapter 4

The Geographic Study

4.1 Introduction

The geographic study was inspired by the many observations, reviewed in Chapter 2, that the dialects spoken of Boston MA and Providence RI differ notably despite their being spoken less than 50 miles apart (see Figure 4.1). The territory in between the two state capitals has not been extensively studied since the 1930's, and the results reported in that era proved controversial and in some respects inaccurate.

The research reported here explores this intermediate area, paying special attention to the low vowels. While there are no physical obstacles to communication or migration in this part of New England, a sharp dialect boundary nevertheless exists, especially for speakers born early in the 20th century.

By that time, an original system of three low vowels had yielded to two types of two-vowel oppositions. More recently, both of these two-vowel systems are tending to collapse into systems with a single low vowel.

It is the two-vowel phase that shows the clearest geographical boundary, a phonological phenomenon which seems to have emerged hundreds of years after its seeds were planted in the original patterns of settlement.

This chapter analyzes speech from interviews with 200 senior citizens and young adults in a 40-community study area, to obtain a geographic and historical perspective for understanding these vowel mergers. After a brief introduction dealing with the vowel systems themselves and the theoretical issues involved, §4.2 describes the overall results of the impressionistic (by-ear) analysis of the geographic study speakers. §4.3 discusses further interviews in communities that were found to be previously divided and are now undergoing change. In §4.4 are presented acoustic analyses of older and younger speakers who exemplify the principal low vowel systems. §4.5 deals with the possible interaction between low vowel change and the re-introduction of post-vocalic /r/ in the area, and §4.6 is a general discussion of the results and conclusions of the geographic study.

4.1.1 Vowel systems

The dialects under consideration differ in low vowel inventory (number of contrasts) and in lexical incidence (which word classes are merged). Phonetic effects, such as vowels' precise location (quality) and the influence of surrounding consonants on their realization, are deferred until section 4.4, which discusses the acoustic analysis of several interviews.

The symbol /o/ will represent the stressed vowel phoneme in the 'short-*o*' word class, usually spelled with *o*, and exemplified by *cot, Don, bother,* etc.

The symbol /oh/ will represent the stressed vowel phoneme in the 'long-open-*o*' word class, usually spelled *au, aw, ough,* and exemplified by *caught, Dawn, daughter,* etc.[1]

The symbol /ah/ will represent the stressed vowel in the 'broad-*a*' word class, exemplified by *father*. Many words of foreign origin, like *pasta* and *Osama,* can fall into this class (Boberg 1997). More importantly, in the variably non-rhotic dialects of eastern New England, /ah/ also includes many words like *cart, darn, farther*.

[1]For an account of the historical origins of these word classes, see §2.2.3, or (Labov *et al.* 2006: 58).

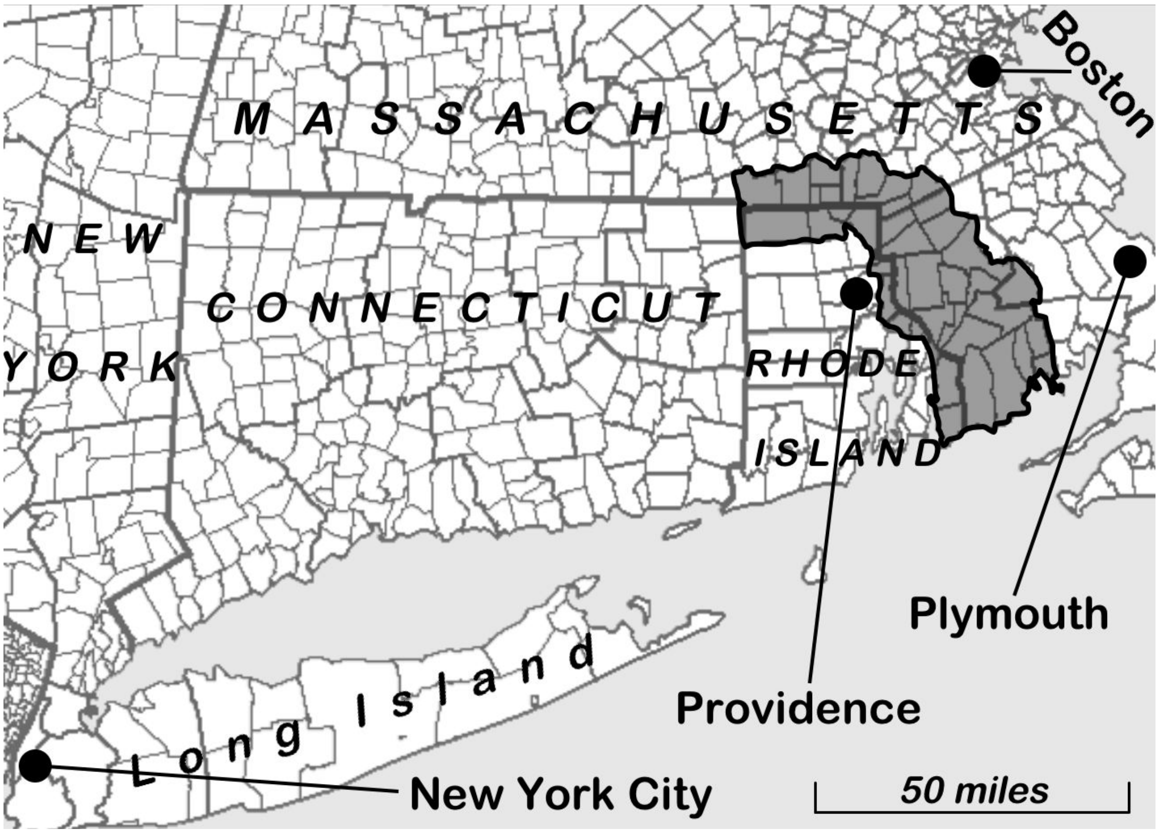

Figure 4.1: Southern New England: Key Cities and Study Area (shaded)

In the Providence dialect of virtually all speakers born there between 1915 and 1995, /ah/ and /o/ have merged into a single low central unrounded vowel, as they have in most of the United States. So *father* rhymes with *bother*, and in non-rhotic pronunciations, *cart* becomes identical with *cot*. This merged /ah = o/ is clearly distinct from /oh/, whose raised, ingliding variants lead many Rhode Islanders to be mistaken for New Yorkers when they travel.[2]

'MAIN' (Mid-Atlantic / Inland North) is a more inclusive label for this two-vowel system, also observed in New York City,[3] Philadelphia, Baltimore, and Washington (the

[2]The apparent fact that many people outside of New England are unfamiliar with the state of Rhode Island, and conflate it with Long Island, NY, adds to this confusion.

[3]In NYC, before approximately the mid-20th century, /ah/ was distinct from /o/, being longer and backer.

Mid-Atlantic; Labov *et al.* 2006: Ch. 17) and in Rochester, Buffalo, Cleveland, Detroit, Chicago, and Milwaukee (the Inland North; *ibid.*: Ch. 14), to name only the larger cities.

In ‘ENE’ (Eastern New England), such as in the Boston dialect of the 20th century, it is /o/ and /oh/ that have merged, into a low back, variably rounded, sometimes ingliding vowel.[4] Merged /o = oh/ is distinct from /ah/, which is found in low central-to-front position, making “p[aː]k the c[aː]r in H[aː]v[ə]d Y[aː]d” a stereotype of the Boston accent even among some who also drop the *r*’s in such words, because of /ah/’s front quality.

Both dialects have reduced the original inventory of vowels from three to two, but by merging the word classes in different ways. The typical phonetic realizations of the vowels are also staggered, so that tokens from any class could be misidentified, or perceived as foreign, by speakers of the other dialect. The two systems are schematized in Table 4.1.

<table>
<tr><td>example word</td><td>father</td><td>bother</td><td>daughter</td></tr>
<tr><td>word class</td><td>/ah/</td><td>/o/</td><td>/oh/</td></tr>
<tr><td>Providence</td><td colspan="2">[ɑ]</td><td>[ɔ]</td></tr>
<tr><td>Boston</td><td>[a]</td><td colspan="2">[ɒ]</td></tr>
</table>

Table 4.1: The low vowel systems of Providence (MAIN) and Boston (ENE)

When Bostonians produce [ɒ] in the /oh/-class word *Boston*, it is a typical realization of their merged phoneme /o = oh/. But Providence listeners, who themselves pronounce *Boston* with [ɔ], identify the ambiguous vowel with the wrong phonemic category of their own dialect, /ah = o/, imitating [ɒ] as [ɑ] (Moulton 1990: 129).

Likewise for the word *Providence:* speakers from MA who use [ɒ] in this /o/-class word are amused to hear RI’s [ɑ], and overreact, equating it with their own [a] (that is, /ah/).

Some speakers are more sophisticated in their renditions of the neighboring dialect. A 82-year-old man from Millville MA, told me that “in Uxbridge, J-o-h-n, they’ll say J[ɒ]n. Down here, it’s J[ɑ]n. Just in seven miles.”

[4] This may also be called the ‘*cot*∼*caught* merger’ or the ‘low back merger’.

4.1.2 Transition Zones

A comment such as the above suggests there can be a sharp linguistic boundary between adjacent towns.[5] And in this study area, geographical transitions were usually found to be of this sharp type. Nevertheless, it is worth considering what types of transition zone might plausibly be found in the area between two places with different vowel systems.

Imagining a simpler situation, where the dialect of place A has a certain vowel distinction that is merged in the dialect of place B, there could be a transition zone of some width, in between, where one or more of the following is found:

(1) the distinction is maintained irregularly, for some pairs of lexical items only; (2) the distinction is maintained regularly, but only in some phonological contexts; (3) the phonetic distance between the vowels decreases gradually across the zone, though strictly speaking, the phonological boundary may still be sharp; (4) the boundary is sharp in speakers' production, but people report or perceive the merger on the distinct side of the line, or the distinction on the merged side; (5) individual speakers have command over the distinction, consciously or not, and employ it in some styles but not others; (6) with or without individual variability, there is heterogeneity within the speech communities of the transition zone, patterning by age, class, or other factors.

Though there may be other possibilities, the above breakdown suggests the most likely major patterns that could exist in the area between any two places, such as large cities, one of which distinguishes two vowels that the other combines as one phoneme.[6]

Between A and B we were imagining a transition zone with respect to only one vowel

[5] In fact, the above speaker prefaced his remark with, "You know, I'm gonna tell you where the boundaries are. The boundaries are between Millville and Uxbridge!" And he was right.

[6] These sub-cases would presumably fall under the category of an *overlapping* boundary, in the typology proposed by Dinkin (2007). His *null* boundary would correspond to a conservative three-vowel area between the two two-vowel areas ('underlap'). Dinkin's *fading* boundary seems more suited to phonetic than phonological features. Particularly, while a distinction could in principle become phonetically closer and closer across space, a merger cannot vary in the same way. In any case, the observations to be described in this chapter are closest to Dinkin's first category, that of a *sharp* boundary.

merger, but between Boston and Providence, there are, or were, two mergers operating in the same part of the vowel system, and these are probably not independent phenomena, like the mergers of *cot*$\sim$*caught* and *pin-pen*, for example, probably are in the South.

The /ah/$\sim$/o/ merger (Providence) and /o/$\sim$/oh/ merger (Boston) are not independent in two senses. First, each acts on the same initial three-vowel system to yield a two-vowel system that may be seen as simpler or stabler.[7] Once either of the mergers has occurred, there is presumably not as much pressure for the other to take place – two phonemes in the low area of phonological space are less crowded than three.[8]

The two mergers are also connected in that if they both occur in the same dialect, they combine, yielding a one-vowel system. Such a 'three-way merger' typically occurs in two stages, the second of which involves an already-merged vowel, phonetically and phonologically different from either of its predecessors, participating in another merger. So it is questionable whether we can argue that 'the same mergers' are at work as in another dialect where the sequence is reversed, even if the eventual outcome is the same.

In any case, the proper theoretical constructs for discussing vowel mergers and their causes may be something quite different than these essentially descriptive formulations, whether they be higher-up historical-phonological processes such as the loss of distinctive vowel length, or the lower-level workings of language acquisition and dialect contact.

4.1.3 Spread or evolution: external vs. internal accounts of change

From a geographic and diachronic perspective, one might suppose that the /o/$\sim$/oh/ merger started in Boston and spread outward, and that the /ah/$\sim$/o/ merger, while perhaps not

[7]However, any such generic account of merger teleology must account for the preservation of the 3-vowel distinction in most varieties of English, including those of England, Ireland, Australia, and New Zealand.

[8]This implies a sort of competition happening in every place between equally motivated mergers, which is probably inconsistent with phonetic and historical reality. More likely, the pressure was for one or the other; as discussed in §2.6, /o/ was probably always closer to /oh/ in Boston, and closer to /ah/ in Rhode Island.

having originated in Providence,[9] did spread from there into adjacent areas. This would conform to Herzog's Principle that "mergers expand at the expense of distinctions" (Labov 1994: 35) and to a wave or gravity model (Trudgill 1974) that sees changes spreading outward from population centers.

Leaving aside the question of how waves of change spread,[10] if the merger of /ah/ and /o/ coming from Providence (or beyond) had not yet met the merger of /o/ and /oh/ coming from Boston, there would be an area in between that neither wave had reached. This 'relic area' would presumably retain the original three-way distinction.

If, on the other hand, the waves had already met and crossed, it would have created a zone affected by both changes, where the three-way-merged, one-vowel system prevailed.

In fact, we find neither type of intermediate zone; the Boston two-vowel system extends to where that of Providence begins. This coincidence is suspicious under a wave account. Also, given the low back merger's ubiquity in northern New England – much farther from Boston than Rhode Island is – the putative waves would have had to travel north much faster than they did south.[11]

Another unlikely coincidence, as will be seen, is that these waves should have met, or halted, along a line that is so close to an early settlement boundary. External contact, despite cities' known influence on their hinterlands,[12] will not explain this.

But communities also follow internal pathways of change, and we should assume, especially when there is no evidence for external influence, that speech communities of every size change primarily by following them, rather than by being the targets of 'diffusion'.

[9]Since the /ah/∼/o/ merger is found almost everywhere in the country, a single point of origin is unlikely; even if there were one, it would almost certainly not be Providence; RI sent few settlers West, for example.

[10]Do waves travel mainly by the migration of speakers, through their long-distance contacts, or through chains of local contacts, like a giant game of 'telephone'?

[11]Gravity models, expecting changes to reach secondary population centers before less-dense suburban and rural areas, have another problem: Providence is New England's second-largest city.

[12]"The history of innovations in the speech of Eastern New England is in large measure the history of the influence of Boston upper-class speech..." (Kurath *et al.* 1939: 11) But Kurath goes on to give other types.

If a town was settled at the same time and by similar people as a nearby city, or settled from that city, their dialects' persistent similarity can be attributed to parallel 'innovation', or similar reactions to inherited structural pressures, rather than parallel inundation by the same waves of external influence.[13]

When a change spreads across a dialect boundary, to an area which would almost certainly not have undergone it anyway, then a diffusion account is motivated. But the persistence of historical patterns and the primacy of internal change are more likely explanations when dialect areas closely correspond to settlement areas.

4.2 Results

To determine the geographic distribution of the vowel systems and whether change has been occurring over time, I interviewed senior citizens and young adults in forty cities and towns on both sides of the linguistic boundary: 29 in Massachusetts and 11 in Rhode Island. This is the area shaded on Figure 4.1, and shown with the names of the communities (and their two-letter abbreviations) in Figure 4.2. These contiguous communities included small towns, suburbs, and medium-to-large cities. In each place, I collected data from at least one senior citizen and two young adults (one male, one female) who had lived there since an early age.

The older subjects were mainly contacted with the help of local senior centers, and interviewed there or at their homes. The younger informants were almost all interviewed at their workplaces. Most were found in retail and service establishments with low customer volume or during off hours, while others were municipal employees.

In many places, more than two young adult natives were found, so the sample ended up

[13]If language changes faster in larger places (as is plausible, driven by the quantity or diversity of interactions), we would expect the 'innovations' in and around a city to form patterns mimicking those of a gravity model, even without taking migration or contact into account.

Figure 4.2: The Study Area: 40 communities (29 in Massachusetts, 11 in Rhode Island)

consisting of 67 'seniors' aged from 58 to 97 (75% of them between 70 and 90) and 113 'young adults' aged from 15 to 33. The median length of these interviews was 26 minutes, with the older speakers tending to have longer interviews with more spontaneous speech. All interviews were digitally recorded with a Marantz PMD-670 solid state recorder, using Sony ECM-55 lavalier microphones.

Along with spontaneous speech gathered by asking about personal history, interviewees were asked to read aloud ten pairs of sentences – containing, all together, over 100 tokens of the low vowels – from laminated cards. Each sentence pair contained a minimal pair which speakers repeated and judged 'the same' or 'different'. For example, the first card read as follows:

```
After the fourth operation on his heart,
Don started walking farther and jogging
more.  He's a lot calmer now.

Donna named her daughter Dawn
to honor her father's aunt,
whose death she was mourning.
```

When speakers read this side of the card, they produced tokens of *Don* and *Dawn* without undue attention being called to those particular two words. The other side read:

Don started walking farther

named her daughter **Dawn**

After reading the short phrases a second time, speakers were directly asked about the minimal pair in bold, along the lines of "So, do those two names – the man's name and the woman's name – sound the same, or different, to you?"

While the ten cards – of which only a subset were given to subjects with limited time or a mounting distaste for the task – contained one 'overt' minimal pair each, the same sentences contained other low vowel words, some of which could be paired retroactively.[14] Approximately 30 /ah/-, 50 /o/-, and 30 /oh/-words were elicited, among others.[15]

The complete text of the reading cards is given in Appendix A.

Two more cards simply read *balk, bock, Bach, bark* and *r's, ah's, Oz, aw's;* speakers' productions and perceptions of these 'quadruples' supplemented the data from the pairs.

Auditory impressions of these pairs, and of other low vowels from more spontaneous speech, were considered when assigning to each speaker a low vowel system type: three-vowel (3-D), 'Boston' two-vowel (ENE), 'Providence' two-vowel (MAIN), one-vowel (3-M), or unclear. Despite a bias toward labeling a speaker 'unclear' if their system was in any doubt, there were relatively few such cases. Minimal pair perceptions were not taken into account here, as they rarely disagreed with productions. Notwithstanding outliers, reading 'mistakes', etc., the categorical nature of the data and the sharp boundaries it reveals reflect the power of phonemic dispersion and of dialect areas.

4.2.1 Senior Citizens

For the 67 senior citizens, the picture is the sharpest (see Figure 4.3). Most of these subjects (58, or 87%) exhibit one of the complementary two-vowel systems; only a few of them (9, or 13%) retain the three-vowel system or have a pattern that is unclear.

[14]This same card elicits six potential tokens of /ah/ (*heart, started, farther, calmer, father's, aunt*), four more of /o/ (*jogging, lot, Donna, honor*), two more of /oh/ (*walking, daughter*), and one of /owr/ (*mourning*). Other cards contained close matches for some of these, e.g. *hot∼heart, comma∼calmer, morning∼mourning.*

[15]To contrast /o/∼/oh/ I used *Don∼Dawn, cot∼caught, knotty∼naughty* and *collar∼caller.* For /ah/∼/o/ I used *balm∼bomb* and *lager∼logger,* which were less successful, as *balm* is increasingly pronounced with /l/, *lager* often with /ae/ or /ey/, and *logger* sometimes with /oh/. For /ah/∼/oh/ I used *Pa's∼pause, Ra∼raw,* and the semi-linguistic pair *Ah∼Aw.* A final card probed the /ohr/∼/owr/ distinction using the pair *for∼four.*

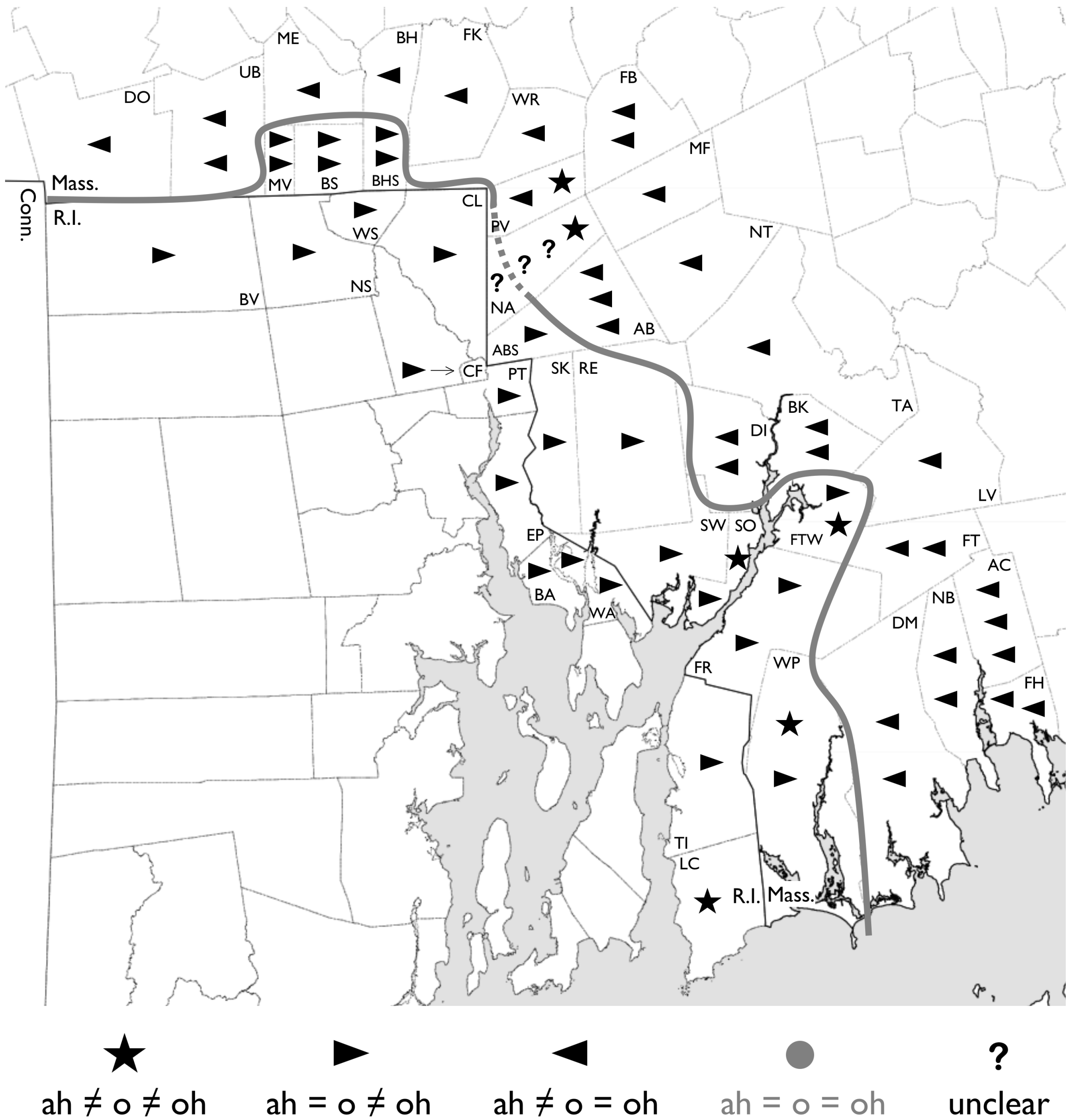

Figure 4.3: Low vowel systems of 67 senior citizens

4.2.1.1 Two-vowel systems

The 26 rightward-pointing triangles in Figure 4.3, each standing for a speaker with a Providence-like system of two vowels where /ah $=$ o/ $\neq$ /oh/, are found in all but one of the Rhode Island communities and extend into Massachusetts in two areas.[16]

The 32 leftward-pointing triangles show the limit of the Boston-like system of two vowels where /ah/ $\neq$ /o $=$ oh/.

The location of the boundary between the two-vowel systems is not unexpected, given the settlement history outlined in §2.2. Most of Massachusetts Bay (including the old Plymouth Colony) ended up merging /o/ and /oh/, while Rhode Island (like the rest of the United States) merged /ah/ and /o/.[17]

The correspondence is not exact, however. The towns on the east shore of Narragansett Bay, most likely through early maritime contacts, came to resemble the RI settlements across the water more than the Plymouth Colony towns they sprang from.[18] Fall River, a 19th-century industrial city, also came to match RI, either from its origins or later contact. It then likely brought its own influence to bear on the closest towns to it, reversing their phonological destiny.

A similar fate befell the part of Massachusetts just across the state line from Woonsocket RI, where settlement history would lead us to expect Boston-like systems, but in fact Rhode Island patterns are found. This reversal of phonological course may be attributable to contacts between the city (Woonsocket) and the towns (Blackstone, Millville, S. Bellingham), to the out-migration from the city that turned those towns into suburbs, or to both processes.

The most startling thing revealed by the seniors' data is that in three places, the linguis-

[16] Along the northern border of Rhode Island we find (from west to east) Millville, Blackstone, and South Bellingham MA, which for many years have functioned almost as suburbs of Woonsocket RI. And along the eastern border of Rhode Island we find a larger area, where seven or eight Massachusetts communities, many of which could be considered suburbs of Providence or Fall River, pattern with Rhode Island.

[17] It should be reiterated that these mergers took place probably several centuries after the original fabric of English settlement was laid down, and with it that of English pronunciation.

[18] Kurath *et al.* (1939: 13) include Bristol County MA in a 'Narragansett Bay Area.'

tic boundary cuts through a city or town. These municipalities, shaded in grey in Figure 4.3, are (from west to east) Bellingham, Attleboro, and Freetown MA.

One senior citizen from the northern section of Bellingham, three from the central or northern part of Attleboro, and two from East Freetown all pattern with Massachusetts (ENE system). But two seniors from South Bellingham, one from South Attleboro, and one of two from Assonet – the western part of Freetown – pattern with Rhode Island (MAIN system).

In these three towns, the section closest to Rhode Island (for Freetown, closest to Fall River) has a fairly distinct identity now, and that was even more the case when these seniors were growing up. Those from South Bellingham who attended high school went to Woonsocket, and some from Assonet went to high school in Fall River.[19]

But though South Attleboro is geographically and economically closer to Pawtucket RI, one high school has served all parts of Attleboro since the 19th century. So the boundary within the city suggests that dialect contact starting at high-school age is not enough to level a vowel system difference of this sort (consistent with the findings of Chapter 3).

Individual vowel systems will be examined in §4.4. There, a 62-year-old man from South Attleboro (ABS62M[20]) will represent the 'Providence' (MAIN) two-vowel pattern. An 86-year-old woman from Norton (NT86F) will represent the 'Boston' (ENE) two-vowel pattern.

4.2.1.2 Other systems

Six seniors, aged 81 to 93, gave evidence, in their minimal pair responses, of a three-way distinction between /ah/, /o/, and /oh/, such as was found in many earlier records. While the

[19]North Bellingham high school students went to Milford or Franklin, deeper into Massachusetts territory, while East Freetown students went to New Bedford. Since 1938 Bellingham has had its own high school for both sections, and since 1950 students from all over Freetown have come together even in elementary school.

[20]For economy, speakers will sometimes be referred to by a code of this type. The initial letters represent the community, the number the subject's age in 2005, and the final letter their gender.

/o/ in such cases was sometimes shorter, in terms of quality it ranged widely, overlapping considerably with /ah/ and /oh/.

Two of these conservative speakers were as expected: older male ‘Yankees’ of English descent, from out-of-the-way communities: a 90-year-old from Assonet MA and an 88-year-old from Little Compton RI. But the others were not from remote places; two – an 81-year-old Polish man from Plainville MA and an 85-year-old Portuguese woman from Westport MA – even had immigrant parents.[21]

Only three of the 67 seniors had ‘unclear’ low vowel systems, and all three were from North Attleborough MA. Perhaps being on Route 1 (the main road between Providence and Boston) allowed more migration and contact from both sides to affect North Attleborough, keeping its dialect intermediate between the two types. Even so, the town’s unique status is mysterious, as it separated only in 1887 from Attleboro, where seniors had either the MAIN or ENE system (depending on neighborhood), and no unclear types were found.[22]

In §4.4, an 85-year-old woman from Somerset MA (SO85F) shows a fairly clear three-way distinction (3-D). The speaker from Plainville (PV81M) may be 3-D as well, although his system is less clear.

None of the senior citizens had a system with only one low vowel phoneme. This three-way merger (3-M) was found only among the young adult speakers.

4.2.2 Young Adults

The more complex pattern of 113 young adults is shown in Figure 4.4. Most speakers have one of the two-vowel systems, and the geographic boundary between the patterns remains essentially unchanged, based on an apparent-time interpretation of the comparison between

[21] I would not have expected such an old-fashioned phonological pattern from speakers who must have learned English entirely from their peers (and older siblings).

[22] Among the earlier oral histories from North Attleborough, there were two clear ‘Boston’ types, but of the seniors actually interviewed, three had /o/ and /oh/ as *probably* distinct, /ah/ and /o/ as *possibly* distinct; that is to say, perhaps closer to ‘Providence’, but essentially unclear.

the seniors and young adults – that is, that the patterns represent the ones learned by the respective groups in their early lives.[23]

A few subjects, mainly on the Massachusetts side of the dialect boundary, have a fully-merged one-vowel system; no young adults retain the three-vowel system. And more than for the seniors, the phonological system of some young adults could not be determined from the data collected (or perhaps was inherently unclear or intermediate).

In the 'Rhode Island' area, including the parts of MA noted above, 48 of 62 young adults (77%) had the same 'Providence' (or MAIN) two-vowel system as the seniors there. Five others – in Barrington RI, Blackstone, Freetown, Rehoboth, and Seekonk MA – had 'Boston' two-vowel systems (ENE). One in South Bellingham MA had a one-vowel system (3-M), and eight had systems that were unclear.

Across the old boundary, 32 of 47 young speakers (68%) had retained the 'Boston' or ENE pattern found there among speakers two or three generations older. One subject in Attleboro had the 'Providence' or MAIN system, four – in Dartmouth, Dighton, Franklin and Plainville MA – had a three-way-merged system (3-M), and ten were unclear.

In North Attleborough, which really belonged on neither side of the old boundary, one young adult had the 'Boston' system (ENE), one had a one-vowel system (3-M), and two were unclear. The ENE subject, a 30-year-old fireman, and the 3-M subject, a 19-year-old female student (and tanning salon employee), are analyzed in §4.4 as NA30M and NA19F.

Table 4.2 summarizes the low vowel systems that were observed.

	3-D	MAIN	ENE	3-M	UNCLEAR	TOTAL
SENIOR CITIZENS	6	26	32	—	3	67
YOUNG ADULTS	—	49	38	6	20	113

Table 4.2: Low vowel systems of the 180 geographic study speakers

[23]For most of its length, there is substantial interaction across the boundary, making its stability noteworthy.

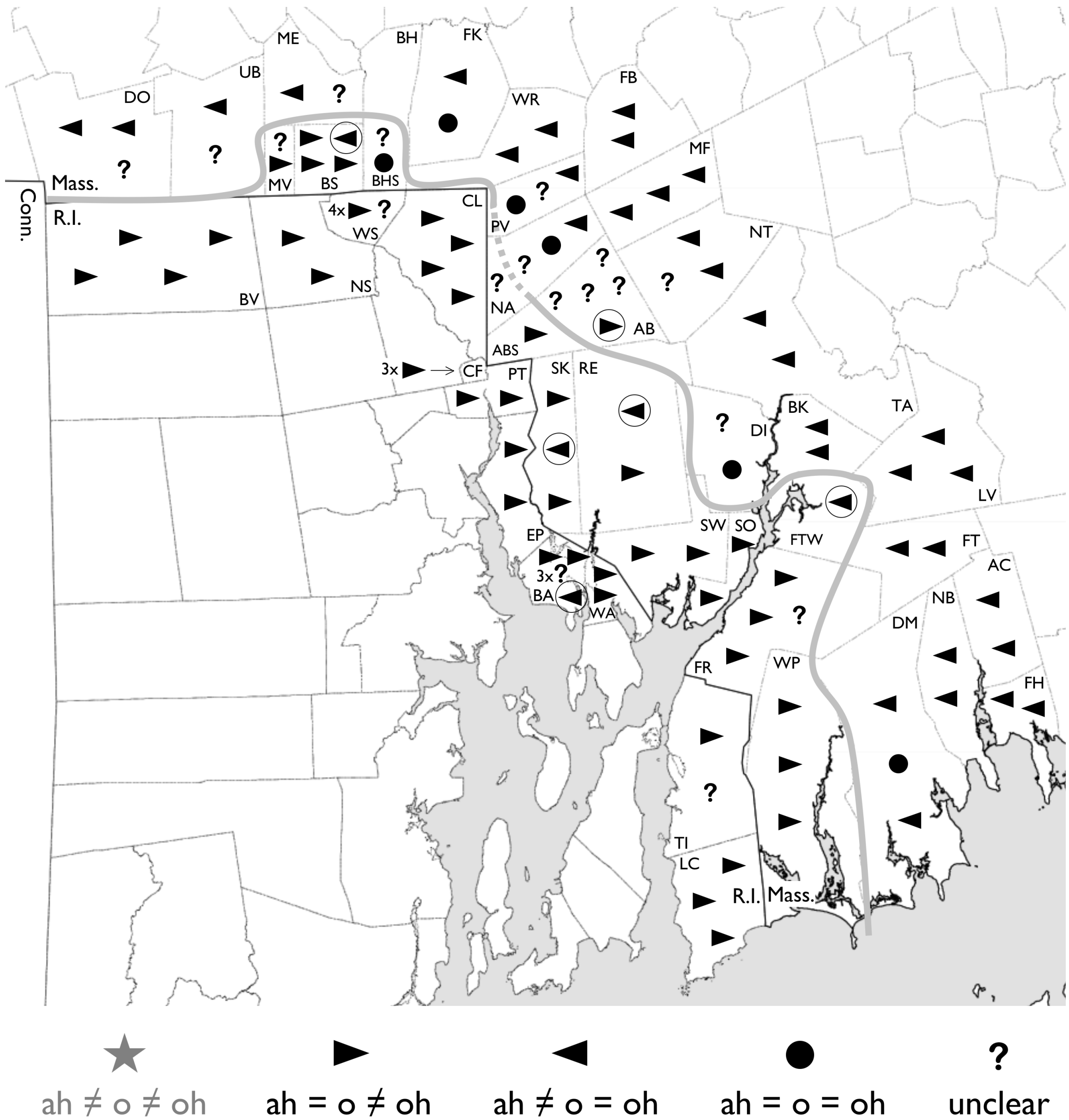

Figure 4.4: Low vowel systems of 113 young adults (with isogloss for senior citizens

In general, those young adults who show change from the seniors' pattern are not clustered geographically, but they are somewhat predictable by age. Of the young adults aged 20 and over, 85% (64 of 75) have a two-vowel system. For those under 20, this figure falls to 59% (22 of 37), a significant drop (chi-square, $p = 0.002$).

Speakers' individual backgrounds also play a role. Of the six examples of fully merged young adults, three (50%) had parents who grew up on opposite sides of the boundary from each other. Among the other 107 young adults, only six (6%) had parents like this. The 3-M pattern is significantly more common with such a parental configuration ($p = 0.0001$), and this makes perfect sense: children from such families might be expected to level the complementary two-vowel systems of their parents' input into one low vowel.

The relative influence of parents and peers on the development of young people's dialects is a complex issue, but is not especially illuminated by this data (but see Chapters 3 and 5). The most common case here was for both parents, unless they were foreign immigrants, to have grown up in the same dialect area, if not the exact same town, as the subject.

In the three Massachusetts towns that, judging by the senior citizens' data, were formerly cut in half by the dialect boundary, the young adult data suggests that this situation has not always continued. Those towns are becoming more homogeneous.

In South Bellingham, I found one one-vowel speaker and one 'unclear' one.

In South Attleboro, a 26-year-old hairstylist was interviewed, who preserved the 'Providence' (MAIN) two-vowel system found in older speakers from that section of the city. Like them, she had many contacts in Pawtucket RI, and few in 'uptown' Attleboro,[24] despite having attended high school there. This speaker is analyzed below, in §4.4, as ABS26F.

In Assonet, the western part of Freetown, a 20-year-old waiter clearly had the 'Boston'

[24]Some South Attleborians refer to Attleboro's central business district, five miles to the northeast, as 'uptown'; those from other parts of the city call it 'downtown Attleboro'.

pattern, keeping /ah/ distinct from a merged /o = oh/. Not only was this a change from the 'Providence' (or better, 'Fall River') pattern of one of the elderly informants from Assonet, it was in contrast to the (assumed) systems of his own parents, who grew up in Fall River and nearby Somerset.

For one two-vowel pattern to replace the other is more surprising than for unclear or one-vowel patterns to emerge along the boundary. A community of *cot∼caught* distinguishers can merge these two classes unproblematically, but for them to also fully separate out the *father* class from the *bother* class, at the same time, is a vastly more difficult task (see §1.3).

The same task could be seen as the transfer of /o/-class words from being merged with /ah/ to being merged with /oh/. But to say '/o/ is merged with /ah/' is to say the dialect has no underlying distinction between the two word classes, and a mass transfer that must proceed word-by-word is no more likely than a separation.

But as yet, we have no clear evidence of community change in any place, just a few individuals whose patterns differ from those of their grandparents.[25]

We must analyze young speakers from potentially changing communities, explore the stability of vowel systems in families that do not move, and probe the effect on a community's vowels of migration from other dialect areas.

4.3 The abruptness of change: more evidence from three formerly split communities

In the formerly split communities of Attleboro, Bellingham, and Freetown, interviews with 20 more subjects give more evidence of community change.[26] These cases involve MAIN

[25]Not their actual grandparents, if they lived somewhere else; their neighbors' grandparents, maybe.

[26]The family study (Chapter 5) deals with a similar community change in Seekonk and other places. It seems to have been equally sudden in Seekonk, but to have happened ∼10 years later than in South Attleboro.

communities, which had already merged /ah/∼/o/, and are now no longer distinguishing between /ah = o/ and /oh/.

There are isolated examples of the complementary change too – where /ah/ falls together with a long-merged /o = oh/ – and anecdotal evidence that this is widespread among young speakers in ENE. If both changes were to go to completion, there would again be a single phonological pattern across the area: a three-way-merged system of one low vowel.

Table 4.3 reviews the senior citizen and young adult speakers already discussed, from South Attleboro (ABS), South Bellingham (BHS), and Assonet (FTW).

COMM.	AGE	SEX	MOTHER[a]	FATHER[a]	o∼oh	ah∼o	ah∼oh	SYSTEM
ABS	62	M	PT	PT	D	S	D?	MAIN
ABS	26	F	PT	Portugal	D	S	D	MAIN
BHS	70	M	BHS	BHS	D	S?	D	MAIN
BHS	58	M1	WS	BS	D	S	D	MAIN
BHS	25	F	BHN	BHS	S	S	S	3-M
BHS	18	M	BHS	BHS	S?	??	??	unclear
FTW	90	M	WA	FR	D	D	D	3-D
FTW	85	F	FR	FR	D	S	D?	MAIN
FTW	20	M	SO	FR	S	D	D?	ENE

[a]For community codes, see Figure 4.2.

Table 4.3: Summary of speakers from the MAIN side of three split communities: South Attleboro (ABS), South Bellingham (BHS), Assonet (FTW); D: different; S: same

The MAIN, or Rhode Island system, is found in all three places among the senior citizens (except the oldest Assonet subject, who may have a 3-D system). In South Attleboro, the 26-year old still has the /o/∼/oh/ distinction, but in South Bellingham and Assonet a range of different patterns were observed from the young adult speakers.

In South Bellingham, a 25-year-old woman shows a clear 3-M pattern, which makes sense as a possible evolution of the MAIN pattern, as well as a logical outcome from her parents' contradictory patterns: her father from South Bellingham, is likely MAIN, her mother, from North Bellingham, is likely ENE.

In Assonet, a 20-year-old man has an unexpected ENE pattern, which seems unlikely to have evolved from the earlier community system (MAIN) nor from that of his parents (also MAIN). The integration of Assonet with East Freetown during the second half of the 20th century could be related, as East Freetown had, and still has, an ENE system.[27]

A limited further investigation was carried out among young adults in these three places; in BHS and FTW because change was already seen there, and in ABS once it became clear, in the course of the family study, that most teenagers had lost the /o/∼/oh/ distinction. The goal was to see how quickly low vowel patterns changed in these communities, and how much uniformity there was for any particular age cohort.

With a revised, shorter set of methods, five more local young adults between the ages of 18 and 20 were interviewed in South Attleboro. In South Bellingham and Assonet, where less was known of what happened between the oldest and youngest generations, a wider age range was targeted. Six subjects were interviewed in South Bellingham, ranging from age 15 to 58, and nine more speakers, from 17 to 74 years old, were found in Assonet.

4.3.1 Change in South Attleboro MA

In South Attleboro so far, a 62-year-old man and a 26-year-old woman had shown very similar MAIN systems. Six new subjects were interviewed, but only four had always or almost always gone to school locally,[28] important for accurately dating any change.

A 20-year-old woman still had the MAIN pattern, pronouncing and judging *naughty∼knotty* and *cot∼caught* as different, and *ah's∼Oz* as the same. The pair *Pa's∼pause* was pronounced differently when embedded in sentential context, then pronounced and judged

[27] Since 1950, Assonet public schoolchildren have attended elementary school together with East Freetown, a section with roughly equal population. And since 1959, the Freetown students have later combined with those from Lakeville, a slightly larger town to the northeast (the mixing with Lakeville originally began in 7th grade, but since 1972 it has happened in 5th grade). As a result, for many years of their education, children who live in Assonet are exposed to the ENE speech patterns of East Freetown and Lakeville.

[28] That is, by attending Hill-Roberts Elementary and Coelho Middle School in ABS, then Attleboro High.

the same when treated as an explicit minimal pair.

By asking 'semantic differential' questions like "What's the difference between a shopping plaza and a shopping mall?" or "What's the difference between a spa and a salon?" or "What's the difference between Stop & Shop and Shaw's?", a number of tokens of /ah/, /o/, and /oh/ were elicited, of a more spontaneous nature than the minimal pairs, which were embedded in shorter reading card sentences – given in full in Appendix A.1 – with many words from the three low vowel classes. Based on these and her spontaneous speech, ABS20F1 clearly had a pattern of /ah = o/ $\neq$ /oh/.

Another 20-year-old woman had arrived at age 9 from Panama, but had no English language exposure prior to arriving in the South Attleboro environment. She had a light foreign accent, but her English low vowel pattern was definitely MAIN.

A 20-year-old man, who attended parochial school for two years[29] in Pawtucket before entering the (South) Attleboro public school system, also had a clear MAIN system.

A young man and woman who were 18 years old, however, displayed a different pattern. The young man, whose interview was cut short, pronounced /o/ and /oh/ the same. However, since both his parents were from further north, his vowel pattern could always be traced to theirs, rather than to any community change in South Attleboro.

The young woman, however, is more certain to reflect such change. She did live in Pawtucket until the age of five, but never went to school until moving to South Attleboro. Although her accent is substantially non-rhotic, it is innovative in merging (or at least closely approximating) all three low vowels.[30]

The South Attleboro children interviewed as part of the family study (Chapter 5) behaved in keeping with this change. A 16-year-old boy, 17-year-old girl, and 18-year-old

[29]This was probably a year of pre-school and a year of kindergarten, but this was not clarified.

[30]ABS18F's father is from Canada, which is known for its three-way-merged low vowel system. However, ABS18F's non-rhoticity is probably a clue that she is not strongly influenced by his speech. Impressionistically, her speech sounds like that of Rhode Island, except having the /o/$\sim$/oh/ merger.

boy (in three different families) all merged /o/∼/oh/, although only the 18-year-old had both parents with the distinction.[31] None of 15 younger ABS children showed the distinction, either, except for a 6-year-old believed to still be under the influence of his distinct mother.

Extrapolating from these subjects, we can state that people born in 1985 or before, and raised in South Attleboro MA, acquired a MAIN low vowel system identical to that of adjacent Pawtucket RI: /ah = o/ $\neq$ /oh/. Those born in 1987 or later, however, learned a 3-M system, where /ah = o = oh/.

There is no obvious trigger for the sudden merger in terms of schooling. For over a century, South Attleboro children have mainly met those from the rest of the city only upon starting high school. A more recent and potentially relevant phenomenon in South Attleboro is the construction of upper-scale residential subdivisions; many of the new residents of these came from Greater Boston, and their children would have mixed with the South Attleboro locals from a much earlier age.

4.3.2 Change in South Bellingham MA

So far in South Bellingham, a 70-year-old and a 58-year-old had the MAIN pattern, while a 25-year-old and an 18-year-old showed different patterns (3-M and unclear). This left a large age range completeley unknown, in that community.

Seven new South Bellingham subjects were interviewed, but one of these did not qualify as a lifelong BHS resident.[32] The oldest of the other six, a 58-year-old man (BHS58M2) had parents from the ENE area, and his low vowel pattern was essentially ENE as well (he pronounced *cot*∼*caught* differently, but *knotty*∼*naughty* was the same, and /o/∼/oh/ sounded very much the same in spontaneous speech. BHS58M2 did not grow up in the furthest south section of town, but did attend BHS schools; "I'm from the South," he said,

[31] The 18-year-old boy's father is ABS62M from the geographic study, a strong example of the MAIN pattern. His mother, from Connecticut, has the same low vowel system, except she is rhotic, as is her son.

[32] A 52-year-old woman had the MAIN pattern, but had lived in adjacent Woonsocket RI through 1st grade.

meaning South Bellingham.

The next oldest speaker, BHS46M, conformed better to the previous image of the older South Bellingham pattern. He was different only in having attended a parochial school in South Bellingham through the eighth grade,[33] then Bellingham High School. The low vowel pattern of BHS46M was pure MAIN, /ah = o/ $\neq$ /oh/.

BHS41M came from a different segment of the population, being a member of one of the oldest 'Yankee' families in the area. He grew up and went to elementary school in South Bellingham, and commented, like BHS58M2, that they had little or no contact with North Bellingham children until junior high school, and that commercial contacts were much more towards Woonsocket than in the other direction. In parallel with this, BHS41M has a clear MAIN low vowel pattern.

The next South Bellingham subject to be discussed was the son of BHS41M. He was 21 years younger than his father, and expressed the same attitudes about isolation from North Bellingham and connections with Woonsocket. However, BHS20M displayed a different low vowel pattern. He stated that /oh/ was "longer" than /o/, but pronounced them almost identically. He also claimed to hear a length difference in *ah's*∼*Oz* and *Pa's*∼*paws,* pronouncing them differently under focus, but the same away from the minimal pair context.

It seems likely that BHS20M does not make any of the low vowel distinctions in his spontaneous speech, and is thus fairly described as having a 3-M system.[34]

Another speaker of similar age is BHS23F. She did not have the same South Bellingham roots of the previous two speakers, as her father came from the central part of Bellingham and her mother from Franklin, an adjacent town on the ENE side of the linguistic boundary.

[33] The population that attended the parochial school, including BHS46M, was heavily French Canadian in origin. The French had originally worked in mills in Woonsocket RI and South Bellingham. The association of South Bellingham and Blackstone/Millville with Rhode Island speech may be older, but the connection persisted through the 20th century. Table 4.6 shows several Woonsocket–South Bellingham marriages.

[34] Regarding the pairs, he made the revealing comment that "in general conversation, I would look at the context more than the sound."

BHS23F grew up in South Bellingham from birth and went to the South Bellingham elementary school, then attended a Catholic junior/senior high school in Cumberland RI,[35] eventually also moving to Cumberland at the age of 16.

Her vowel pattern is somewhat more complicated to describe. Her behavior in reading and repeating minimal pairs is consistent with the ENE pattern of her parents (and some of her junior/senior high school cohort). However, the phonetics of her presumed /o = oh/ vowel bear possible signs of contact with the MAIN pattern.

For example, the /o/∼/oh/ pairs *knotty*∼*naughty* and *cot*∼*caught* are pronounced exactly the same in reading context and when repeated as minimal pairs, consistent with the 'Massachusetts' pattern. But when BHS23F pronounces the names of two supermarket chains in a semantic differential, the stressed /o/ in *Stop & Shop* is not backed, raised, or rounded, while the /oh/ in *Shaw's* clearly is. In pronouncing those particular two words, and some others, she sounds like a Rhode Islander.[36]

What is happening with BHS23F is fascinating, but perhaps a digression from the story of the evolution of South Bellingham speech. The target of that evolution is seen from the youngest subject interviewed, BHS15M, who attended South Bellingham elementary school and currently is an eighth grader at Bellingham Middle School.[37]

BHS15M's parents are both certain to have MAIN systems, his mother coming from New York and his father from Rhode Island. He himself, however, has a clear 3-M pattern.

In South Bellingham, then, most people born up to 1965 have a MAIN low vowel

[35] BHS23F describes a culture of substantial separation at this school between students who lived in Rhode Island and those from Massachusetts.

[36] Although both supermarkets are common in both states, there is a Stop & Shop located in South Bellingham itself, while the nearest Shaw's is located in, and strongly associated with, the city of Woonsocket RI. Because of this, BHS23F's pronunciation of *Shaw's* could be an atypical realization of her usual /(o =) oh/ phoneme. For a similar case involving the names *Don* and *Dawn,* see §4.4.2.2.

[37] BHS15M downplayed the differences between different parts of Bellingham, but noted that others do see them, in very contemporary terms: "I think kids assume that there is, but there really isn't. Kids say they, like, grow up in the 'hood of Bellingham, even though there really isn't a 'hood. It's like a middle-class society, but kids are always trying to act gangster, and they consider themselves [gangster], but they're really not."

system, assuming their parents do as well. At some point after that date, but no later than 1985, /o/ and /oh/ merged, leading to the 3-M pattern of BHS20M and BHS15M.

It may be relevant that in South Bellingham, beginning in the late 1950's, a substantial expansion of the population occurred, by the creation of suburban subdivisions that had not previously existed. Although the community remained commercially oriented towards Woonsocket for some time – until an economic downturn in Woonsocket created strong and persistently negative attitudes toward that city – many couples and families relocated to Bellingham from the Greater Boston area.

Through the 1990's, immigration from the north into this distant Boston suburb continued, and the relocating population also became more affluent. This non-native population, of course, had less invested in divisions between North, Central, and South Bellingham, which diminished for that reason and others. The dissolving ties between South Bellingham and Woonsocket also must have led to a certain amount of reintegration between South Bellingham and the rest of the town.

At some point, within this milieu, South Bellingham children whose parents had the MAIN pattern (being local, or from the south or west) stopped acquiring it, merging /o/ and /oh/. This contrast is clearest between BHS41M (MAIN) and his son, BHS20M (3-M?).

However, not everyone growing up in South Bellingham followed this path from MAIN to 3-M. Both BHS58M2 and BHS23F largely retained the ENE system of their parents.

We see that the number of subject parameters to consider, however, begins to outstrip the methodology of this small-scale study. To locate the number of informants here, for example, required visiting literally every retail business in South Bellingham.

4.3.3 Change in Assonet MA

As noted, the original study interviewed two elderly Assonet natives, one of whom, a 90-year-old man, had a possible 3-D low vowel pattern, while his 85-year-old wife had the

MAIN pattern typical of the Fall River area. A 20-year-old man, by contrast, had a fairly clear ENE system, even though his parents were from MAIN territory as well.

In an attempt to fill the gap and determine the course of phonological change in this community, nine more subjects of varying ages were located. The oldest of these, a 74-year-old woman, had a similar background to the two seniors already mentioned, in that she attended school through eighth grade in Assonet, before Freetown had a combined elementary school, and then went to high school in Fall River.

Her spontaneous speech clearly follows the MAIN pattern, as does her pronunciation of the reading cards and minimal pairs, except for *knotty*∼*naughty* being close or identical.

The next-oldest subject was a 53-year-old woman, who had attended the new combined Freetown Elementary School through sixth grade, then the regional secondary schools together with children from the town of Lakeville.

Her low vowels are not similar to the older Assonet subjects, phonetically – a backer /o/ that is sometimes rounded, a lower /oh/ that is not always heavily rounded – but phonologically the same MAIN pattern is probably indicated, although some of her behavior on /o/∼/oh/ in the formal methods contradicted this. FTW53F stated that the vowels should be different, but she was correct in saying that she did not always keep them apart.

FTW50F, of similar age and identical school history, had an unambiguous MAIN system. She even asked about the /o/∼/oh/ pairs, "Do some people pronounce them the same?"

None of the younger Assonet speakers had a clear MAIN system; they showed divergent developments. A 31-year-old woman had an apparent ENE system in spontaneous speech, but in focusing on minimal pairs she separated /o/∼/oh/ and collapsed /ah/∼/o/.[38] Her 28-year-old brother, however, had a clear ENE system.[39]

The next-younger subject was a 19-year-old man who was very connected to the As-

[38]FTW31F stated that during a year of college in Texas, with a roommate from Oregon, she first noticed her "atrocious" accent, and substantially eliminated it. Indeed, she sounds very unlike her brother, FTW28M.

[39]Like FTW20M, above, FTW28M's ENE pattern was a reversal of his parents' assumed MAIN patterns.

sonet community and served on several Freetown governmental committees – although his parents were from Taunton and Boston (hence ENE). He spoke of the continuing division within town between Assonet and East Freetown, despite their sharing an elementary school for 55 years.[40]

The impression of FTW19M's spontaneous speech is of a mild ENE low vowel system. Certainly, /o/∼/oh/ is merged, and a few examples of /ah/ (*father,* for example) were quite fronted. When focusing on minimal pairs, though, he tended to separate /o/ and /oh/, subtly when he repeated *knotty∼naughty,* clearly when he repeated *cot∼caught.* Conversely, the first reading of *ah's∼Oz* had a noticeable difference, but he pronounced the words identically when juxtaposed as a minimal pair.

The youngest Assonet subjects were three 17-year-old young women. The first, known as FTW17F1, had lived in Westport until the age of four and attended preschool there (her parents were also from Westport), but since then has been an Assonet resident, and currently is a senior at the Freetown/Lakeville regional high school. She states that most of her friends are from Lakeville.

The impression of her low vowels, in both spontaneous speech and on the formal methods, is of a definite 3-M system, where there are no phonemic distinctions, but where the vowel covers a large phonetic range. Some tokens of /oh/ are MAIN-like, high and back (e.g. *Shaw's, Claus*) while others are low and central (e.g. *talk, stalk*). Some tokens of /o/ are ENE-like, back and rounded (e.g. *bonfire, not*), but some are front and unrounded (*dollars, options*). Similar phonetic variation occurred for /ah/ (e.g. front *spa* vs. back *massages*). The only minimal pair that FTW17F1 judged different was *ah's∼Oz,* where she heard (and made, on repetition) a length distinction, rather than any of vowel quality.

The other two 17-year-olds were twins whose mother grew up in Assonet (system

[40]FTW31F had mentioned these feelings as well. In Bellingham, on the other hand, the feeling of division has lessened, although separate neighborhood elementary schools still exists.

unsure, since her own parents were from ENE); their father was from Jersey City NJ (almost certainly MAIN). FTW17F2 and FTW17F3 had attended pre-school in Assonet, elementary school in Freetown, and after an unsuccessful half of fifth grade in a Taunton parochial school, returned to the Freetown-Lakeville school system, where they are now in eleventh grade. They report being friends with Lakeville, East Freetown, and Assonet kids.

Their low vowel systems were very similar, and impressionistically were three-way-merged. Unlike FTW17F1, however, their vowels did not range over a wide phonetic area. Most tokens of all three word classes were realized with an unrounded low back vowel.

FTW17F2 disputed that *Pa's∼paws* and *ah's∼Oz* sounded identical, but had in fact pronounced them extremely close, up until the final, most conscious repetition. Her sister FTW17F3 judged, as well as produced, all the minimal pairs the same.[41]

To summarize Assonet, those born up to 1955, and perhaps for some time thereafter, retained the MAIN pattern in common with Fall River. The first Assonet students to attend the common Freetown elementary school and the Freetown-Lakeville secondary schools retained this MAIN system (FTW53F and FTW50F).

People born roughly between 1975 and 1985 who grew up in Assonet acquired a different pattern. In some cases, it presents as mixed or unclear. But there is no doubt that the ENE pattern was learned by some people who did not have it in their family background (FTW28M and FTW20M).[42]

Although this implies that they reversed their parents's merger of /ah/∼/o/ and acquired a merger of /o/∼/oh/, the conditions for such a rare event may well have been in place. Not only did these children attend an elementary school where at least half the other children, from East Freetown, had the ENE system, they continued in middle and high school with

[41] When asked how her NYC-area father would pronounce *knotty∼naughty,* FTW17F3 produced a moderate distinction in the right direction.

[42] The possible ENE speakers noted for South Attleboro and South Bellingham – ABS18M, BHS58M2, and BHS23F – all had exposure to that pattern from both parents, while the two Assonet speakers in question – FTW28M and FTW20M – had MAIN-area parents.

children from Lakeville, another historically-ENE community.

In addition, substantial direct immigration from the Boston area began to affect Assonet during this same time period, which would have amplified this same demographic swamping of the MAIN pattern.

This shift towards ENE was apparently short-lived, however, considering that three subjects born around 1988 are all fairly clear examples of the 3-M system. This pattern is also the most common outcome for the teenagers of South Attleboro and South Bellingham.

4.3.4 Accounting for change

One line of explanation for these shifts looks to the demographic and cultural context. In all three communities, there has been, in recent decades, a turning away from the large adjacent cities to the south – Pawtucket for South Attleboro, Woonsocket for South Bellingham, Fall River for Assonet. FT74F, for example, went to Fall River frequently as a child, attended high school there, as noted, and continued to visit and do shopping there "until the city disintegrated" in the mid-twentieth century.

And in Assonet recently, just as in South Bellingham and South Attleboro for some time, there has been immigration from the Greater Boston area. As of yet, Assonet has not reached the point of being considered a "bedroom community" with respect to Boston. This has reportedly happened more to Lakeville (which has grown since the re-opening of a commuter train station in 1997), and the term is frequently applied to Bellingham. Assonet, though hardly further from Boston than these other places, retains more of a small-village feeling, though this may be changing.[43]

Table 4.4 provides one measure of the relative extent to which these three communities are bedroom communities. It shows the number of residents of Attleboro, Bellingham,

[43] These impressions are a combination of my own and the reports of the interviewees. When not asking them to read cards or answer semantic differential questions, I asked them about their communities, their travel habits, their impressions of Boston and Providence, and about the accents of these and other places.

and Freetown who worked in the city of Boston, according to the 1990 and 2000 Census (Census 1999, 2003b).[44] Several other communities in the study area are included for comparison. Unfortunately, data at the sub-community level (e.g. South Attleboro) is not available. However, the Census percentages match the above impressions very well.

In all the selected communities except Bellingham – where such commuting patterns are perhaps older and more stable – there has been an increase in the proportion of residents commuting to Boston. Both in 1990 and 2000, Freetown was less a bedroom community than Attleboro and Bellingham – yet we have seen that it still underwent linguistic change, from more proximate causes.

COMMUNITY	WORKERS		WORKED IN BOSTON		MILES (MINUTES) [a]
	1990	2000	1990	2000	
Attleboro MA	19514	21540	4.7%	6.3%	39 (49)
Bellingham MA	8021	8462	5.4%	5.3%	44 (52)
Freetown MA	4224	4800	2.1%	3.6%	43 (46)
Foxborough MA	7897	8525	12.8%	14.2%	32 (38)
Lakeville MA	3802	5109	2.5%	6.9%	41 (47)
Westport MA	6876	7153	1.0%	2.8%	60 (70)

[a] Miles and minutes to downtown Boston as estimated by Google Maps.

Table 4.4: Proportion of workers in Attleboro, Bellingham, Freetown, and other selected communities who commuted to work in Boston (1990 & 2000 Census Journey-to-Work data)

Table 4.5 provides comparable information for workers who commuted from the three communities focused on in this section to the adjacent cities on the MAIN side of the dialect boundary.

The number of commuters to the adjacent cities to the south has decreased in all three cases between 1990 and 2000. Today, many more people in Attleboro and Bellingham commute a significant distance north and east to work in Boston than work in the adjacent Rhode Island cities of Pawtucket and Woonsocket, though it is likely that in South Attleboro

[44] In general, for every commuter to Boston itself, there are two or three more who work near Boston.

COMMUNITY	WORKERS 1990	WORKERS 2000	WORKED IN . . . 1990	WORKED IN . . . 2000	. . . CITY	(2000 POPULATION)
Attleboro MA	19514	21540	3.2%	2.6%	Pawtucket RI	(72958)
Bellingham MA	8021	8462	5.8%	2.6%	Woonsocket RI	(43224)
Freetown MA	4224	4800	14.5%	12.2%	Fall River MA	(91938)

Table 4.5: Proportion of workers in Attleboro, Bellingham, and Freetown who commuted to work in the adjacent (MAIN) cities (1990 & 2000 Census Journey-to-Work data)

and South Bellingham the proportions are closer to equal. However, in Freetown, the situation is quite different, with a high proportion continuing to commute to Fall River. The economic ties to Fall River are still strong, despite the "disintegration" of the latter city alluded to by several subjects in Assonet. It is despite these adult-centered connections that young people in Assonet have undergone change in their linguistic systems.

4.3.5 Summary of changing communities

The results of the 20 additional interviews in South Attleboro, South Bellingham, and Assonet are summarized in Table 4.6, which also reproduces, in italics, the information from Table 4.3 about the original 9 interview subjects from the same communities.

In all three communities, a change is observed from the MAIN to the 3-M low vowel system, that is, from /ah = o/ $\neq$ /oh/ to /ah = o = oh/. In South Attleboro the transition seems to be especially sudden, happening in the course of just a few years. Quite simply, teenagers and younger children from South Attleboro have the /o/~/oh/ merger while those in their twenties and older do not (assuming distinct parents).

In South Bellingham, a perfect array of subjects for testing this transition was not found. In particular, no one in their thirties was interviewed, and most in their twenties had some ENE parentage, which distracts from tracing the basic evolution of the community. But it was fortunate to find a father (age 41, MAIN) and son (age 20, likely 3-M) who had very different systems. How the community evolved between those age points is still unknown.

COMM.	AGE	SEX	MOTHER[a]	FATHER[a]	o~oh	ah~o	ah~oh	SYSTEM
ABS	*62*	*M*	*PT*	*PT*	*D*	*S*	*D?*	*MAIN*
ABS	*26*	*F*	*PT*	*Portugal*	*D*	*S*	*D*	*MAIN*
ABS	20	M	Portugal	Portugal	D	S	D?	MAIN
ABS	20	F1	SK	PT	D	S	D	MAIN
ABS	20	F2	Panama	Panama	D	S	D	MAIN
ABS	18	M	FB	NA	S	—	—	ENE? 3-M?
ABS	18	F	PT	Canada	S	S	S	3-M
BHS	*70*	*M*	*BHS*	*BHS*	*D*	*S?*	*D*	*MAIN*
BHS	*58*	*M1*	*WS*	*BS*	*D*	*S*	*D*	*MAIN*
BHS	58	M2	Milford MA	UB, WS	S?	D	D	ENE
BHS	46	M	WS	BHS	D	S	D	MAIN
BHS	41	M[b]	WS	BHS	D	S	D	MAIN
BHS	*25*	*F*	*BHN*	*BHS*	*S*	*S*	*S*	*3-M*
BHS	23	F	FK	BH	S?	D	D	ENE?
BHS	20	M[b]	Enfield CT	BHS	S?	S?	S?	3-M?
BHS	*18*	*M*	*BHS*	*BHS*	*S?*	*??*	*??*	*unclear*
BHS	15	M	NY	R.I.	S	S	S	3-M
FTW	*90*	*M*	*WA*	*FR*	*D*	*D*	*D*	*3-D*
FTW	*85*	*F*	*FR*	*FR*	*D*	*S*	*D?*	*MAIN*
FTW	74	F	FTW	BK	D	S	D	MAIN
FTW	53	F	R.I.	R.I.	D?	S	D	MAIN?
FTW	50	F	TA	FR	D	S	D	MAIN
FTW	31	F	SO	FR	??	??	D?	unclear
FTW	28	M	SO	FR	S	D	D	ENE
FTW	*20*	*M*	*SO*	*FR*	*S*	*D*	*D?*	*ENE*
FTW	19	M	TA	Boston	S?	D?	D?	ENE?
FTW	17	F1	WP	WP	S	S	S	3-M
FTW	17	F2[c]	FTW	N.J.	S	S	S	3-M
FTW	17	F3[c]	FTW	N.J.	S	S	S	3-M

[a]For community codes, see Figure 4.2. [b]Father and son. [c]Twin sisters.

Table 4.6: Summary of speakers from changing communities: South Attleboro (ABS), South Bellingham (BHS), Assonet (FTW); D: different; S: same; *italics* = from Table 4.3

Assonet has had a more complicated evolution of its low vowels. Overall, the same transition from MAIN (age 50 to 85) to 3-M (age 17) is observed, but several in the middle show the ENE pattern, which is presumably related to the fact that they attended school with a majority of ENE-speaking children, from East Freetown and later Lakeville as well.

Since some of these Assonet young adults came from MAIN-speaking family backgrounds, their adoption of the ENE pattern does represent the reversal of one merger – /ah/∼/o/ – and the adoption of a different merger – /o/∼/oh/ – on the individual level.

It is not clear whether ENE became the community norm for Assonet children growing up in the 1980s. If it did, then the community has subsequently re-merged /ah/ and /o/. If the ENE development is more of a side branch, evolutionarily, then we may be dealing with the same merger of /o/ and /oh/ as in South Attleboro and South Bellingham.

There is evidence for both these merger types among young speakers. Chapter 5 deals extensively with young people merging /o/ and /oh/ in parts of the formerly-MAIN territory. In the ENE area, the historical distinction between /ah/ and /o/ seems to be weakening among the youth as well. The outcome of both of these processes, phonologically, is 3-M.

The 3-M speakers found in the three sub-communities of this section are younger than the majority of the young adults in the regular geographic study, and this seems to be important. It was noted in §4.2.2 that teenagers were less likely to preserve the two-vowel systems. Looking at the entire ENE territory,[45] Table 4.7 shows the 46 young adults with a clear merger of /o/∼/oh/. The /ah/∼/o/ distinction is less stable for the younger subjects.

While 15 of 16 subjects (94%) in the oldest, 24-to-33-year old age group were rated ‘probably’ or ‘definitely’ distinct on /ah/∼/o/, only 17 of 30 (57%) of those aged 15 to 23 were. The drop-off is highly significant, statistically ($p = 0.009$ by Fisher’s Exact Test, one-tailed).

[45]The ENE territory comprises the Massachusetts communities in the study area, with the exception of Assonet, Blackstone, Fall River, Millville, North Attleborough, Rehoboth, Seekonk, Somerset, Swansea, South Attleboro, South Bellingham, and Westport.

AGE	/ah/ ≠ /o/ (ENE)	UNCLEAR	/ah = o/ (3-M)	TOTAL
24-33	15	1	0	16
20-23	9	5	1	15
15-19	8	4	3	15

Table 4.7: Decreasing stability of the ENE system: behavior on /ah/∼/o/ vs. age

More informally, the increase from no ‘probably’ or ‘definitely’ three-way-merged subjects at all over the age of 23, to one in the 20-23 category, to three in the under-20 category, exemplifies the same trend.

The ‘unclear’ behavior was sometimes the result of not pronouncing some of the key minimal pair words so they could be usefully compared – [bɑlm] for *balm,* [leɪgɚ] for *lager* – but other times it was due to pronouncing /ah/ and /o/ very close, but neither identical nor regularly different in a comprehensible way.

In the historically-MAIN territory, apart from the three sub-communities discussed in this section, the /o/∼/oh/ distinction does not *appear* to be endangered among the younger young adults in the geographic study, the way the /ah/∼/o/ contrast does in the ENE area. However, as the family study will show, change was on the way in some of those towns as well, and turns out to be no less profound for having been less clearly ‘signaled’ in advance by phonetic approximation.

When the changes in South Attleboro, South Bellingham, and Assonet are seen in this larger context, it becomes a slightly less attractive endeavor to try to explain the timing of the linguistic changes by referring to local demographic events. Before doing so conclusively, at least, it would be important to evaluate the stability of ENE and MAIN vowel patterns in other communities that are nowhere near the historical boundary line. If word classes are merging there, too, it would require a more global account of the reason.

4.4 Acoustic Analysis of Principal Low Vowel Systems

Although it would surely have yielded a valuable perspective on the phonetics and phonology of the low vowels (and other vowels) in the study area, a widespread acoustic analysis was not carried out. Unfortunately, performing such an analysis on any substantial fraction of the 200 subjects would have been too lengthy an undertaking.

Instead, seven 'typical' speakers were analyzed, who between them illustrate the most common low vowel system types, for both seniors and young adults. Most of these speakers were taken from the central part of the study area: two from South Attleboro (both MAIN), two from North Attleborough (ENE and 3-M), and one from Norton (ENE). A speaker from Plainville, in the same geographic area, was possibly three-way distinct; one from Somerset was selected to display a 3-D pattern more clearly. Table 4.8 compares the seven.

CODE	COMMUNITY	AGE	SEX	MOTHER FROM	FATHER FROM
ABS62M	South Attleboro MA	62	M	Pawtucket RI	Pawtucket RI
NT86F	Norton MA	86	F	Norton	Milton MA
PV81M	Plainville MA	81	M	Poland	Poland
SO85F	Somerset MA	85	F	Fall River MA	Swansea MA
ABS26F	South Attleboro MA	26	F	Pawtucket RI	Portugal
NA30M	North Attleborough MA	30	M	Plainville	N. Attleboro'
NA19F	North Attleborough MA	19	F	N. Attleboro'	N. Attleboro'

	R-FUL	*saw* [ɹ] *a*	BROAD A	o∼oh	ah∼o	ah∼oh	SYSTEM
ABS62M	some	—	Y	D	S	D?	MAIN
NT86F	no	Y	Y	S[a]	D	D	ENE
PV81M	no	Y	N	D?	D?	D	3-D?
SO85F	no	N	Y	D[a]	D	D	3-D
ABS26F	some	Y	N	D	S	D	MAIN
NA30M	no	Y	N	S?	D	D	ENE
NA19F	some	N	N	S	S	S?	3-M

[a]Only *Don∼Dawn* behaved deviantly.

Table 4.8: Summary of background and linguistic behavior (based on auditory impressions) of seven 'typical' speakers – all but one from the 'focus area' – to be analyzed acoustically

Being able to draw most of these speakers from a small contiguous 'focus area' demonstrates the sharpness of the main linguistic boundary. Good examples of both two-vowel patterns – even fairly extreme ones – exist close to one another geographically.

4.4.1 Procedures for Acoustic Analysis

The low vowels of the selected speakers were analyzed using the freely-distributed phonetics software package `Praat`. The analysis methods were adapted from those described in Labov *et al.* (2006: Ch. 5). For each stressed vowel of interest, the first three formants were measured automatically, but the single 'horizontal' point of measurement was selected by the researcher using a combination of several criteria. Ideally, the vowel nucleus, as perceived auditorily, would coincide with most of the following:

(1) an F1 maximum, or at least a steady state; (2) an F2 mininum (or sometimes maximum), or a steady state; (2) an F3 extremum or steady state; (3) an intensity maximum.

With these factors considered in roughly descending order of importance, a point of measurement was chosen, and checked auditorily and spectrographically to ensure it was 'free' of the preceding and following consonants.

If several points – usually adjacent, but not always – presented themselves as good candidates for the vowel nucleus, the measurement point was taken as early in the vowel as possible. This is because many of the low vowels in the study area are essentially ingliding diphthongs, ending up as central or low-central vowels.

So when dealing with such common ENE types as [kɔɐt] *cot, caught* and [kaɐt] *cart,* measuring later in the vowels would tend to obscure a real difference, while measuring earlier – consistently – will not suggest any difference that does not exist.

Following the `Praat` default settings as well as the suggestions of Baranowski (2006: 35), each vowel's analysis began with five formants (ten poles) being estimated by the linear predictive coding (LPC) algorithms. For women, their maximum value was 5500

Hz; for men, 5000 Hz. Occasionally, the number of formants had to be decreased to four (eight poles), when it was clear that the algorithm was estimating a false formant near the nuclear point.

Most often, the F1 and F2 tracks were strong and steady enough, located in the appropriate places, and the selection of a measurement point was not difficult. Sometimes, there was really no nucleus to pick. But this all depended to a great deal on the particular word under analysis, because the consonants surrounding the measured vowel have a profound influence on the position and shape of the formant tracks.

While the phonetic environment affects the quality of vowels as perceived by the ear, its influence on instrumental measurements seems to be even greater. The auditory-perceptual apparatus, presumably, can 'adjust' for the predictable co-articulatory effects of e.g. /b/, /l/, and /r/. But these consonants' lowering of F1, F2, and F3, respectively, ensure that diverse tokens of a vowel plotted based on acoustic measurements will always form a cloud rather than a tight cluster.

Not all allophonic effects are predictable, either. Some must be considered part of 'dialect competence' (such as the well-known differing effects of following environment on /ae/). Unlike 'mere' co-articulation effects, these consonantal influences need to be attended to, not factored out. Differences of pitch, stress, and many other factors can also affect formant values.

The difficulties associated with determining phonemic low vowel systems by acoustic analysis are well illustrated by reviewing Herold's (1990: 60-91) attempt to do just that.

4.4.1.1 The Acoustic Analysis of Herold (1990)

Having discovered an area of low back merger in Eastern Pennsylvania, Herold conducted interviews in the town of Tamaqua. Her auditory impressions told her that the oldest speakers there are distinct, while those under 70 are merged (on /o/∼/oh/, as /ah/ and /o/

are universally merged there). There appears to have been fairly sudden change in the community, which later leads Herold to develop the theory of 'merger-by-expansion'.

Selecting ten speakers from Tamaqua ranging from the oldest (age 91) to the youngest (age 9), Herold begins the acoustic analysis by measuring all the tokens of /o/ and /oh/ in a 20-minute segment, usually of spontaneous speech, from each interview (p. 60).

Noting that the dispersion of F1 and F2 for both classes is approximately normal, she considers performing a t-test to evaluate, for each interviewee, the null hypotheses that the two word classes have the same means for both F1 and F2 (p. 71).

Since tokens before /l/ have a particularly low F2, and are most frequently /oh/-words, they are eliminated as being especially likely to skew the data and produce a spurious distinction (p. 73).

The three speakers identified by ear as distinct present no problem in the acoustic analysis; the two word classes have a highly significant difference for both formants. But several of the speakers identified by ear as completely merged also present statistically significant differences in one or both formants (p. 74).

These differences were not as large as those between the /o/ and /oh/ of the oldest speakers. The t-statistics associated with the oldest speakers' vowels were larger, and only for them could the null hypothesis of equal means be rejected at the .01 level for both formants (p. 75).

Still wondering why any significant formant differences should be found if the younger speakers are truly merged, Herold considers the consonantal environment in a multivariate analysis, "to tell us for each speaker whether the effect of word-class membership upon the values of F1 and F2 was statistically significant once the effects of phonetic conditioning were factored out" (pp. 77-78).

An inspection of Herold's results on this point reveals that on the whole, the multivariate procedure does not reduce the rate of 'false positives' with respect to identifying the low back distinction (pp. 79-80). Though one speaker's differences are no longer as significant as they were, those of two others are unchanged, and for two more speakers the result is actually 'worse' – factoring out phonetics had made the apparent word class 'distinction' – again, one unsupported by auditory impressions – appear more significant.

Herold notes that the unimpressive results of attempting to 'factor out' allophonic effects may be because at least some of these effects simply cannot be separated from word class membership. The sequence /ohp/ is rare or nonexistent, for example, so any peculiarities of /op/-words – in my experience, they are unusually far front – cannot be divided accurately between any effect of the /o/ word class and that of the following /p/.

Secondary phonetic factors can also be correlated with word class membership. Herold notes the example of an interview where many monosyllabic /ohl/-words were obtained (*all, always, ball, call,* each several times), but where the only examples of /ol/ are in *collie, volley(ball),* which share a common stress pattern (pp. 80-82).

Herold concludes that "auditory and acoustic analysis agree in indicating that long and short open *o* are distinguished by the three oldest speakers," but concedes that "we have not yet seen positive evidence from acoustic measurements to support the assertion that the two word classes overlap completely in the speech of speakers under 70" (p. 86).

So without formally resolving the status of the speakers judged merged by ear, but who present acoustically distinct vowels (or at least appear to), Herold goes on to discuss the mechanism of sudden merger, illlustrating it with vowel plots of unambiguously merged speakers (pp. 86-91). She does not address the possibility that the ambiguous speakers thus set aside might constitute a kind of evidence against the sudden-merger hypothesis.

4.4.1.2 Phonemic Analysis by Paired Acoustic Measurements

For the acoustic analyses presented below of selected geographic study speakers, a procedure was devised that was informed by the difficulties encountered by Herold.

First, although the measurement of some vowels from spontaneous speech is important, if only to ensure that they are being pronounced in the same way as in more formal methods, paired tokens from reading passages and minimal pairs enable a more accurate assessment of phonemic differences.

	/ah/	/o/	/oh/
/o/∼/oh/		**collar** **cot** **Don** John **knotty** Molly sod stocking	**caller** **caught** **Dawn** Shawn **naughty** mall sawed stalks
/ah/∼/o/	**balm** calmer card darkness harder heart **lager**	**bomb** comma cod doctors hotter hot **logger**	
/ah/∼/oh/	**ah** **Pa's** **Ra**		**aw** **pause** **raw**
multiple	aunt **Bach, bark** **ah's, r's**	on **bock** **Oz**	gone **balk** **aw's**

Table 4.9: Principal paired words from geographic study reading cards (words in bold were repeated as 'overt' minimal pairs, others were read only in a 'covert' sentential context)

From the ten cards read by each speaker were taken 21 overt and covert minimal pairs (and other multiples) involving /ah/, /o/, and /oh/, which are given in Table 4.9. Several other words were also consistently extracted, saved, and measured; these mainly involved the /ohr/ of *for* and the /owr/ of *four,* and some tokens of /ae/ and /ow/ to frame the principal low vowels. Many seniors and a few young adults exhibited broad-*a* (/ah/ in *ask*, etc.); the old New England short-*o* (e.g. [ɹɵəd] *road* vs. [ɹoʊd] *rowed*) was not observed anywhere.

The vowels for each speaker were plotted using Labov's `Plotnik` software. However, statistical evaluation of phonemic inventory was not carried out using the t-test module in `Plotnik`, which tests the difference between the means of two samples of unpaired observations. Instead, a routine was written in `R` that computes a paired two-sample t-test from the measurements of the paired vowels.

A minor advantage of this method is that it eliminates the assumption that the vowel measurements are normally distributed, allowing its use without necessarily having paired vowels in a full range of phonetic environments. It is now the differences between pairs that is assumed to have a normal distribution, which seems very reasonable if the vowels are merged (the mean formant difference would be zero), and not unreasonable if the vowels are distinct.

The major advantage of using the paired method is that phonetic conditioning effects are directly 'factored out', as long as minimal or near-minimal pairs are used. So in arriving at a decision as to whether /o/ and /oh/ are merged in a speaker's speech, the formant measurements for *cot* are compared only with those for *caught,* those for *collar* with *collar,* and so forth.

The preceding are minimal pairs, though of course not everything about their reading passage contexts is the same. More care must be taken with e.g. *Molly*∼*mall,* where duration, intonation and stress may differ, and potentially affect formant values, despite the similarity of the segmental environment.

Just having a phonetically balanced sample of words addresses the conditioning problem, and thereby reduces the chance of erroneously concluding that the two vowels are distinct. Using the paired t-test, however, greatly increases the chances that small but systematic differences between word classes will be detected.

This type of situation would occur most often when there exists a consistent formant difference between minimal pairs, but it is smaller than the differences within each word class due to phonetic conditioning and any other factors. That is, when two vowel clouds overlap substantially, and an unpaired t-test would not detect a significant difference between them, a paired test very well might.

It may seem unlikely that a vowel system would include two phonemes that overlap so thoroughly, as opposed to a more normal, limited overlap where e.g. the fronter realizations of one phoneme have the same measurements as the backer realizations of another. Even situations of near-merger, where small formant differences are preserved, are not necessarily characterized by such extreme overlap.

In the case of /ay/∼/oy/ in Tillingham, Essex (England), some speakers present vowel classes with means as close as 100 Hz apart for F1 and little more for F2; however, there is essentially no overlap between the token clouds (Labov 1994: 382).

The word classes exemplified by *meat* and *mate* in vernacular Belfast English do overlap phonetically, even while *meat*-words are also transferring into a third category of *meet* (Labov 1994: 384-7; the data, impressionistic rather than acoustic, is from Harris 1985; more on this in §4.4.2.6). And the case of New York City *source*∼*sauce* (Labov *et al.* 1972: 229-234) shows considerable, stable acoustic overlap, although the following /r/ in *source* complicates matters.

Aside from near-mergers – which are a relatively stable, if rare, property of speech communities – there are two circumstances in an individual's life that could plausibly result in closely approximated vowels.

If a speaker learned a vowel distinction as a child, but has since abandoned it because of relocation or communal change, a acoustically-small vestige of the distinction might remain in their speech. Potentially, such a vestigial distinction could be amplified when greater attention is paid to speech, but it is also possible for it to be further suppressed.[46]

[46]This is imagining a version of the 'Bill Peters effect'; Peters was a central Pennsylvania speaker with a

On the other hand, consider a speaker who was merged in early life but more recently has been in contact with people who have a distinction between two vowels. Such distinctions are rarely acquired in full, even when the learner is young (see Chapter 3), but it is possible that micro-distinctions between word classes could develop through subconscious accommodation, especially if word-based phonological theories are correct.

Nycz (2005) performed an experiment with a 24-year-old female New York City college student, who had the low back distinction in spontaneous speech. The speaker maintained a significant difference in a cooperative task of describing imaginary map routes,[47] a task she repeated with a merged and a distinct partner.

With the merged partner, however, the NYC speaker's low back vowel formant means are closer together (as seen in Table 4.10; her token clouds overlap more.

PARTNER	F1 /ah=o/	F1 /oh/	DIFFERENCE	F2 /ah=o/	F2 /oh/	DIFFERENCE
distinct	766	708	58	1378	1247	131
merged	697	669	28	1312	1217	95
change	-69	-39	-30	-66	-30	-36

Table 4.10: F1 / F2 values for a 24-year-old NYC female on a 'map task' with two partners (adapted from Nycz 2005: 2)

More recent work by Nycz (forthcoming) explores how general such accommodation is – both in the direction mentioned, and when natively-merged speakers are exposed to distinct vowels – relating these effects to individual stability and change over the lifespan.[48]

It is somewhat difficult to evaluate the data of Table 4.10 without access to paired measurements of similar words. One notes that both formant values, for both word classes, are slightly lower when the task is completed with the merged partner; that is, both vowels

clear /o/∼/oh/ distinction in spontaneous speech – more than 200 Hz difference in F1, 400 Hz in F2 – but who produced only a very small difference of 25-100 Hz in F1 during minimal pair tests, a distinction, moreover, that he could not hear (Labov *et al.* 1972: 235-6).

[47]The territory mapped, naturally enough, is riddled with *coffee shops, law* schools, *hot dog* stands, etc.

[48]For example, when speakers move to New York and find themselves in a 24-hour, life-size 'map task'.

move up and back, but /ah=o/ does so twice as much as /oh/, leading to an overall narrowing of the gap between the two.

Even though over 100 tokens of each vowel were measured from each task condition, it cannot be assumed that the mean is an unbiased estimate of the vowel tendency. A paired statistical analysis would be very useful here.

Regarding suspiciously-small formant differences in any of the above situations, it should always be borne in mind, when F1 and F2 mostly overlap, that other acoustic properties not measured here (such as duration and spectral slope) could play a role in distinguishing two vowels.

When extracting low vowel tokens from spontaneous speech, the analyst usually observes a surfeit of /o/ and a deficit of /ah/ and /oh/ in a given length of recording. Unless the linguist measures every /o/-word, as Herold did, they may try to select the 'best' tokens with /o/, using vague criteria. By measuring a predetermined set of vowels for each speaker, as was done here with the reading/minimal-pair cards, this potential source of bias (as well as frustration) is largely eliminated.

Another advantage of the paired procedure is that since the same words are analyzed for each speaker, between-speaker comparisons can be made more precisely. Looked at another way, between-speaker comparisons can cast light on individual words' behavior. If a group of otherwise-merged speakers all showed a centralized *caught,* compared to *cot,* we would doubt their merger less than if such a thing occurred for a single individual.[49]

4.4.2 Acoustic Analysis of Senior Citizens

Four senior citizens were analyzed, three of whom come from the nearby communities of South Attleboro, Plainville, and Norton MA, as seen in Figure 4.5.

[49] An explanation could even be put forth, in this hypothetical example, involving the different stress patterns of *caught the ball* and *a narrow cot.*

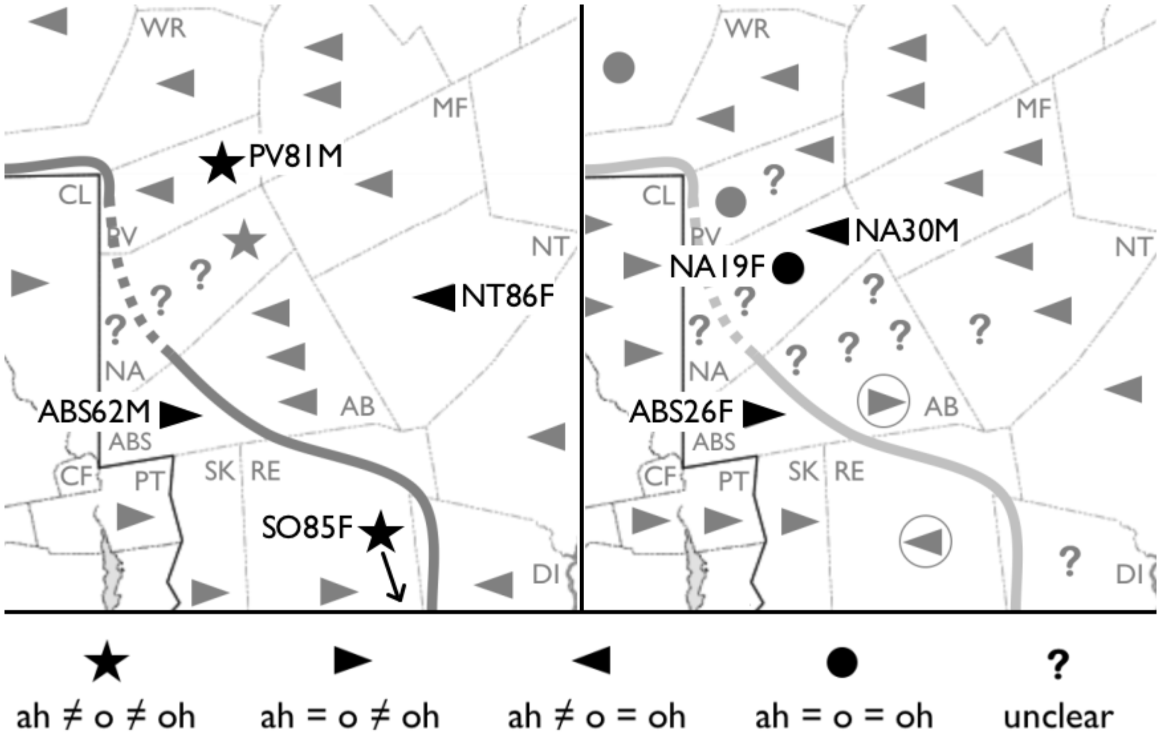

Figure 4.5: The Focus Area: 4 Seniors and 3 Young Adults Acoustically Analyzed

ABS62M, a 62-year-old man from South Attleboro, is a good example of the MAIN (Mid-Atlantic / Inland North) system, where /ah = o/ ≠ /oh/. NT86F, an 86-year-old woman from Norton, is a good example of the ENE (Eastern New England) system of /ah/ ≠ /o = oh/.

However, neither NT86F nor ABS62M were selected because they were *particularly* good examples of those patterns. Most of the senior citizens represented by triangular symbols in Figure 4.3 (or in the background of Figure 4.5) have low vowels similar to one of these two subjects.

PV81M, an 81-year-old man from Plainville, had low vowel behavior that resembled only a few other speakers. It seems likely that he has – or at least had – a three-way distinction, /ah/ ≠ /o/ ≠ /oh/. But acoustic analysis does not confirm this in a straightforward way. Another speaker analyzed had a very similar sound, but exemplified this 3-D pattern more convincingly. This was SO85F, an 85-year-old woman from Somerset MA, about 15 miles southeast of the ‘focus area’ where the other speakers were from.

4.4.2.1 The MAIN system *in extremis* – ABS62M

The first speaker to be discussed is AB62M. Plots of his paired tokens of /ah/, /o/, and /oh/ are shown in Figure 4.6, which highlights the relationship between /o/ and /oh/, and in Figure 4.7, which focuses on /ah/∼/o/.

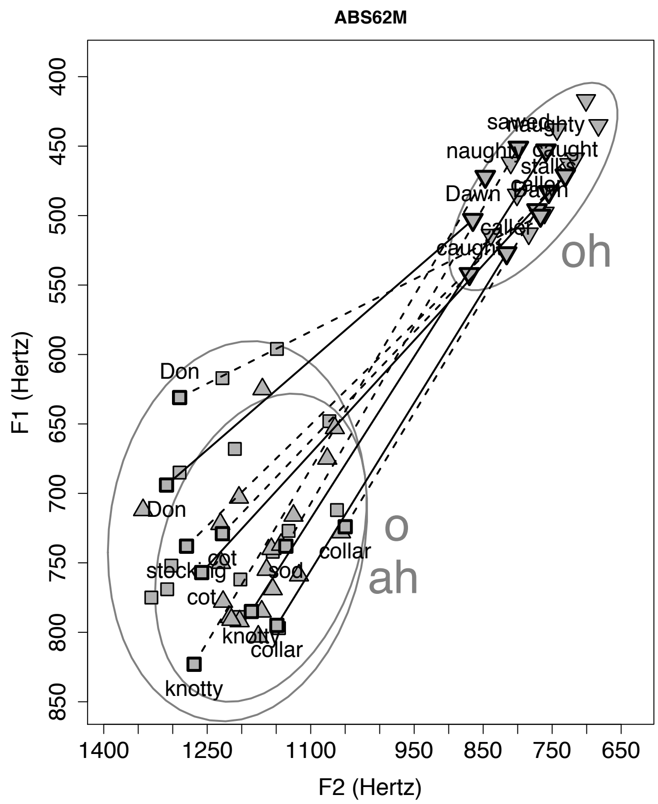

Figure 4.6: ABS62M: Paired tokens of /o/∼/oh/ (dashed: covert; solid: overt)

All plots use a 2:1 expansion ratio between the vertical (F1) and horizontal (F2) axes. A distance of 100 Hz in F1 will look twice as big than the same acoustic difference in F2. This more closely reflects auditory perception. As complete vowel systems were not measured, it was not useful to normalize between speakers.

The upward-pointing triangles represent /ah/, the squares represent /o/, and the downward-pointing triangles represent /oh/. The bold symbols derive from the overt minimal pair contexts, while the regular-thickness symbols are from the covert pairs. Any symbols where the word is not identified are unpaired tokens, usually also from the reading cards.

Figure 4.6 shows that the vowel /oh/ is much higher and backer than /o/ for this speaker. It also reveals tighter clustering for /oh/, and phonetic conditioning especially for /o/: tokens of the same word are usually close together.

The solid lines connect the 4 overt pairs: the formal minimal pairs *Don∼Dawn, cot∼caught, knotty∼naughty* and *collar∼caller,* all of which the speaker judged 'different'.

The mean difference, subtracting /oh/ from /o/, is 269 Hz for F1, and 430 Hz for F2. Reference to such differences will be very common, so a shorthand notation will be used, giving the speaker, style, and number of pairs: Δ/o/ – /oh/ (ABS62M, O, 4) = +269, +430.

The dashed lines connect the 6 covert token pairs, which are the same words as above, read in context a moment before being focused on as pairs. Two other covert pairs, whose members did not even appear on the same card, were *sod∼sawed* and *stocking∼stalks.* The mean difference is slightly smaller here, for both formants: Δ/o/ – /oh/ (ABS62M, C, 6) = +240, +407.

Taking the 10 pairs together, performing a paired t-test gives an unsurprising result. The p-value associated with the true formant difference actually being zero is 1×10^{-6} for F1 and 1×10^{-7} for F2. These word classes are clearly not merged.

A more interesting value obtained from the t-test is a 95% confidence interval for the difference in means, which can be incorporated into the shorthand thus: Δ/o/ – /oh/ (ABS62M, CO, 10) = +252 ±49, +417 ±64. For this speaker, the true difference between /o/ and /oh/ almost certainly falls within these ranges.

The tokens of /ah/ and /o/ can be seen in Figure 4.6, but the zoomed-in view of Figure

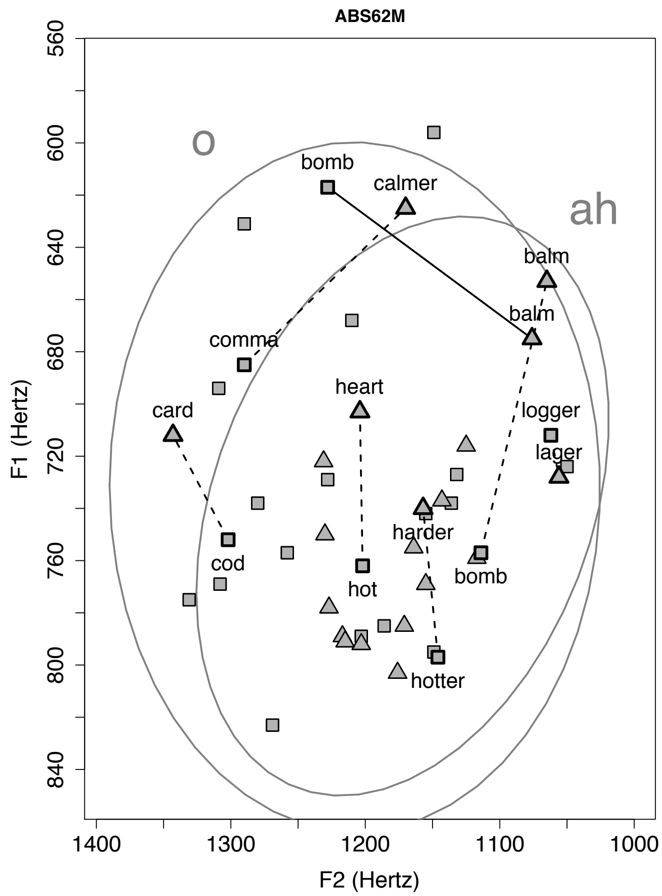

Figure 4.7: ABS62M: Paired tokens of /ah/∼/o/ (dashed: covert; solid: overt)

4.7 allows a better comparison of the two word classes, which overlap almost completely. The ellipses are sized to enclose 90% of all the tokens of each class.

The only overt pair, *balm*∼*bomb,* differs moderately (+58, −152). Note that the direction of difference is not the usual one in Eastern New England, where /ah/ is fronter (and lower) than /o/. Here *balm* is somewhat backer (and lower) than *bomb,* but the tokens sounded very similar and were judged 'same' by both speaker and analyst.

The paired t-test cannot be performed on the single overt pair, but the six covert pairs yield Δ/ah/ – /o/ (AB62M, C, 6) = -51 ± 41, -20 ± 60. The result for F2 – where the confidence interval comfortably includes zero – indicates that the difference is not statistically significant (p = 0.43).

The result for F1 is more interesting. For five of the six covert pairs, /ah/ is higher than /o/, and though the mean difference of -51 Hz (for the six) is very small, the paired test shows it to be significant (p = 0.02).

Three of these pairs involve /ahr/, and since this speaker did pronounce post-vocalic /r/ variably, and more so when reading, the influence of that following consonant could be at work here.[50]

However, there is no question of a following /r/ in *balm* and *calmer,* which are still higher than their counterparts *bomb* and *comma.* As noted, on repetition of *balm*~*bomb,* the F1 difference reversed direction.[51]

Since the /ah/ and /o/ word classes, as a whole, occupy the same phonetic space,[52] and since they sounded identical to both speaker and listener, ABS62M will be considered to have the Mid-Atlantic / Inland North low vowel system, that is, /ah $=$ o/ $\neq$ /oh/. But the observation that /ah/ may be somewhat raised, or centralized, with respect to /o/, despite their overlap, is worth bearing in mind when comparing the vowels of other speakers.

4.4.2.2 A classic ENE system – NT86F

The next senior citizen speaker whose vowels will be discussed is NT86F. A vowel plot showing her paired tokens of /o/ and /oh/ is given in Figure 4.8, while Figure 4.9 focuses on how /ah/ relates to the other classes.

The token clouds of /o/ and /oh/ overlap almost completely, and the t-test results for the covert pairs definitely indicate merger of the two word classes: Δ/o/ – /oh/ (NT86F, C, 7)

[50] Indeed, post-vocalic /r/ can have an effect on vowel quality even when the /r/ is definitely not pronounced, as Labov *et al.* (1972: 229-234) discuss regarding New York City *source*~*sauce.*

[51] ABS62M did not repeat *lager*~*logger* as a minimal pair; he said "I say them the same" and moved on to the next card. Had I doubted his merger of /ah/ and /o/, I probably would have asked him to repeat the pair.

[52] One token of the word *ask* was also measured close by, and it was also perceived auditorily as a 'broad-*a*'; that is, it is an /ah/-word for ABS62M, though a member of the /ae/-class for most younger speakers.

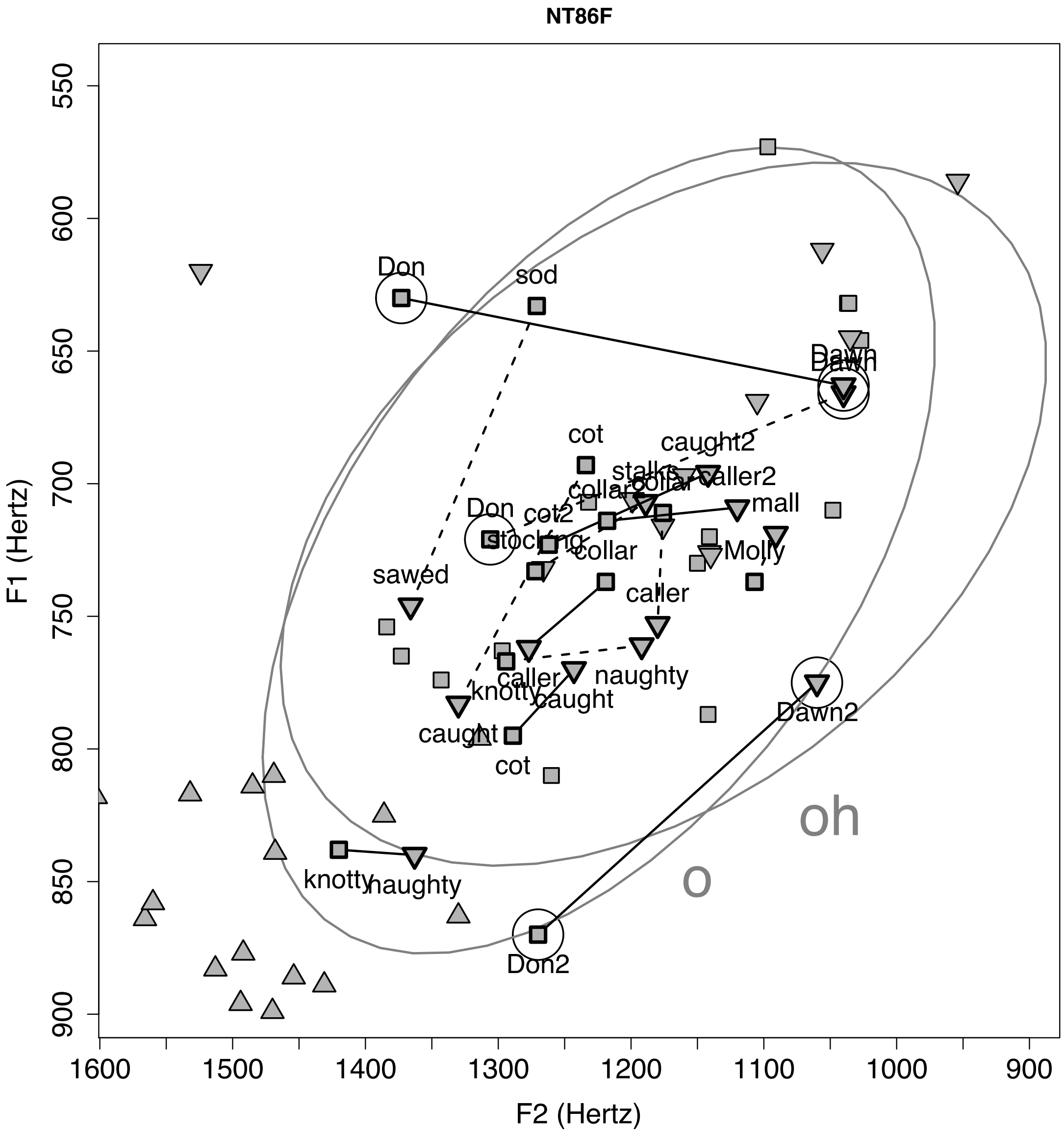

Figure 4.8: NT86F: Paired tokens of /o/∼/oh/ (dashed: covert; solid: overt)

$= -20 \pm 58$ (0.43), $+39 \pm 117$ (0.45).

It is not exactly that the difference between the word classes – the mean difference in means – is too small to come out as significant. What is more important is the amount of variability among the differences – the variance of the differences in means. So while the *average* difference was -20 for F1, $+39$ for F2, four out of seven pairs went in the opposite direction for F1, having a positive difference, and three of seven pairs had a negative difference for F2.

4.4.2.3 A statistical digression

In the context of that much variation – the standard deviation of the seven differences was 127 Hz – the paired t-test is reporting that average differences as far from zero as -20 or $+39$ Hz could very likely arise by chance with this sample size, even if there were no real overall difference between the word classes. Because of the variance, we would need a large number of pairs for the mean difference to reliably approach zero.

If the seven pairs had shown an equally small average difference, but differed more consistently from pair to pair, the t-test would have pointed to an underlying contrast. To demonstrate this, I took the seven F1 values for the /o/-class tokens and modeled F1 values for imaginary /oh/-class tokens such that the average difference between classes was still -20 Hz, but was less variable, having a standard deviation of 20 Hz.

This still represents considerable variation; in five consecutive trials, the 'F1' differences for the seven pairs ranged from -48 to -4, -54 to -14, -33 to $+9$, -48 to -12, and -38 to $+2$. Yet even with only seven pairs in each run, the paired t-test reported a significant difference more than half the time: p = 0.006, 0.0008, *0.07,* 0.02, 0.01. Whenever the sample mean difference approached -20 Hz, the p-value was usually less than 0.05, and sometimes much less, as we can see.

Note that an unpaired two-sample t-test, when given this data, usually returned p-values greater than 0.50. The lowest p-value for the five runs above was 0.40, the highest 0.74. The paired t-test is much more effective in rejecting the null hypothesis in cases like this, where it should be rejected. Compared to the unpaired version, the paired t-test has greater statistical *power* to identify actual distinctions, eliminating 'Type II error' (false negatives).

However, as Herold (1990) demonstrated, the challenge in this type of analysis is usually the reverse situation, when the statistical test rejects the null hypothesis of merger even when it is actually justified, known as 'Type I error' (false positives).

This frequently occurs if tokens of various word classes are not balanced according to phonetic environment. Using a paired t-test addresses this problem by considering only words with appropriately similar pairs. While it is still a good idea to have phonetically-balanced samples, it is no longer critical because, for example, each far-back token of /oh/ before /l/ will be compared to a (presumably) far-back token of /o/ before /l/.

Beyond that, the paired t-test is not a magic bullet for combating Type I error. In fact, its sensitivity can even exacerbate the problem. Remember that when there are small, consistent differences between two overlapping sets, a paired t-test usually identifies them as significant where a regular two-sample t-test may not.

As a constructed example, take the set (10, 20, 30, 40, 50, 60, 70, 80, 90) – mean 50, standard deviation 27 – and the set (10, 21, 32, 40, 51, 62, 70, 81, 92) – mean 51, s.d. 28. An unpaired t-test returns a p-value of 0.94 regarding the difference of $+1$ in overall means; a paired t-test returns a p-value of 0.009 regarding the average difference of $+1$ between the members of each pair.

If we take the same first set, but make the each member of the second set differ from the corresponding element of the first by a random number between -2 and $+2$, we find that the unpaired test will never return a significant result, because even in the unlikely event that the mean of the second set is as low as 48 or as high as 52 ($p = 1 \times 10^{-6}$), such a mean is not significantly different from 50, given the range of values from $\sim$10 to $\sim$90. It would take a set as different as (-20, -10, 0, 10, 20, 30, 40, 50, 60) or (40, 50, 60, 70, 80, 90, 100, 110, 120) to achieve a significant result in an unpaired test; those means, 20 and 80 respectively, would be different enough from 50 ($p = 0.04$).

But this made-up data obviously does have a paired structure, and a paired t-test will return false positives, at the 0.05 level, approximately 5% of the time. In these cases, through sheer chance, seven or eight of the nine paired differences will have the same sign.

In running repeated paired t-tests on actual vowel data, it is important to realize that some false positives will occur. But by performng the tests on F1 and F2 separately, it provides a check that will prevent most cases of Type I error. Only once in every 400 comparisons would a false positive occur for both formants at the 0.05 level, and only once in every 1600 comparisons would it occur for both formants in the same direction as the actual low vowel distinction.

For these reasons, when the paired t-tests give no indication of a distinction for either formant, a true vowel merger is highly likely, and when they indicate a difference for both formants ($p < 0.05$) that is in the same direction as actual low vowel distinctions, a non-spurious distinction in pronunciation is very likely.

4.4.2.4 NT86F (continued)

When responding to the covert pairs, NT86F said most of the key words twice, leading to more data points. This also highlighted an interesting discrepancy between *Don∼Dawn,* which the speaker pronounced differently, and the other three /o/∼/oh/ pairs, which she pronounced alike, in her own judgment and mine.

In fact, she had pronounced *Dawn* distinctly back of *Don* in the covert context as well, and I had noticed this immediately. Such a regular difference between two pairs – which could be of type 1 or 2 in the scheme laid out in §4.1.2 – was not observed from many other speakers, but this particular word pair brought it out more often than others. It may be that people associate *names* with the way acquaintances bearing those names pronounce them, in a way that can sometimes approximate a phonemic split.[53]

If the tokens of *Don*∼*Dawn* are removed, the covert-pair differences remain non-significant, and the overt-pair differences – which would otherwise show an F2 effect, because of the tokens of *Don* and *Dawn* – are not significant either: Δ/o/ – /oh/ (NT86F, O, 5) = +6 ±27 (0.56), +53 ±85 (0.16).

It may be worth noting that for both formants, NT86F moved in the direction of the typical distinction (positive values for the differences), when she moved from covert to overt pairs. Indeed, four of the five overt pairs show /oh/ backer than /o/, by 46 to 120 Hz.

This is reminiscent of how ABS62M pronounced /ah/ slightly higher than /o/ in most pairs, even though the entirety of those word classes occupied the same acoustic space. For NT86F, it is /o/ and /oh/ that completely overlap, but again, a detailed closeup reveals the possibility that the two classes are not completely undifferentiated.

However, this may be a chance result, and it is clear that in terms of gross production and perception, the /o/ and /oh/ word classes of NT86F are merged – except, intriguingly, for *Don*∼*Dawn* (and perhaps other words that were not investigated).

Figure 4.9 shows that the /ah/-class is distinct from the merged /o=oh/-class just discussed. The separation is by no means as great as was seen for the /oh/ of ABS62M, and there is a small amount of overlap. However, the paired method illuminates how a small amount of acoustic overlap may not mean very much, linguistically, if it is phonetically dissimilar tokens that overlap, while potentially contrasting ones have a clear difference.

The top panel of Figure 4.9 displays the pairs, both overt and covert, that contrast the /ah/ word class with that of /o/. This is the same comparison made in Figure 4.7, but with

[53] In my personal experience, I have met an *Anna* who insisted on [ɑ] in the first syllable of her name, and a *Tara* who used [æ], and I had to learn to use those forms in speaking to (and about) those people. I was used to [æ] or [æ̃] in *Anna* and [ɑ] in *Tara*; to reverse these vowels sounded foreign in the first name, and in the second it required some phonotactic adjustment. If I came to know a person with such a name well, the initially-foreign version *might* even become my default pronunciation of the name.

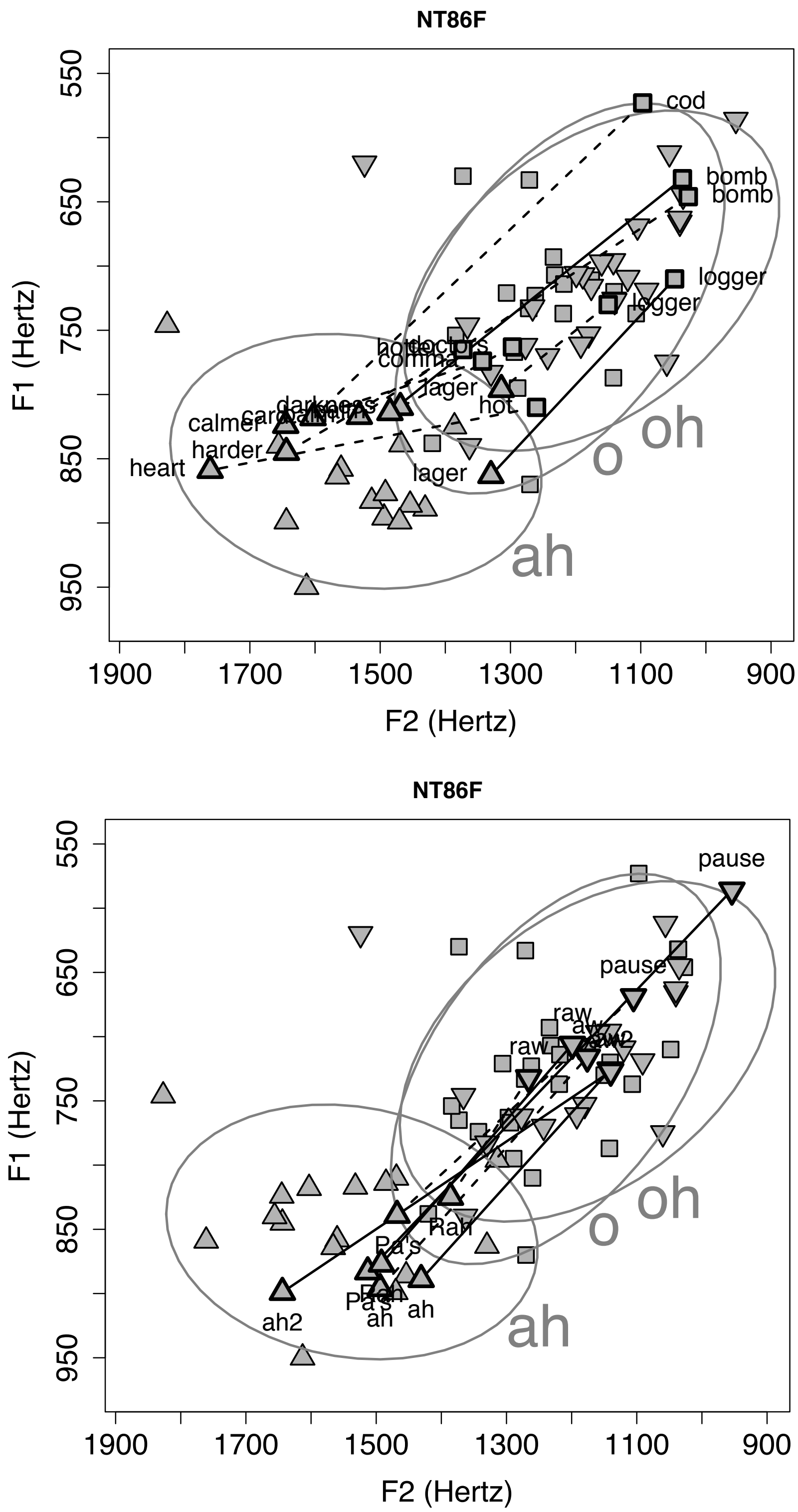

Figure 4.9: NT86F: Paired tokens of /ah/∼/o/ (top), /ah/∼/oh/ (bottom)

a different outcome. Here, there is a clear distinction in both formants. For covert pairs, Δ/ah/ – /o/ (NT86F, C, 7) = +101 ±71(0.02), +346 ±144 (0.001). There are only two overt pairs, and the p-values are not significant, but the actual differences between pairs are just as large – bigger, actually: Δ/ah/ – /o/ (NT86F, O, 2) = +168 ±184 (0.06), +366 ±1061 (0.15). Both overt pairs were judged "different" by both speaker and analyst.

The overlap between these word classes involves /ah/-tokens that are far back for /ah/ – especially *lager* and *balm* – and tokens of /o/ that are far front and low for /o/ – *hot, hotter, comma.* This may seem obvious, but note the position of the pair corresponding to each of these words: *logger* and *bomb* are among the furthest back in the /o/-class, and *heart, harder, calmer* are some of the frontest /ah/-words.[54]

So while the two tokens of *lager* have F2 values of (covert) 1314 and (overt) 1330 Hz, further back than *comma* and *hotter,* which measured at 1343 and 1373, each of these words has a pair whose F2 differs from it in the appropriate direction by a sizable margin. The tokens of *logger* are 164 and 282 Hz further back than those of *lager,* and the examples of *calmer* and *harder* are 302 and 271 Hz fronter than their paired counterparts.

In the bottom panel of Figure 4.9, one sees the result of comparing /ah/-words to /oh/-words. Although these necessarily involve different lexical items – there are very few, if any, useful three-way minimal pairs – the picture is very similar. This makes sense, since if /o/ and /oh/ are merged in /o = oh/, words from the /ah/-class would have no business behaving differently with respect to /oh/ than with respect to /o/.

The acoustic measurements reflect this parallel behavior. For covert pairs, Δ/ah/ – /oh/ (NT86F, C, 3) = +148 ±118 (0.03), +267 ±321 (0.07). Since the subject repeated one

[54]Presumably, these parallels are mainly due to minimal pairs being affected similarly by the same preceding and following consonantal environment. Some portion of these effects reflect a less-than-perfect match between vowel quality as perceived, and the vowel-measurement procedures used; however, most of the front and back tokens discussed above really sound that way. Whether functional pressures are also at work – whether words that contrast are kept apart because they need to be – will be revisited in §4.4.2.

pair,[55] there is an additional overt token: Δ/ah/ – /oh/ (NT86F, O, 4) = $+201 \pm 102$ (0.01), $+411 \pm 223$ (0.01). More clearly than any so far, these pairs – already distinct when read in context – move noticeably apart when the speaker is more conscious of them.

Given the amount of distance between the /ah/$\sim$/oh/ pairs – *ah*$\sim$*aw, Pa's*$\sim$*pause,* and *Ra*$\sim$*Raw* – it is unsurprising that they all sounded quite different to the analyst, and were also judged "different" by NT86F herself.

NT86F has, therefore, a typical Eastern New England low vowel system, where /ah/ $\neq$ /o = oh/. The only exception to this is her regular differentiation of the names *Don* and *Dawn,* which still remain in or close to the /o = oh/ area. The /ah/-words are lower and fronter, especially when phonetic environment is considered, and they also include two tokens of broad-*a* in *half.* Being almost completely non-rhotic completes her typical ENE sound, although both non-rhoticity and broad-*a* can be found alongside the MAIN vowel system too, as we saw for ABS62M.

4.4.2.5 A possible 3-D pattern – PV81M

One of the first senior citizens interviewed was PV81M, and his pattern of production and perception was hard to reconcile with other systems then observed. His vowels seemed even more exceptional as more ENE- and MAIN-type seniors were recorded. In the end, five other seniors would exhibit a similar-sounding pattern to varying degrees.

These speakers had, or at least often seemed to have, a three-way distinction between the low vowels /ah/, /o/, and /oh/. The general auditory impression was of an /ah/ that was sometimes, though not consistently, quite fronted (suggesting ENE), an /o/ that spanned a wide range, sometimes being front and unrounded (suggesting MAIN), sometimes back and rounded (suggesting ENE), and an /oh/ that was variable but often very high and back (suggesting MAIN).

[55] This repetition, of the affective words "*Ah* and *Aw*", was notable for a so-called 'intrusive *r*': [aːɹənɒː].

More crucially, given the complicated phonetics, is that these speakers explicitly judged /ah/∼/o/ “different” in minimal pairs, yet reported /o/∼/oh/ to be “different” too. If *balm* had a different vowel from *bomb,* for example, and *Don* was also distinct from *Dawn,* the system must, under a certain simple logic, be three-way-distinct.

But that behavior does not imply 3-D, of course, if the /o/-class had split in some previously unattested way, something that seemed quite plausible in light of productions where the vowel of *Don* was not far from *balm,* while *bomb* had a quality closer to *Dawn.*

The acoustic analysis of PV81M mirrors these impressionistic observations, although as noted, he was a more unusual example of it than some others. In Figure 4.10 we see the tokens of all three word classes, and their overlapping ellipses; the highlighted comparisons are the /o/∼/oh/ pairs, both covert and overt.

The four overt pairs all differ by more than 100 Hz in both F1 and F2. Only the closest of these, *collar*∼*caller* (+105,+122), was judged “same” by the informant. The other three were judged different or close. The opinion of the paired t-test is that the speaker is making a distinction: Δ/o/ – /oh/ (PV81M, O, 4) = +141 ±57 (0.004), +204 ±96 (0.007).

Of the covert pairs, some showed an even greater distinction, the biggest one being *stocking*∼*stalks* (+191, +323). Other covert pairs measured as very close: *collar*∼*caller* (+43, +52) had been judged “probably same” by the analyst, while *Don*∼*Dawn* (+18, +34) had somehow managed to sound different.

The t-test for these seven pairs shows that they are closer than the overt pairs, but still statistically distinct, taken together: Δ/o/ – /oh/ (PV81M, C, 7) = +96 ±53 (0.005), +138 ±93 (0.02). Even if we take the four closest pairs, which happen to involve the same words as the overt tokens, a small but significant result obtains: +60 ±56 (0.04), +69 ±54 (0.03).

It seems as though this speaker produces a distinction between /o/ and /oh/, though it is sometimes – for example, under conscious attention – much clearer than other times. For context, we can note that the most distinct /o/∼/oh/ pairs produced by PV81M were

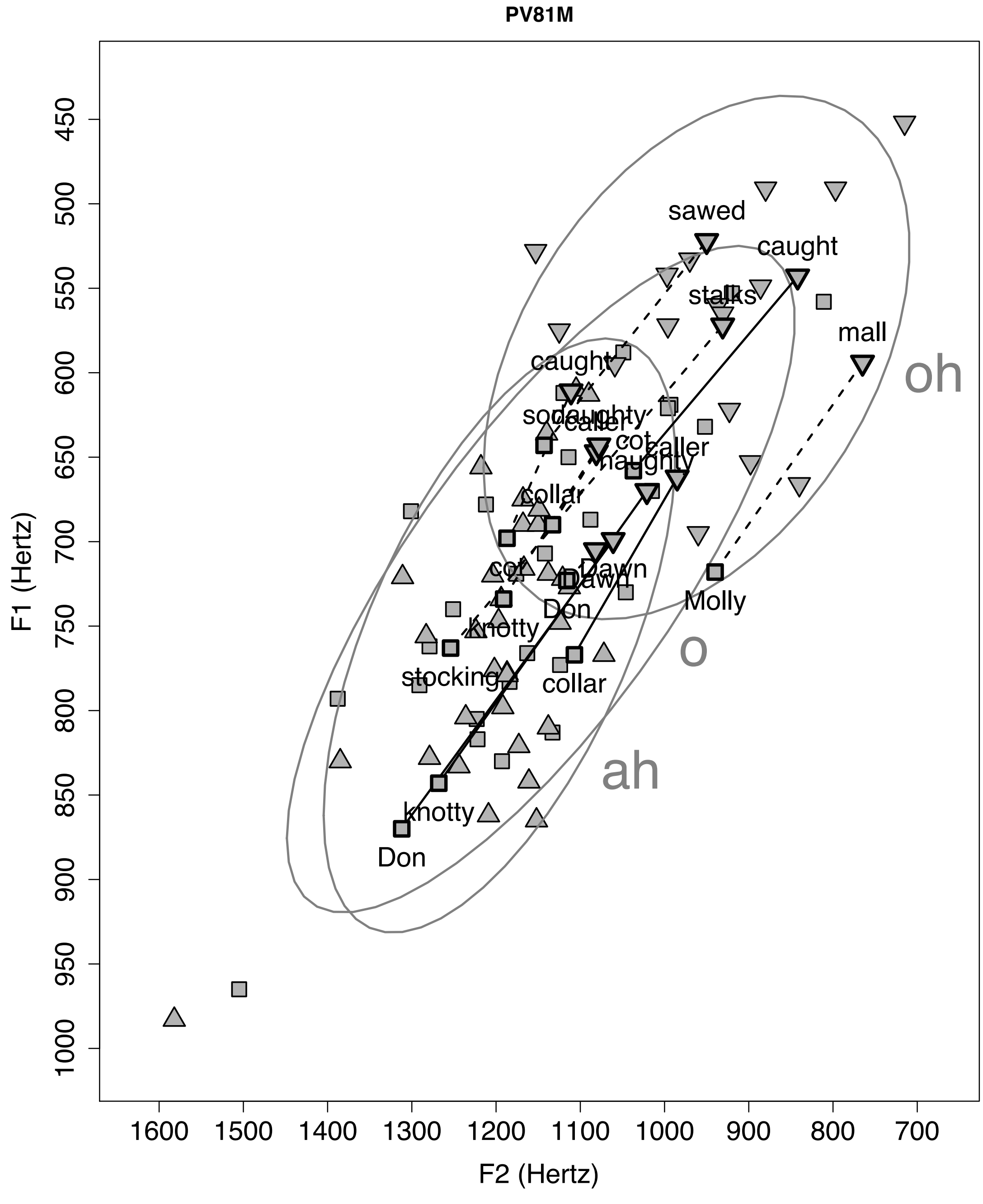

Figure 4.10: PV81M: Paired tokens of /o/∼/oh/ (dashed: covert; solid: overt)

acoustically closer than the closest pairs produced by ABS62M.

Turning to see how the /ah/ word class fits into the picture, we will see things become more complicated. Based on his covert /ah/∼/o/ pairs, illustrated in Figure 4.11, one would think PV81M has definitely merged those two classes, putting him in the MAIN category.

Each of these seven pairs is very close together in terms of F1 / F2. Other than *card∼cod,* where the /ah/-word is 104 Hz further front (still not a large difference by any means), neither of the formant differences exceeds 41 Hz for any pair. And while four of the pairs do have both micro-differences in the 'right direction', two have both differences in the wrong direction. It is no surprise that the t-test finds the overall mean differences to be non-significant: Δ/ah/ – /oh/ (PV81M, C, 7) = $+9 \pm 21$ (0.31), $+17 \pm 42$ (0.37).

Note also that the paired t-test does not take into account the position of the pairs, but only evaluates the differences between the members of each pair. The relevance of this can easily be seen in Figure 4.11, where each pair is clustered close together, but the different pairs are relatively far apart from each other. For example, *lager* and *logger* are about 50 Hz apart, near (600, 1075); *calmer∼comma* are about 30 Hz apart (in the same direction), but located near (825, 1225).

In the current case, there is no problem, since the within-pair differences are not significant. But if they were, it would pose a challenge for the interpretation of these vowels' phonology. It would no longer be possible to think of 'word-class membership' as essentially equivalent to 'underlying category', if the historical origin of a word consistently showed a small phonetic effect – subordinate in importance to phonetic conditioning – *inside* of an impressionistically-merged group.[56]

[56] As an illustration, consider the weather in Boston and Providence. The temperature is usually a few degrees warmer in Providence, and this could be demonstrated conclusively by a paired t-test on observations taken at the same time over a set of days. But while the set of Boston measurements in some sense represent 'cooler weather' and those from Providence 'warmer weather', the temperature ranges over a year would overlap almost completely, perhaps 10-95 °F in Boston, 12-97 °F in Providence. No one could accurately determine which city they were in on a given day by the temperature alone.

Unless the distinction produced between two vowels is completely vestigial, that is, useless for perception,

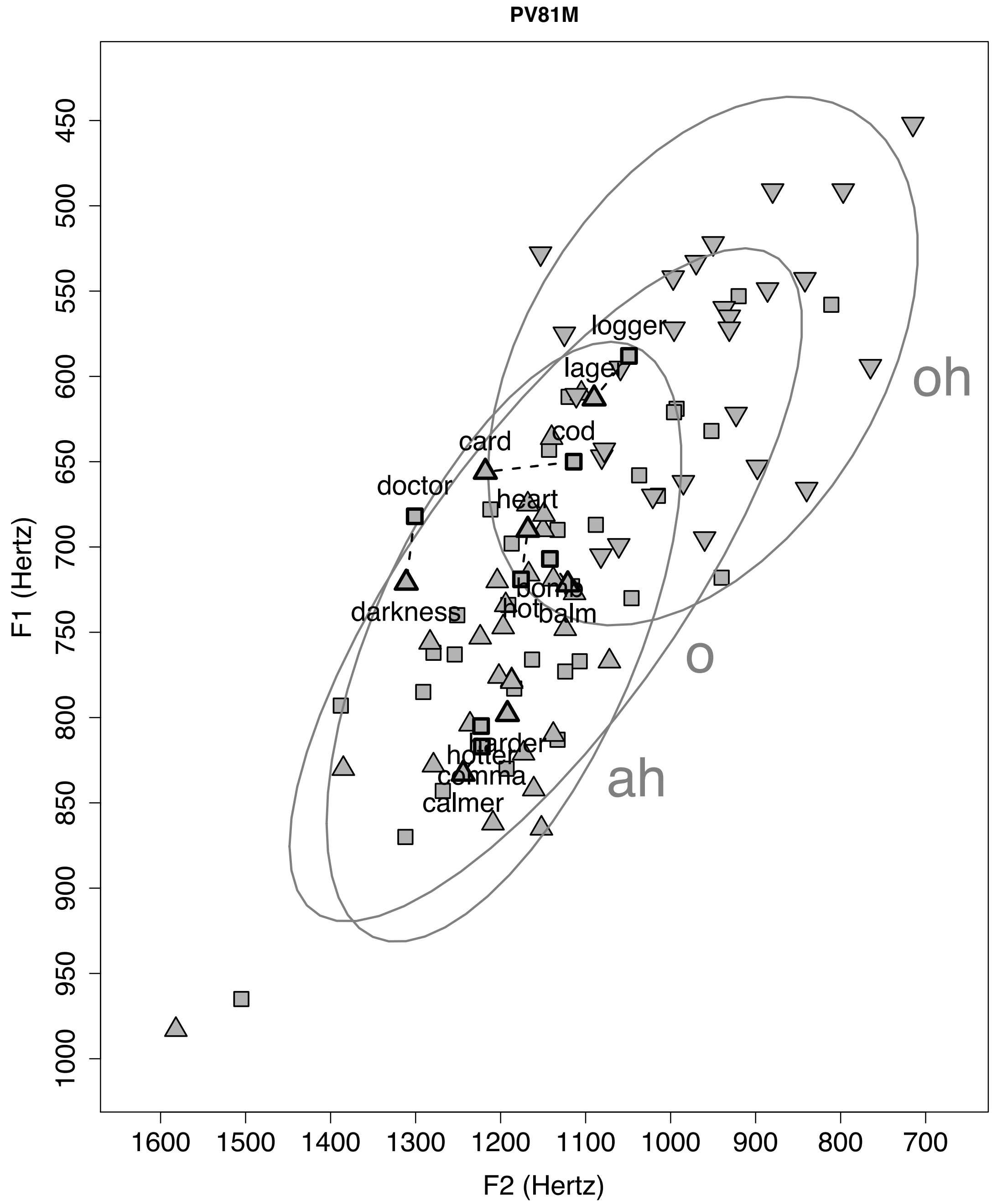

Figure 4.11: PV81M: Paired tokens of /ah/∼/o/ (covert context)

But this brings up the issue of how PV81M's covert /ah/ and /o/ actually sounded. They did not sound as close together as the F1 / F2 measurements would lead one to believe, nor did many of the tokens observed in his spontaneous speech.

Recall that the reason why speakers like PV81M were suspected of having a three-way distinction was the noticeable rounding of some of their /o/ tokens. This was not observed for any tokens of /ah/, nor was it a characteristic of the /ah = o/ of 'real' MAIN-system speakers, such as ABS62M and many others.

For PV81M's seven covert /ah/∼/o/ pairs, Table 4.11 compares the measured formant differences with my original 'live' impression of the pair, where available, and my current impression after repeated listening.

/ah/∼/o/ pair	ΔF1	ΔF2	impression (live)	impression (repeated)
balm∼bomb	15	-21	??	same
card∼cod	6	104		quite different
calmer∼comma	16	22		different
darkness∼doctor	39	10		different
heart∼hot	-29	-8		same
harder∼hotter	-7	-31		different?
lager∼logger	25	41	different	same?

Table 4.11: PV81M: Acoustic differences and auditory impressions of covert /ah/∼/o/ pairs

Considering the small formant differences, it is likely that the perceptual difference between the pairs is associated with other acoustic properties. For most of the pairs that sounded different, the /o/-class word sounded noticeably rounded, while the /ah/-class word sounded unrounded.

As lip rounding can be difficult to accurately hear (Ladefoged 1960) as well as to measure (Johnson 2000), these results should be interpreted with some caution. However, for context, consider ABS62M again: when he pronounced an /ah/∼/o/ pair, the vowels

doesn't there need to be a decent-sized absolute difference in sound, as well as distinctions pair by pair?

usually sounded identical, even on repeated hearing. PV81M, on the other hand, made a subtle but perceptible distinction, at least some of the time.

When PV81M repeated some of these pairs in the 'overt' condition, the questionable distinction became a very noticeable one, as seen in Figure 4.12. We are dealing with two examples each of *balm∼bomb* and *lager∼logger,* and /o/ was now consistently higher, backer, and/or rounder than /ah/.

The p-values are surprisingly high in the overall result, Δ/ah/ – /o/ (PV81M, O, 4) = +122 ±141 (0.07), +195 ±193 (0.05), but in fact this is related to the *lager2∼logger2* pair, even though its formant differences are *greater* than the other pairs.[57] If that 'outlier' pair is removed, the F2 p-value drops to 0.006.

In making these larger distinctions against /ah/, PV81M's /o/ enters the acoustic territory of his /oh/, and the effect is rather confusing, especially remembering how some of his /o/ tokens had sounded extremely /ah/-like when matched with /oh/.

The 100Hz-plus distinctions made by PV81 in the overt context may involve a conscious effort to distinguish the pairs, but this is probably only possible because he does possess an underlying linguistic knowledge of the difference between the three word classes. In that sense, at least, has the 3-D system.

In moving from covert to overt minimal pairs, both ABS62M and NT86F did make

[57]This speaker had an unusual way of reporting whether he thought a pair sounded the same or different. Although it was clear he was attending to, and commenting on, the *sound* of the words, he would usually transform this into an anecdote involving the meaning. In this case, he said,

> *Lager* and *logger.* Well these are the closest, to being the same or not, Dan. But you'll find more of the *lager[2],* you'll find up in Maine: *lager[3].* And you'll find the *logger[2]* down more in the western part of the country."

In contrast to the covert *lager∼logger,* which had been very close, the first overt *lager∼logger* sounded different, *lager2∼logger2* distinctly different, and *lager3* had an exaggeratedly fronted vowel, which fairly accurately mimicked the /ah/ found in Maine, where PV81M spends time in the summer. The focus is apparently on the sound; it would be strange to say that lager beer is found more there.

Next, he could be saying that the rounded, backer vowel is found in the West – but in which word? both? – or else that he associates loggers with that region. The comment resists a single coherent interpretation, except that PV81M knows the key words do, or at least should, sound different.

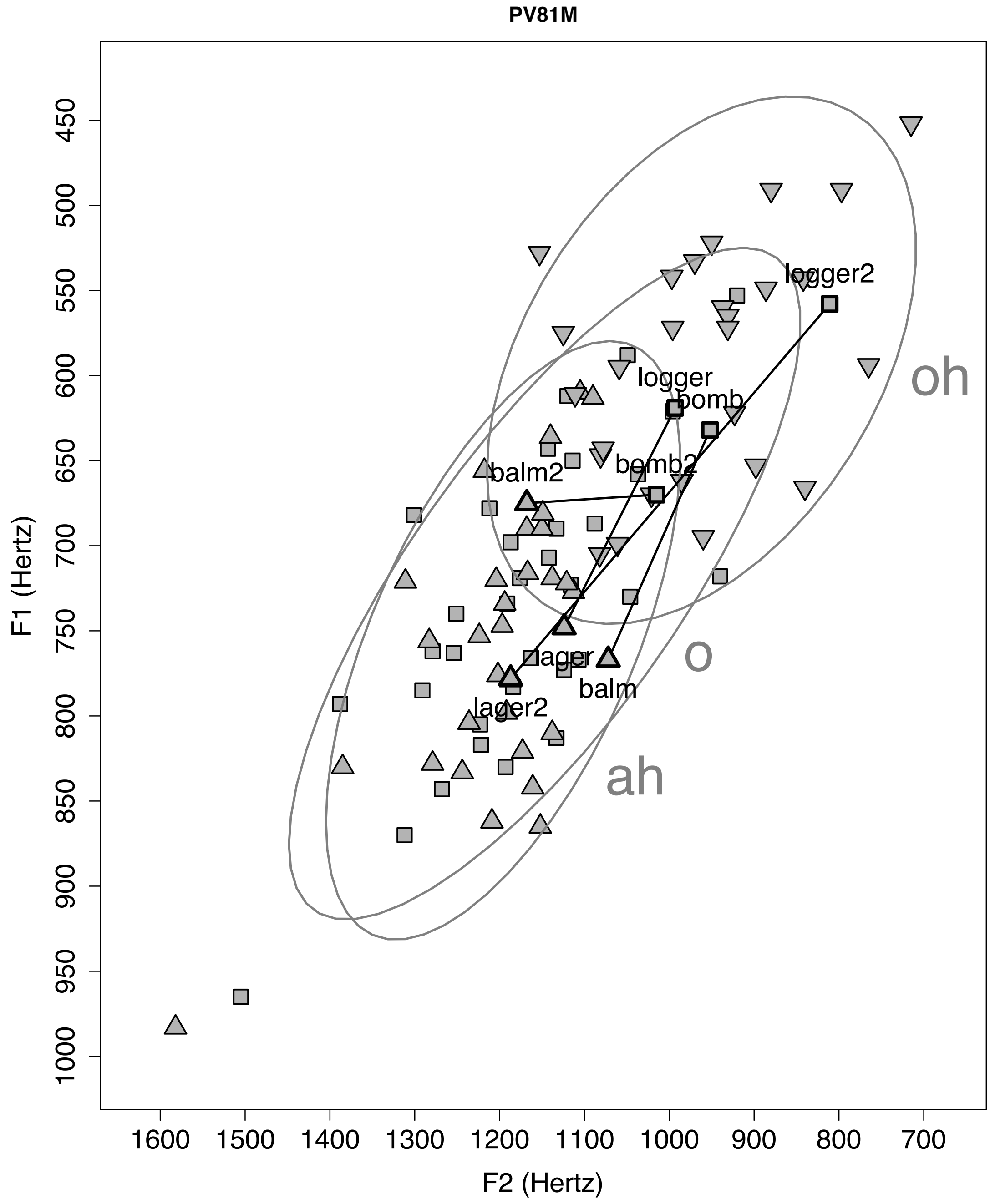

Figure 4.12: PV81M: Paired tokens of /ah/∼/o/ (overt context)

slightly bigger distinctions even between word classes that were essentially merged for them, an interesting development in its own right. But PV81M's shift was much more dramatic, and included judgments as well as greater acoustic differences.[58]

Figure 4.13 summarizes of the overt and covert tokens of the three word classes. The thicker, bolder symbols represent the overt tokens, means, and 'whiskers' (which extend to ± 1 standard deviation from the mean for F1 and F2).

The pattern from words read in context – the covert pairs – is /ah $=$ o/ $\neq$ /oh/, and tokens from spontaneous speech (not shown) look similar. But when more attention is paid to the pairs, the mean of /o/ moves into the middle, suggesting /ah/ $\neq$ /o/ $\neq$ /oh/. However, this is misleading because as the token clouds and whiskers show, /o/ now extends across a wide, overlapping area, rather than having an intermediate quality of its own.

A reasonable suggestion is that the /ah/$\sim$/o/ distinction is not natural, or native, to PV81M's phonology, but that he consciously imitates it, being familiar with it from people he knows with the ENE system, whether in Maine (see note 57) or much closer by.

I would rather argue that it is, underlyingly, present, but he does not typically realize it – not with regular F1 / F2 differences, in any case. Perhaps this suppresion is due to prolonged contact with speakers with the MAIN system – his wife from Rhode Island, for example.

PV81M shows signs of an /ah/$\sim$/o/ distinction – and hence the 3-D pattern – in the phonetics of his /o/, even in less self-conscious speech. When attention is brought to it, he recalls and reproduces the distinction accurately.

Part of the reason for believing this is that other senior citizens exhibited the 3-D pattern more consistently than PV81M, yet the general phonetic impression of their vowels was rather similar to his.

[58]The opposite case, of speakers who make a distinction in their natural speech but suspend it in minimal pair tests, has been better documented (Herold 1990: 182-6).

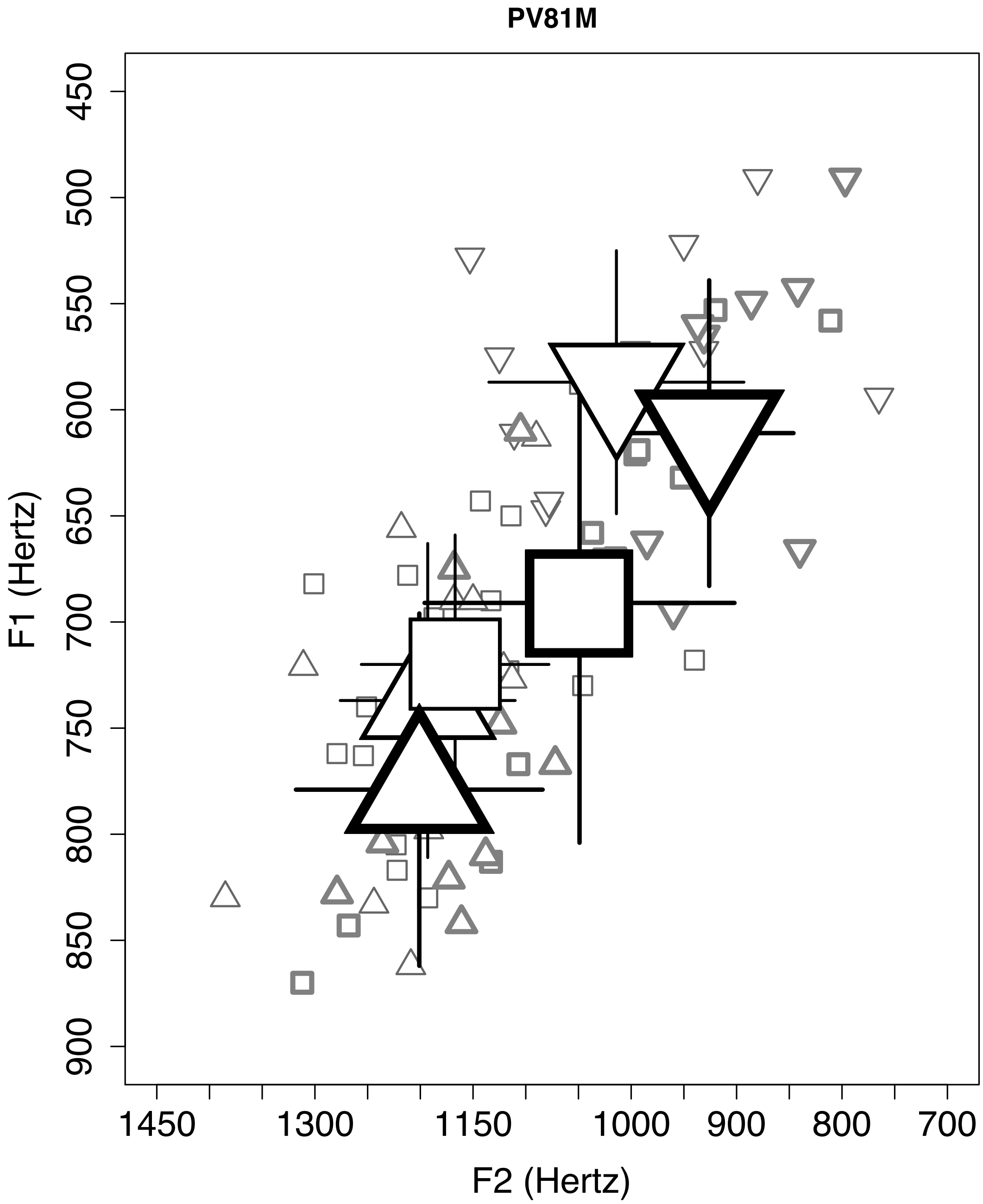

Figure 4.13: PV81M: Means of /ah/, /o/, and /oh/ (regular symbols: covert; bold: overt)

4.4.2.6 A probable 3-D pattern – SO85F

One of these people was SO85F, who comes from Somerset, a town outside the focus area, where the other senior interviewed had a MAIN system.[59] Because the same comparisons were conducted as for PV81M, the results will be presented in a more abbreviated manner.

For /o/∼/oh/, SO85F made a significant distinction (especially in F2), when the pairs were covert, and a larger one (for both formants), when they were overt:

Δ/o/ – /oh/ (SO85F, C, 8) = +85 ±75 (0.03), +295 ±164 (0.004);

Δ/o/ – /oh/ (SO85F, O, 7) = +140 ±73 (0.004), +389 ±146 (0.0007).

Again, the pair *Don∼Dawn* behaved exceptionally. Whereas NT86F had pronounced it distinct, unlike her other /o/∼/oh/ pairs, SO85F pronounced it "close" (in both of our judgments), while the other pairs were judged different. Acoustically, *Don∼Dawn* were closer than most other pairs in the covert condition, and in the overt condition they moved apart to be solidly distinct while some other pairs became exceptionally distinct.

Unlike PV81M, SO85F regularly (though not always) distinguished the /ah/∼/o/ pairs in the covert, reading context as well as when they were explicitly minimal pairs. As usual, the small number of overt pairs calls for focus on the means, not the p-values:

Δ/ah/ – /o/ (SO85F, C, 7) = +59 ±50 (0.03), +161 ±120 (0.02)

Δ/ah/ – /o/ (SO85F, O, 2) = +68 ±426 (0.29), +282 ±635 (0.11)

These pairs, too, were impressionistically judged different by the analyst, and either different or close by the speaker. So there is evidence that /ah/ $\neq$ /o/, and that /o/ $\neq$ /oh/, with /o/ represented by a different set of words, of course, in each comparison.

The case for a 3-D pattern is further bolstered by observing that when /ah/ and /oh/ are compared directly, the mean difference between pairs is considerably greater than either of the two 'intermediate' comparisons:

Δ/ah/ – /oh/ (SO85F, C, 3) = +161 ±114 (0.03), +446 ±253 (0.02)

[59]In Plainville, the home of PV81M, the other senior interviewed had an ENE pattern.

Δ/ah/ – /oh/ (SO85F, O, 3) = $+176 \pm 316$ (0.14), $+509 \pm 238$ (0.02)

If the acoustic 'end points' of the /ah/∼/o/ pairs were always close to the 'start points' for the /o/∼/oh/ pairs, there would be no doubt that SO85F had a three-way-distinct system. However, in terms of actual F1 / F2 locations, the end points of /ah/∼/o/ are sometimes close to /oh/, and the start points of /o/∼/oh/ can be close to /ah/.[60]

This can be seen in Figure 4.14. Both covert and overt means indicate a 3-D system, but there are not very many tokens of /o/ in the vicinity of its mean. Rather, about half the tokens of /o/ are clustered near the /ah/ means, and half are clustered near the /oh/ means. Although /o/ never achieves the extreme values of *some* /ah/'s and /oh/'s, it certainly overlaps with many *typical* realizations of both those word classes.

It is worth taking a closer look at which /o/-words appeared in which phonetic positions, and this is shown in Table 4.12, where the 33 measured tokens of /o/ are sorted into columns by phonetic realization and organized in rows by following segment type.

The tokens of /o/ were divided into three groups based on the diagonal dotted lines in Figure 4.14. The 14 /ah/-like tokens are those where $F1 + F2/2 > 1580$ (the overall mean of /ah/ was 1674 by this measure); the 15 /oh/-like tokens are those where $F1 + F2/2 < 1415$ (the overall mean of /oh/ was 1285 by this measure). Only four tokens fell between 1415 and 1585, even though the overall mean of /o/, 1507, was in this range.

Table 4.12 shows, first of all, that the phonetic position of /o/ for this speaker is fairly predictable by the nature of the following consonant. Except for one example, *bock,* all words where /o/ preceded an underlyingly voiceless stop were realized fairly low and/or front – more like /ah/ – and all words where /o/ preceded a voiced stop were realized higher and/or further back – more like /oh/. Most pre-nasal tokens were like /oh/, while the small pre-lateral group was split, with four far-front /o/'s before intervocalic /l/ in *collar,* and a

[60]The endpoints in the /ah/∼/oh/ comparison are not atypical for those classes. But they are consistent, while /o/ is variable, yielding the greater mean difference when compared with either /ah/∼/o/ or /o/∼/oh/.

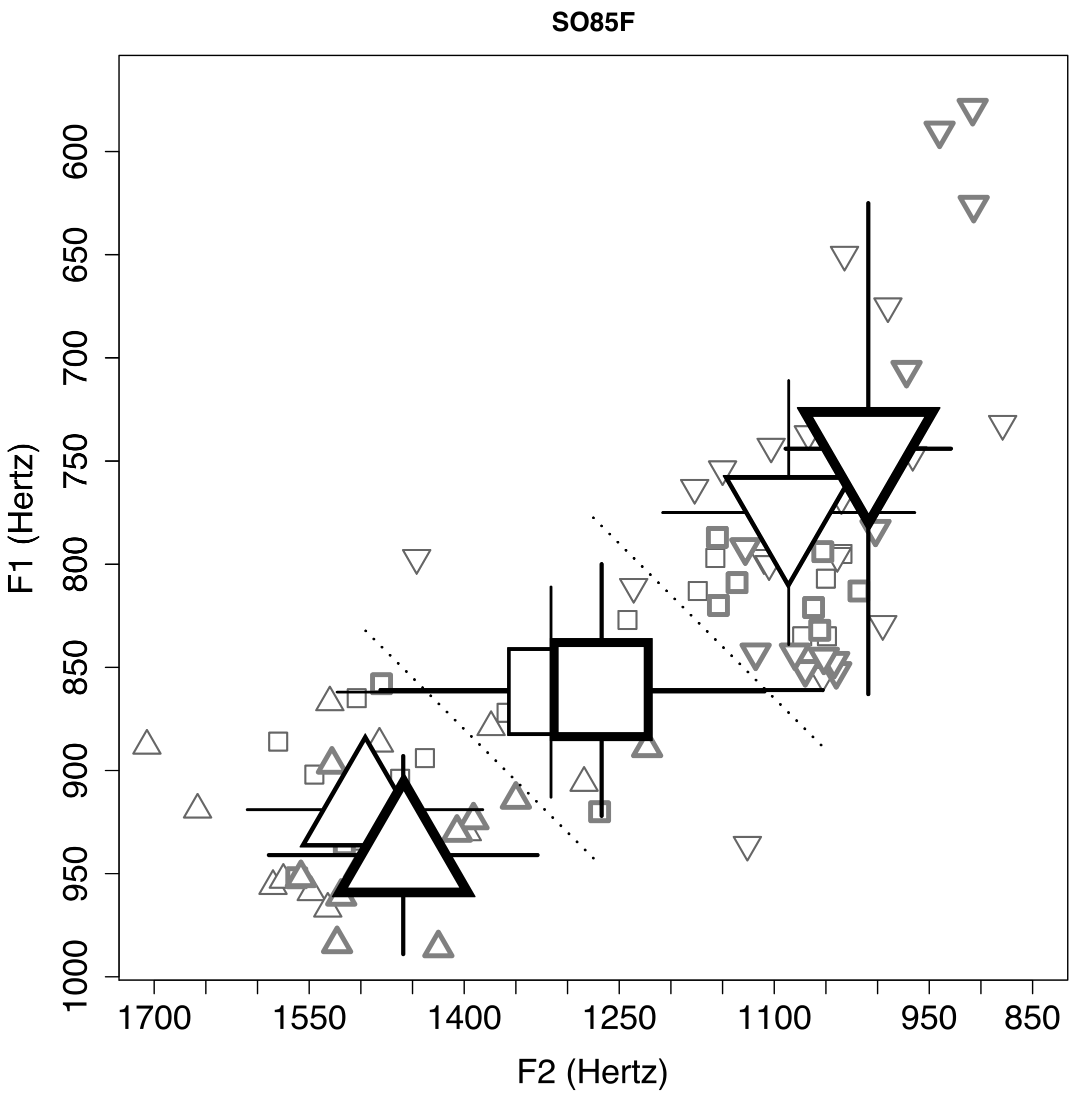

Figure 4.14: SO85F: Means of /ah/, /o/, and /oh/ (regular symbols: covert; bold: overt)
Dotted lines: (left) $F1 + F2/2 = 1580$; (right) $F1 + F2/2 = 1415$ (see Table 4.12)

following segment	F1 + F2/2 (Hz)		
	>1580 (≃/ah/)	1580–1415	<1415 (≃/oh/)
voiceless stop	cot (COO[a]) **hot** (CC[b]) **hotter** (C) knotty (CO) stocking (C)		bock (O)
voiced stop			cod (C) **sod** (C) logger (CO)
fricative	**bothers** (C)		**Oz** (OOO[a])
nasal		comma (C) John (C) Don (CO[b])	bomb (CO) con (CC[b]) **Don** (CO[b])
lateral	collar (COCO[b])		**doll** (C)

[a]SO85F repeated this minimal pair, in judging it.
[b]SO85F read the card containing this word twice.

Table 4.12: SO85F: Realization of /o/ by following segment (bold: close to paired word)

far-back /o/ before final /l/ in *doll.*

Of the eighteen word types from the /o/ class, there were seven that were pronounced quite close to the word they were paired with (these are bolded in Table 4.12).

The other pairs, like *balm∼bomb* and *cot∼caught,* were pronounced very far apart. But in both those cases, the impression was of possible merger with another category: *bomb* was high and back, like *Dawn,* an /oh/-word, while *cot* was low and front, like *card,* an /ah/-word. This data, shown in the top panel of Figure 4.15, might easily create the impression that /o/ had split between /ah/ and /oh/.

But the seven bolded /o/-words are mostly kept distinct from their paired counterparts, although the margin is often very narrow. The bottom panel of Figure 4.15 shows a selection of these pairs. In the case of the /o/∼/oh/ pairs, such as the covert *sod∼sawed* and the overt *Oz∼aw's,* the difference is rather clear. The covert /ah/∼/o/ pair *hot∼heart* and near-pair *father's∼bothers* are much closer, overlapping in fact, but they do sound different, with the /o/-vowel being rounded, as discussed above. But note that the other /ah/∼/o/ pair

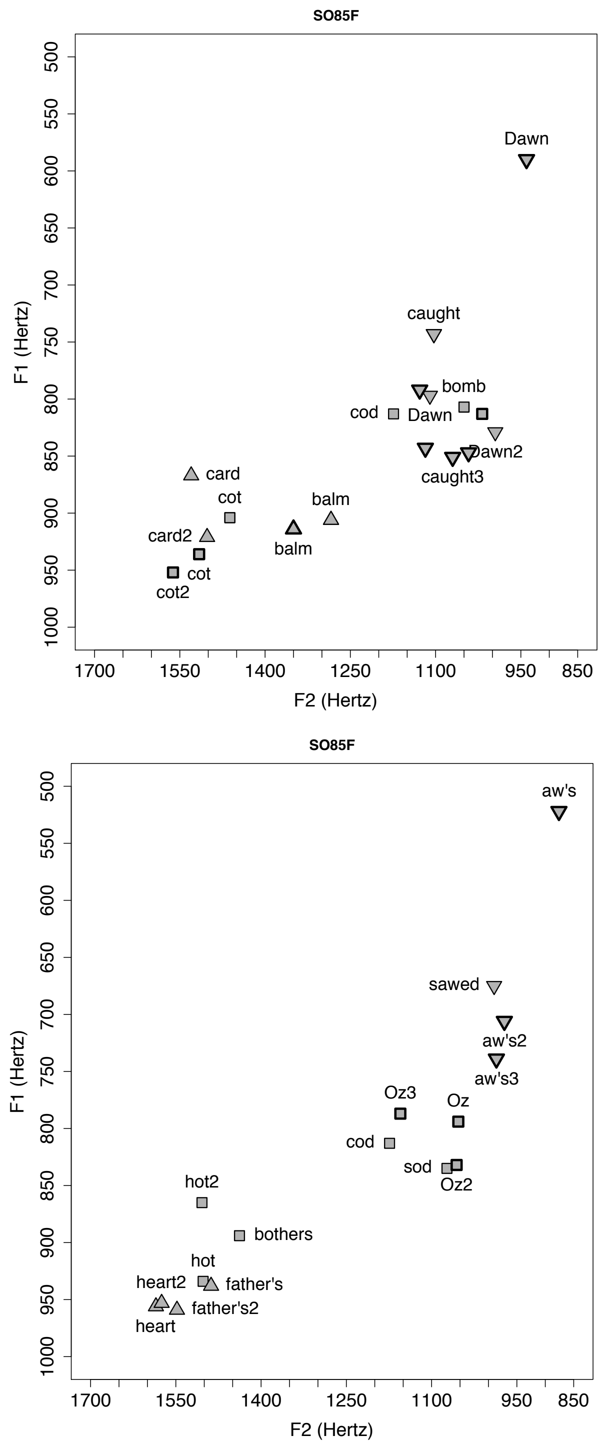

Figure 4.15: SO85F: Selected /o/∼/oh/ and /o/∼/ah/ pairs (regular: covert, bold: overt). **Top:** *cot* is far from *caught,* but close to *card*; *bomb* is far from *balm,* but close to *Dawn.* **Bottom:** *Oz* is back, but *aw's* more so; *hot, bothers* are front, but *heart, father's* more so? **3-D:** *card* $\neq$ *cod; cod* $\approx$ *sod; sod* $\neq$ *sawed.*

in this position, *harder∼hotter* (not shown), actually differs in the reverse direction.

One other word has been plotted on both panels of Figure 4.15. This is *cod,* which is paired with *card* in the top panel. One sees there that *cod* is notably farther back and also higher than the two tokens of *card.* In the bottom panel, one sees that *cod* is adjacent to a word with similar phonetic structure: *sod.* And *sod* in turn is lower and fronter than its paired word, *sawed.* A pattern like this is good evidence of a 3-D system, especially as it was produced with no awareness that those words were later to be compared; *card, cod, sod,* and *sawed* were in sentences on four different printed cards.

It seems that phonetic environment plays an especially large role in how /o/ is realized, so that a word like *cod* sounds close to *caught,* and *cot* sounds close to *card,* even though it is *cod* and *cot* that have the same underlying vowel.

In describing the low vowel system of SO85F (or PV81M), several approaches initially might have seemed possible. First, we could say that there is a phonological three-way distinction (3-D), but that one of the categories, /o/, has a wide range which overlaps considerably with the two other categories, /ah/ and /oh/. This account would predict the minimal pair contrasts that we (mostly) find, but it would not predict the bimodal, or dumbbell-shaped, distribution of /o/ in phonetic space.

A second view would be that there actually are only two low vowels here, /ah/ and /oh/. But instead of /o/ having merged with one or the other of them, as in most dialects nearby, here it has split between them, on mainly phonetic grounds. This would explain the phonetic dispersion of the /o/ group, but it would not predict contrasts to be maintained between /ah/-words and /ah/-like /o/ words, or between /oh/-like /o/-words and /oh/-words. But as was just seen, there is some evidence that the first type of contrast is maintained (*hot∼heart*), and convincing evidence for the second type (*sod∼sawed*).

A third position is that there is a third phonological vowel, /o/, and that inherent to its nature is its alternation between the phonetic positions of /ah/ and /oh/. Herold (1990: 186-

200) discusses this possibility using the example of Belfast, based on the work of Harris (1985). Harris suggests that two classes which partially overlap – through approximation or transfer – can remain distinct, and Herold wonders if even complete phonetic overlap might not necessarily lead to merger, because in such cases

> word-class identity may be maintained by patterns of alternation within a phonetic continuum … and variable neutralized distinctions acquired, as long as each of the phoneme-classes involved … has a different probability of being realized with a specific phonetic value (Herold 1990: 206-7).

Certainly the /o/ being discussed here meets some of these criteria for being considered a distinct, though overlapping, phoneme. But although more data would need to be acoustically analyzed to be sure, it seems that an important difference in the speech of SO85F, at least – and perhaps PV81M and the other seniors in the small '3-D' group – is the consistent phonetic realizations of individual words when they are repeated.

For SO85F, the /o/ word-class as a whole occupies a large phonetic range, but there is little to show that individual /o/-words alternate between /ah/-like and /oh/-like realizations. Following the arguments of Harris and Herold, it should be such an alternation that alerts the learner that a word is a member of the /o/-class.

For example, a learner who hears *Wizard of* [a]*z, Wizard of* [ɔ]*z, Wizard of* [a]*z* would perceive that this alternating stressed vowel cannot be the phoneme used in the word describing former rulers of Iran, which is consistently *Sh*[a]*hs,* nor the one used in the name of a supermarket chain, which is consistently *Sh*[ɔ]*w's.*

But in SO85F's speech, /o/ has those two sounds, but seemingly only in different words. So it is hard to understand why a learner of this variety would associate *doll,* realized at (795, 1034), with *collar,* pronounced four times near (900, 1500), rather than with *caller,* which was measured four times with a mean of (756, 1017), unless spelling played a role.

If one observed more speech, one might notice that individual /o/-words did alternate. Even if not, it seems the /ah/-like /o/-words are not learned as tokens of /ah/, and the /oh/-like /o/-words are not real /oh/'s. Small but reliable phonetic contrasts are maintained.[61]

The SO85F example has some properties of merger-by-approximation and some of merger-by-transfer. But despite elements of both, no merger has occurred, and therefore the system is 3-D.

4.4.2.7 Summary of Senior Citizens

Figure 4.16 displays the tokens, means, and standard deviation 'whiskers' for the four senior citizen speakers analyzed. The figure uses one set of axes for the two male speakers and another for the two females, which is shifted and expanded by 20% with respect to the males' plots.[62]

Though it is not possible to compare inter-vowel distances accurately without normalizing, it is safe to say that ABS62M has the greatest distance between phonemes. This is because his /oh/ is of the high, ingliding type typical of New York City speech, and its nucleus is thus far removed from that of his merged /ah = o/, the mean symbols for which overlap.

There is less distance between the means of NT86F's /ah/ and her merged /o = oh/, but it is still substantial. The /ah/-vowel is in a further front position than for any other speaker.

The 3-D speakers, PV81M and SO85F, have three vowels in roughly the same amount of phonetic space where the other speakers have two. Their /ah/ is not particularly fronted, nor is /oh/ on average very high. This corresponds to my auditory impression of the vowels.

The movement of /o/ between the covert and overt contexts, for PV81M, is noted

[61]If other phonetic properties, such as duration, had been measured, it is possible that they would have helped demonstrate a self-consistent /o/, despite its wide F1 / F2 range.

[62]The *axes* are 'expanded', e.g 504-1044 Hz for F1 instead of 420-870; the effect is to *contract* the female speakers vowel plots, which would otherwise be larger.

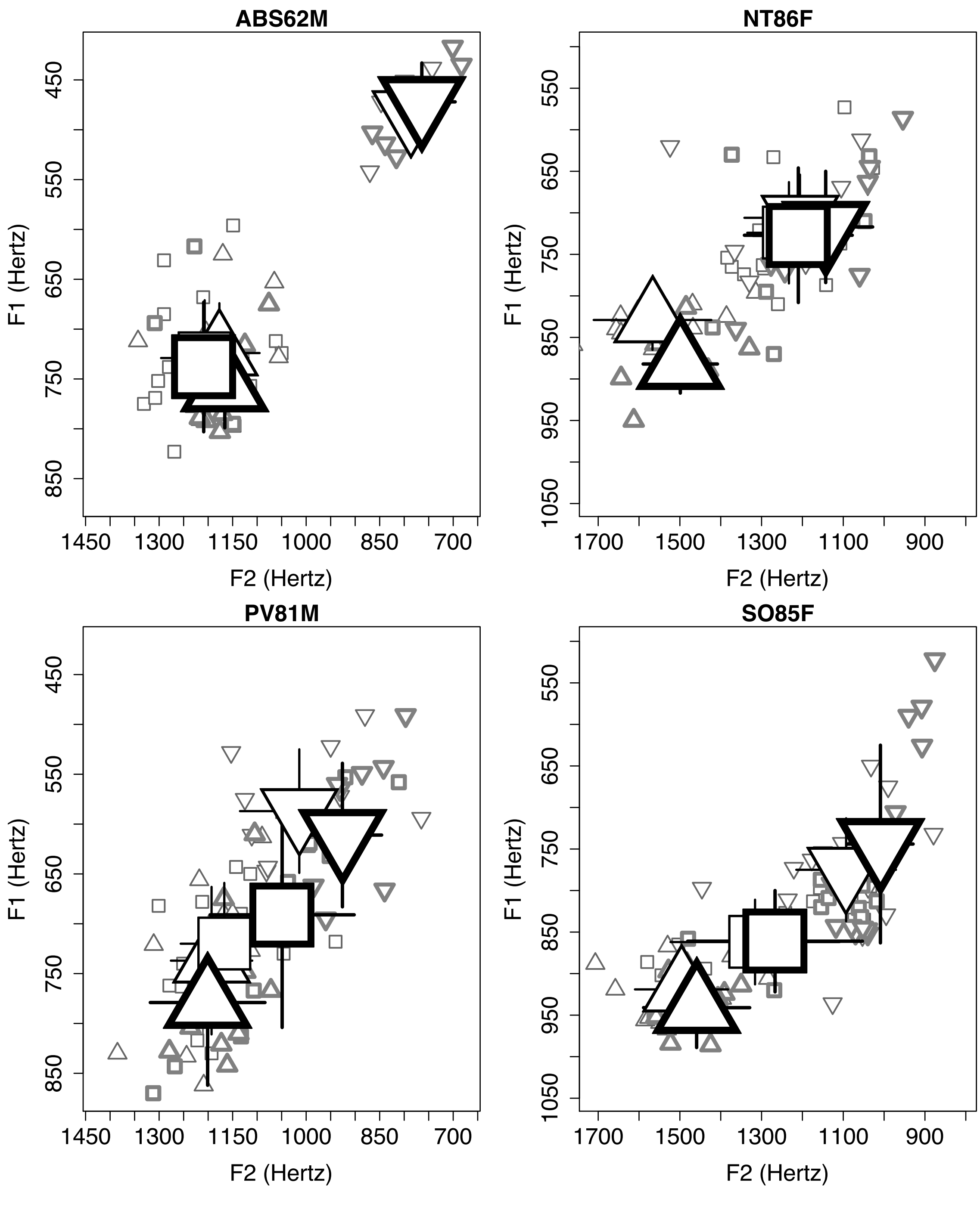

Figure 4.16: Senior systems: ABS62M – MAIN (top left); NT86F – ENE (top right); PV81M – possible 3-D (bottom left); SO85F – probable 3-D (bottom right); bold: overt.

again, but the other differences between the two conditions are less easy to interpret. Since a partially-different set of words occurred as covert vs. overt pairs, this graphical representation could be misleading. When the same pairs were compared, as shown earlier, the overt context always led to a greater acoustic difference. This happened even when the vowel classes involved were merged, which is thought-provoking.

4.4.3 Acoustic Analysis of Young Adults

As can be seen in the background of Figure 4.5, many of the young adults in the focus area had low vowel systems that were judged 'unclear' (although such unclear patterns were not that common overall). Those selected as good examples of the 'traditional' two-vowel systems are still less extreme than their senior citizen counterparts.

Nevertheless, ABS26F, a 26-year-old woman from South Attleboro, is unequivocally MAIN. A 30-year-old man from North Attleborough, NA30M, was judged impressionistically as a clear example of the ENE pattern, but acoustic analysis showed /ah/ overlapping considerably with /o = oh/ in F1 / F2 space. Although his formant differences were significant, NA30M probably represents some phonetic progress towards three-way merger.

The final subject analyzed acoustically, a 19-year-old woman from North Attleborough, has the three-way merger unambiguously. NA19F's low vowels made a very different auditory impression than NA30M's, reinforced by her pronouncing and perceiving all the minimal pairs she read as 'same', even *Ah* $\sim$ *Aw*. The acoustic analysis of her vowels confirms a pattern of /ah = o = oh/.

4.4.3.1 Conservation of the MAIN system – ABS26F

Coming from the same community of South Attleboro, ABS26M is 36 years younger than the senior citizen exemplar of the MAIN system. Her low vowel pattern is not as extreme as ABS62M's, but it is essentially congruent.

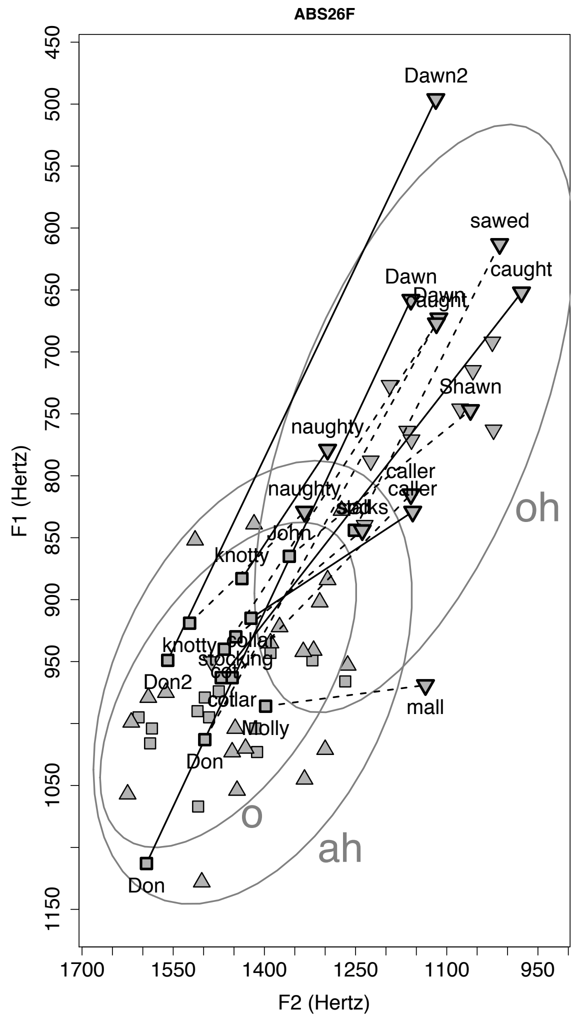

Figure 4.17: ABS26F: Paired tokens of /o/∼/oh/ (dashed: covert; solid: overt)

For overt /o/∼/oh/ pairs – all of which were judged "different" by both of us – she approaches ABS62M's degree of distinction (+269, +430); her covert pairs are closer but still definitely distinct:

Δ/o/ – /oh/ (ABS26F, O, 5) = +281 ±224 (0.03), +335 ±183 (0.006);

Δ/o/ – /oh/ (ABS26F, C, 8) = +162 ±90 (0.004), +278 ±56 (8×10^{-6}).

Figure 4.17 shows that the highest tokens of /o/ acoustically overlap the lowest tokens of /oh/ (e.g. *sod* and *stalks,* in the center of the plot). However, the closest *pairs,* the two examples of *knotty∼naughty,* differ by approximately 100 Hz in F1 and 150 Hz in F2.[63]

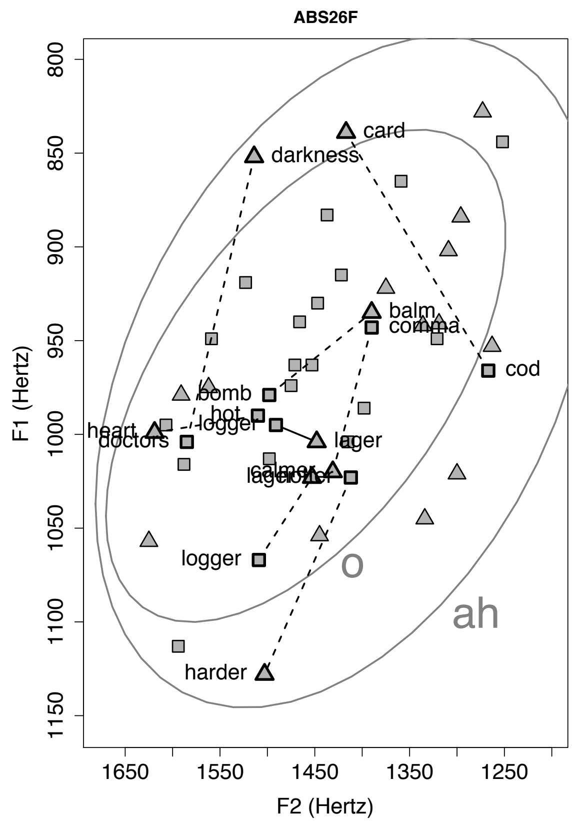

Figure 4.18: ABS26F: Paired tokens of /ah/∼/o/ (dashed: covert; solid: overt)

The /ah/∼/o/ pairs of ABS26F illustrate merger perhaps better than any comparison examined so far. For seven covert word pairs, although each pair was not clustered tightly together, there was little regularity in the position of the tokens and none in the size or direction of the acoustic differences between them (see Figure 4.18):

Δ/ah/ – /o/ (ABS26F, C, 7) = -25 ± 89 (0.52), $+22 \pm 93$ (0.58).

The only overt pair was *lager∼logger,* and it was pronounced virtually identically, differing by only 9 Hz in F1 and -43 Hz in F2.[64] The negative sign indicates the ‘wrong

[63]The covert pair *Molly∼mall* is distinguished only by an F2 difference, as *mall* was measured as much lower than the other /oh/ tokens. The overt pairs *Don(2)∼Dawn(2)* are separated more than any other pairs.

[64]The other potential overt /ah/∼/o/ pair, *balm∼bomb,* was whispered and could not be acoustically

direction' of difference, with *logger* slightly fronter; the reversal usually indicates merger.

Thus, the acoustic data support ABS26F having a system where /ah = o/ $\neq$ /oh/. It is notable that she reacted to her own accent as she read the cards, in an amused and slightly troubled way. It was especially her high back realizations of /oh/ that struck her as marked, and some correction of these may account for the wide phonetic range of her /oh/, especially when compared to ABS62M's tight cluster (Figure 4.6). However, whatever adjustment of /oh/ there may be does not extend as far as confusing it phonologically with /ah = o/.

4.4.3.2 The ENE system, endangered? – NA30M

The next speaker to be analyzed, NA30M, was considered from auditory impressions to be a perfectly good example of the ENE system surviving close to the linguistic boundary in a younger speaker. However, acoustic analysis reveals that the pattern of /ah/ $\neq$ /o = oh/ is not as robustly maintained as it was in the older speaker, NT86F.

Figure 4.19 shows the complete overlap of the /o/ and /oh/ word classes. For the seven overt pairs, the closest thing to a significant difference is in the wrong direction – for five of the pairs, the /o/-words are very slightly higher, though in no case more than 50 Hz.

Measurement of the six overt /o/∼/oh/ pairs, which included two repetitions, reflected a merger even more surely, although moving from a negative to a positive average difference does reflect a small, possibly illusory shift in the direction of the usual /o/∼/oh/ distinction:

Δ/o/ – /oh/ (NA30M, C, 7) = -16 ± 24 (0.15), -4 ± 67 (0.90);

Δ/o/ – /oh/ (NA30M, O, 6) = $+16 \pm 30$ (0.23), $+23 \pm 57$ (0.36).

Only NA30M's second repetition of the pair *cot∼caught* achieved a small difference in the right direction: (+69, +107), and this instance sounded different to both of us. We also agreed that *knotty∼naughty* sounded the same, but disagreed on two other pairs.

Don∼Dawn was judged by the subject as neither clearly same nor different, while the

analyzed; it also sounded "the same".

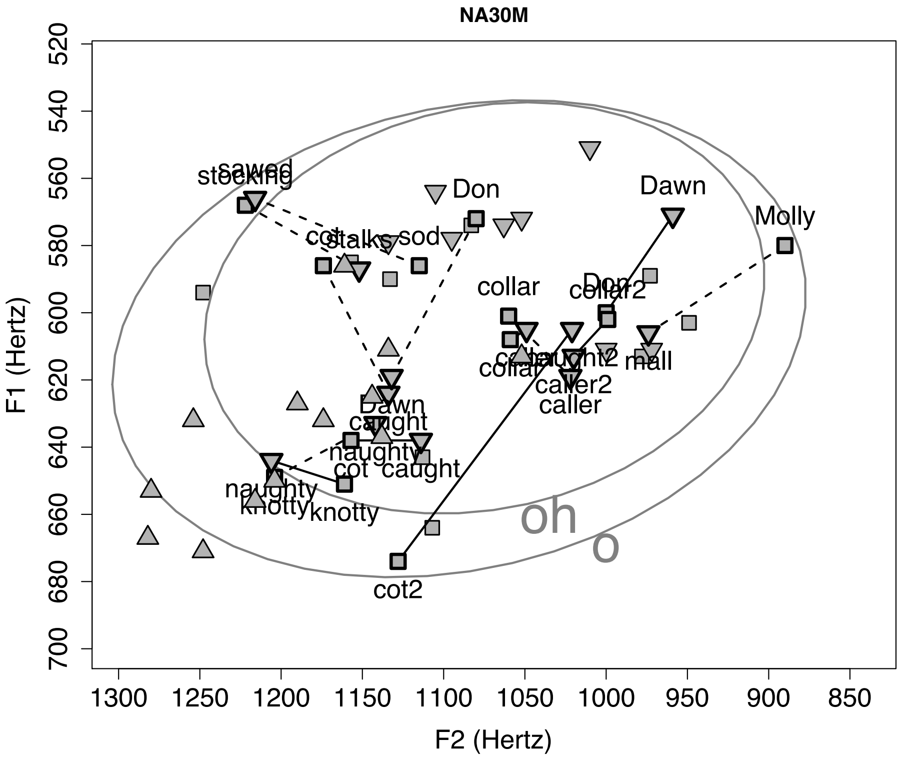

Figure 4.19: NA30M: Paired tokens of /o/∼/oh/ (dashed: covert; solid: overt)

analyst felt it was probably the same; *collar*∼*caller* was heard as identical by the analyst, but judged as clearly different by the subject.[65] The acoustic measurements confirm that all these pairs are very close.

The remaining question is about the status of /ah/, and whether or not it is distinct from the merged /o = oh/. A number of upward-pointing triangles can be seen at bottom left in Figure 4.19; compare this to the less severe incursion visible for NT86F in Figure 4.8.

For NT86F, it was determined that /ah/ was a distinct vowel. Although there was some overlap at the extremes, the average /ah/∼/o/ pair differed by more than 100 Hz in F1 and more than 300 Hz in F2, producing a clearly audible distinction.

[65] Since at least once, the final /r/ was more clearly pronounced in *caller,* I asked, "Is it the end of the word that sounds different, or the beginning of the word?" NA30M responded, "I'd say the beginning. The *o,* opposed to the *a.*" But all his *collar*∼*caller* pairs sounded the same, in line with the acoustic differences measuring only (−18, +38) for the covert pair, (+3, +10) for the first overt pair, (−11, −21) for the repetition.

For NA30M, the auditory impression was of a clear but moderate distinction. Figure 4.20 shows that the difference between /ah/ and the low back vowel /o = oh/ is quite a bit smaller than it was for NT8F. In fact, there is substantial overlap between the classes.

The top panel of Figure 4.20 plots five /ah/∼/o/ pairs, four covert and one overt. There is a consistent F2 difference of between 150 and 200 Hz, except for one pair, *calmer∼comma,* where it is only 61 Hz. The F1 difference is less consistent, and not statistically signficant, but it appears that most /ah/'s are slightly lower than most /o/'s, as well as fronter:

Δ/ah/ – /o/ (NA30M, C, 4) = +21 ±59 (0.34), +141 ±85 (0.02).

The only overt pair, *lager∼logger,* almost overlaps its covert counterpart, at (+8, +185).[66]

The same consistency of position is observed in the bottom panel of Figure 4.20, where the pairs directly comparing /ah/ and /oh/ are plotted. Again, the difference in the front-back direction is larger and more consistent than that of height, but both are regular. The pronunciation of each pair in the overt and covert conditions is almost identical, so the differences between pairs presumably represent phonetic-environment effects.

The pair differences for /ah/∼/oh/ are slightly larger than those for /ah/∼/o/, but this may also be a type of phonetic effect; it seems likely that the same pair of vowels could be realized in a more extreme position, and contrast somewhat more noticeably in word-final positions, which the tokens from the checked-vowel word class /o/ never appear in:

Δ/ah/ – /oh/ (NA30M, C, 3) = +67 ±33 (0.02), +173 ±249 (0.10);

Δ/ah/ – /oh/ (NA30M, O, 3) = +70 ±108 (0.11), +198 ±333 (0.13).

Despite all this, there is no doubt that NA30M really has a distinction between /ah/ and /o = oh/, and thus the ENE system. If the 11 /ah/∼/o/ and /ah/∼/oh/ pairs, compared under separate rubrics above, are combined into a single t-test, the result is unequivocal. The

[66]For this speaker, the pairs with *balm∼bomb* were not measured, because he clearly pronounced /l/ in *balm.* Similar concerns could have led to the exclusion of pairs like *card∼cod* when the speaker pronounced the /r/ in *card* – although NA30M was reliably non-rhotic – but from the point of view of measurement a following /l/, especially a dark, vocalized /l/, proved much more challenging than the sequence /ahr/, where the vowel could usually be measured before the effect of the following /r/ took hold.

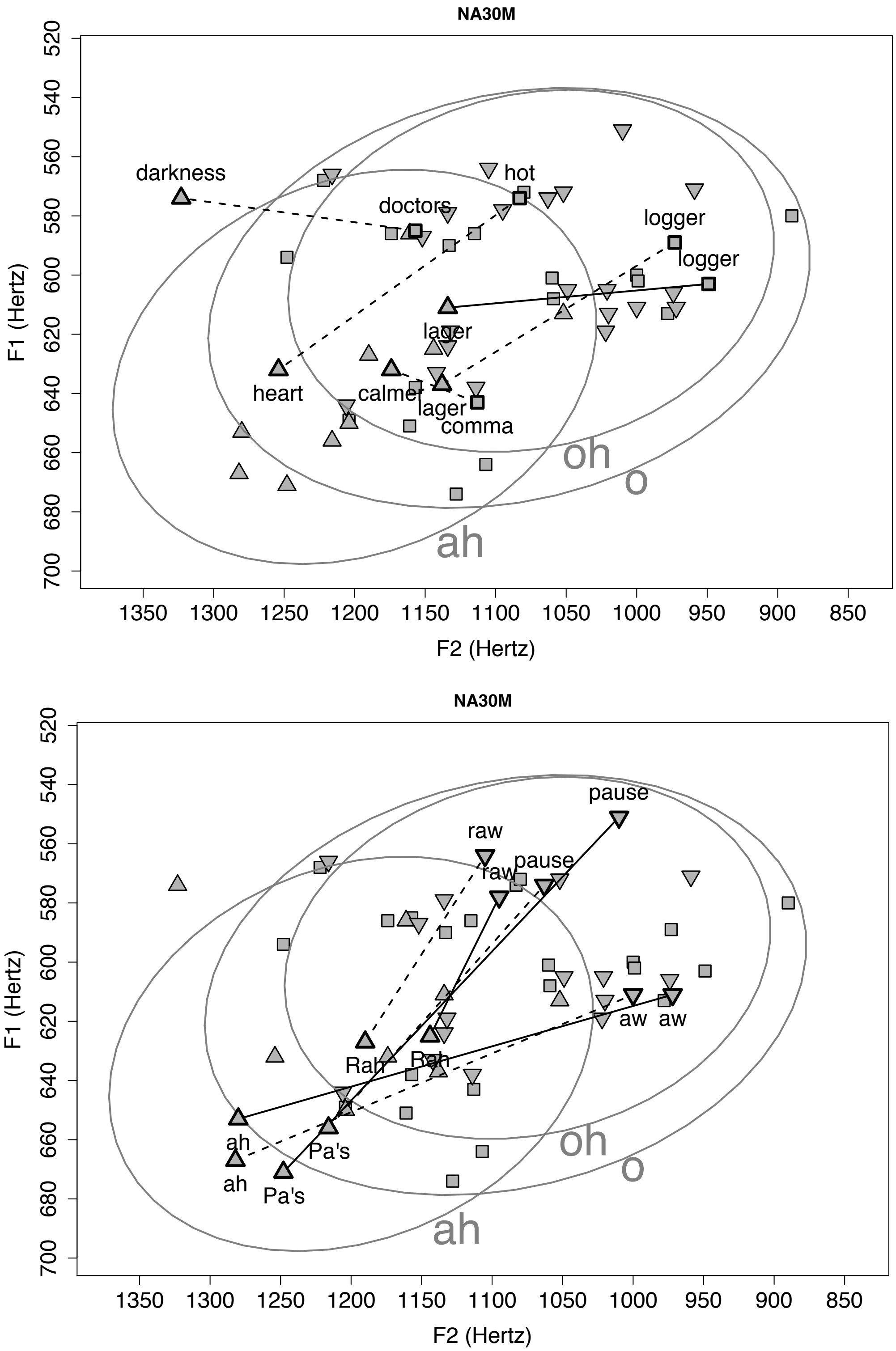

Figure 4.20: NA30M: Paired tokens of /ah/∼/o/ (top), /ah/∼/oh/ (bottom)

phonetic distance may be half as wide as for NT86F, but it is certainly still there:

Δ/ah/ – /o, oh/ (NA30M, CO, 11) = +46 ±26 (0.003), +169 ±55 (5x10^{-5}).

Compared with the senior citizens analyzed in similar communities, both young adults examined so far have phonetically weaker distinctions in their low vowel systems. The MAIN distinction of a high, back /oh/ was dramatic for the older generation (ABS62M), and it is still fairly robust (ABS26F). The ENE distinction of a low, front /ah/ was robust (NT86F) and now perhaps is somewhat less healthy (NA30M), but one could certainly imagine much more closely approximated vowel classes, and much more unclear and ambiguous patterns of produced and reported distinctions, than NA30M displays.

4.4.3.3 "I want to say it differently, but I can't" – the 3-M pattern of NA19F

In the same town of North Attleborough, a speaker some ten years younger had a low vowel system that sounded qualitatively different: "completely different sound" was the note I made on NA19F's paper, after having interviewed NA30M the previous day.

Although NA19F unfortunately did not have time to read every card, there is enough pair data to suggest that she does not make a distinction between /o/~/oh/ (unlike MAIN), nor between /ah/~/o/ (unlike ENE). However, some of her vowels, including tokens of *Ah~Aw,* are more difficult to interpret.

To compensate for having less data from the reading and minimal pair contexts, more vowels were measured from the cards she did complete, as well as some from spontaneous speech. Most of the data pointed to a three-way merger of the low vowels (3-M).

Except for one instance of *Don~Dawn,* the minimal pairs were judged "same" by the analyst, and all of them were judged "same" by the speaker. But NA19F was aware that others pronounce /o/~/oh/ differently, including a customer from Rhode Island, present in the salon where the interview took place, who demonstrated the distinction.

NA19F reacted in an interesting way; she seemed to find an extreme distinction between

Don and *Dawn* amusing, and succeeded in imitating it. But in general, as she heard herself reading and pronouncing the pairs virtually the same, she became almost wistful about her merged status, and regarding one pair, remarked in mock-complaint, "It's like, I want to say it differently, but I can't!"

Acoustically, NA19F's three word class categories all overlap each other almost completely, with each of them ranging widely around similar means.

Looking first at /o/∼/oh/ pairs, shown in the top left panel of Figure 4.21, there are some which do differ in the usual direction of distinction: *cot∼caught* (+82, +102) and *John∼Shawn* (+108, +181) among the five covert pairs, and one of three examples of *Don∼Dawn* (+180, +177) among the four overt pairs.

Other pairs, however, differ in the opposite direction, such as the covert *Don∼Dawn* (−94, −33) and *sod∼sawed* (−19, −231).[67] The overall conclusion is that the /o/∼/oh/ pairs do not show any consistent distinction:

Δ/o/ – /oh/ (NA19F, C, 5) = +13 ±102 (0.75), +48 ±227 (0.60);

Δ/o/ – /oh/ (NA19F, O, 4) = +56 ±152 (0.33), +41 ±155 (0.47);

Δ/o/ – /oh/ (NA19F, CO, 9) = +32 ±66 (0.30), +44 ±110 (0.38).[68]

Because not all the cards were read, the only /ah/∼/o/ pairs that were complete were those that appeared on the same card: *balm∼bomb* and *lager∼logger.* NA19F produced one covert and one overt instance of each, and an additional repetition of *balm∼bomb,* and these pairs are plotted in the top right panel of Figure 4.21.

Three of these five pairs had small formant differences of 10 to 60 Hz. The overt *lager∼logger* differed by (+57, +106), but the first overt *balm∼bomb* differed more, and in the opposite direction (−205, −84). Overall, there is no consistent /ah/∼/oh/ difference, as the p-values from the paired t-tests indicate:

[67] The speaker was unfamiliar with the word *sod* and hesitated before reading it.

[68] Note, however, that both formant differences are in the 'right' direction for both covert and overt pairs, which would only occur 25% of the time by chance, assuming the null hypothesis of complete merger.

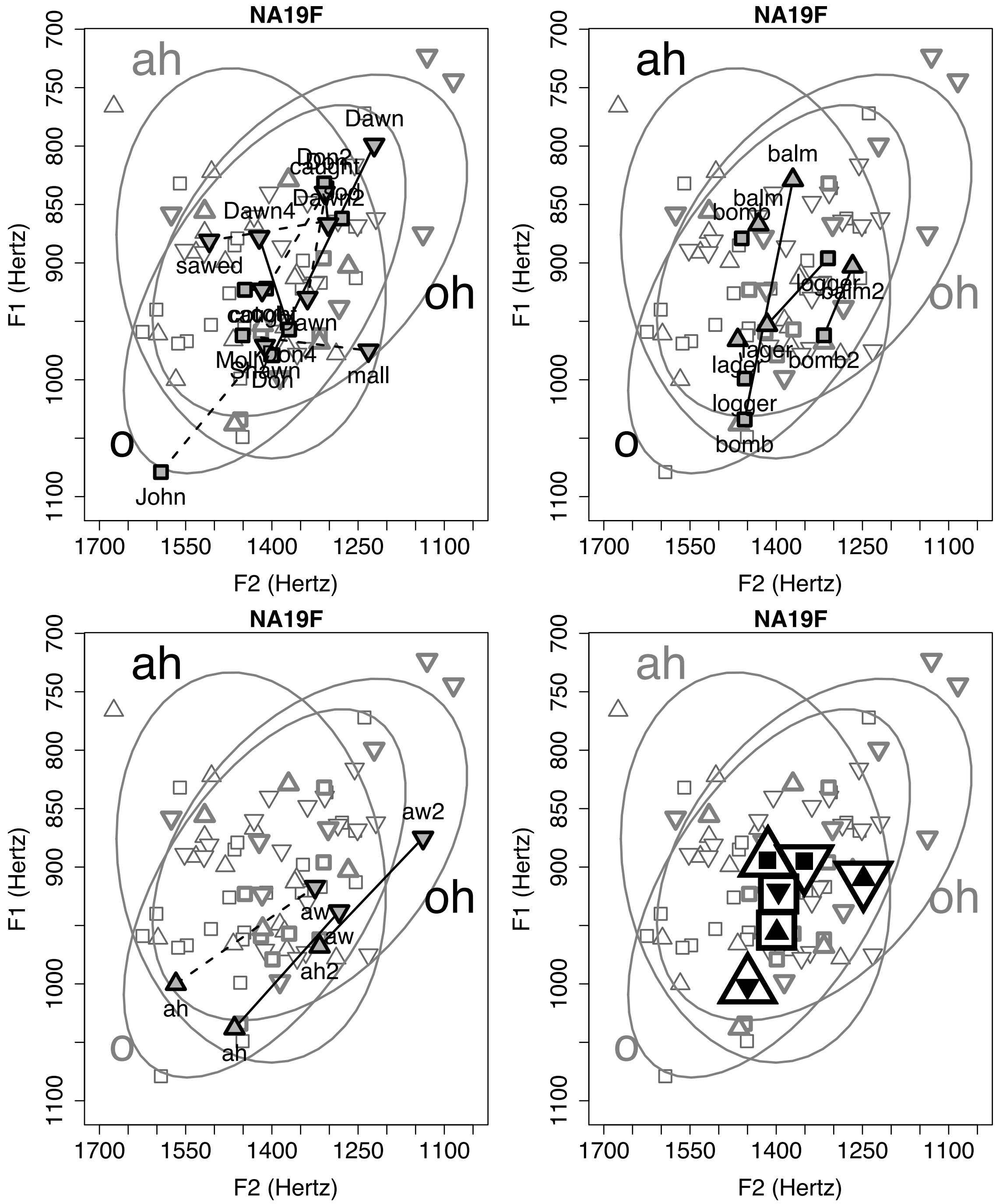

Figure 4.21: NA19F: Paired tokens of /o/∼/oh/ (top left), /ah/∼/o/ (top right), /ah/∼/oh/ (bottom left); means of /ah/, /o/, /oh/ (bottom right; interior symbol is of pairs' class)

Δ/ah/ – /o/ (NA19F, C, 2) = -23 ± 133 (0.28), -9 ± 260 (0.75);

Δ/ah/ – /o/ (NA19F, O, 3) = -69 ± 326 (0.46), -9 ± 252 (0.89);

Δ/ah/ – /o/ (NA19F, CO, 5) = -50 ± 120 (0.31), -9 ± 91 (0.80).

If, for NA19F, /ah = o/ and /o = oh/, one would logically expect her to make no distinction between /ah/ and /oh/ when those classes were paired directly. But in fact, the one direct /ah/∼/oh/ pair was pronounced somewhat differently, three times over. This pair was *Ah*∼*Aw,* originally in the context "doctors ask you to say *Ah*" vs. "*Aw,* how cute!"

The one covert and two overt instances of this pair differed in the same direction and to roughly the same extent (Figure 4.21, bottom left panel). Taken together, they yield a significant t-test result:

Δ/ah/ – /oh/ (NA19F, CO, 3) = $+92 \pm 21$ (0.003), $+202 \pm 88$ (0.01).

How can the /ah/∼/oh/ data be reconciled with that from /ah/∼/o/ and /o/∼/oh/ pairs? We note that for the particular /ah/∼/oh/ pair involved, *Ah*∼*Aw,* it is debatable whether the words elicited are normal speech sounds. For example, among other young speakers who appeared to be three-way merged, *Ah*∼*Aw* was sometimes distinguished nevertheless.

But unlike those cases, NA19's pronunciations of *Ah* and *Aw* sounded very close indeed, and they were judged "same" by both speaker and analyst. Even repeated listening to the pairs reveals only a small difference. Both *Ah* and *Aw* sound completely unrounded, and for whatever reasons, the 200 Hz difference in F2 is barely noticeable in the front-back perceptual dimension.

The bottom right panel of Figure 4.21 shows the means of each of the groups of pairs shown in the other three panels. Each symbol contains a smaller symbol indicating which vowel class it was paired with. For example, the right-side-up triangle with a square inside it indicates the mean position of those /ah/-tokens that were paired with /o/, while the right-side-up triangle containing an upside-down triangle shows the mean of those /ah/-tokens that were paired with /oh/.

The /ah/ and /oh/ means from the tokens that were each paired with /o/ are adjacent: (954, 1399) for /ah/, (923, 1396) for /oh/, a difference of only (+31, +3). Both classes are higher than the /o/ they were paired with.

The /ah/ and /oh/ means when they were paired with each other – from *Ah∼Aw,* in other words – are spaced much farther apart, with /ah/ fronter and lower at (1002, 1450), /oh/ further back at (910, 1248), and the difference being (+92, +202), as noted above.

To determine whether NA19F produces similar small but regular vowel differences with ordinary words – not just with *Ah∼Aw* – a number of other tokens were analyzed.

Before, after, and in between the reading cards, 30 spontaneous low vowel tokens were recorded and measured – 7 tokens of /ah/, 10 of /o/, and 13 of /oh/. Their means are plotted in the upper left panel of Figure 4.22.

And on the reading cards themselves, besides the 17 pairs discussed above, NA19F produced 45 unpaired low vowel tokens, shown in the upper right panel of Figure 4.22. These consisted of 13 tokens of /ah/, 17 of /o/, and 15 of /oh/.[69]

Like the paired tokens, the spontaneous and unpaired tokens of the three low vowel classes overlap greatly. For the spontaneous speech tokens, the means of /o/ (901, 1393) and /oh/ (892, 1329) are very close, and the differences are non-significant using unpaired t-tests: p = 0.78 (F1), 0.23 (F2).

The spontaneous /ah/'s are slightly higher and further front, on average (849, 1420), but even if they are compared directly with the /oh/'s – rather than with /o/, or with /o = oh/ taken together – the difference does not meet the threshold of significance (p = 0.25, 0.12).

The unpaired reading tokens show a somewhat similar pattern. All three classes are approximately 40 Hz further front, /ah/ has moved about 50 Hz lower, and /ah/ has moved slightly higher. The resulting configuration is that the /ah/ and /o/ classes are close – /ah/: (904, 1459); /o/: (923, 1436) – while /oh/ is slightly higher and further back: (877, 1362).

[69] One token was eliminated: the high back production of *Dawn* made in imitation of a Rhode Island accent.

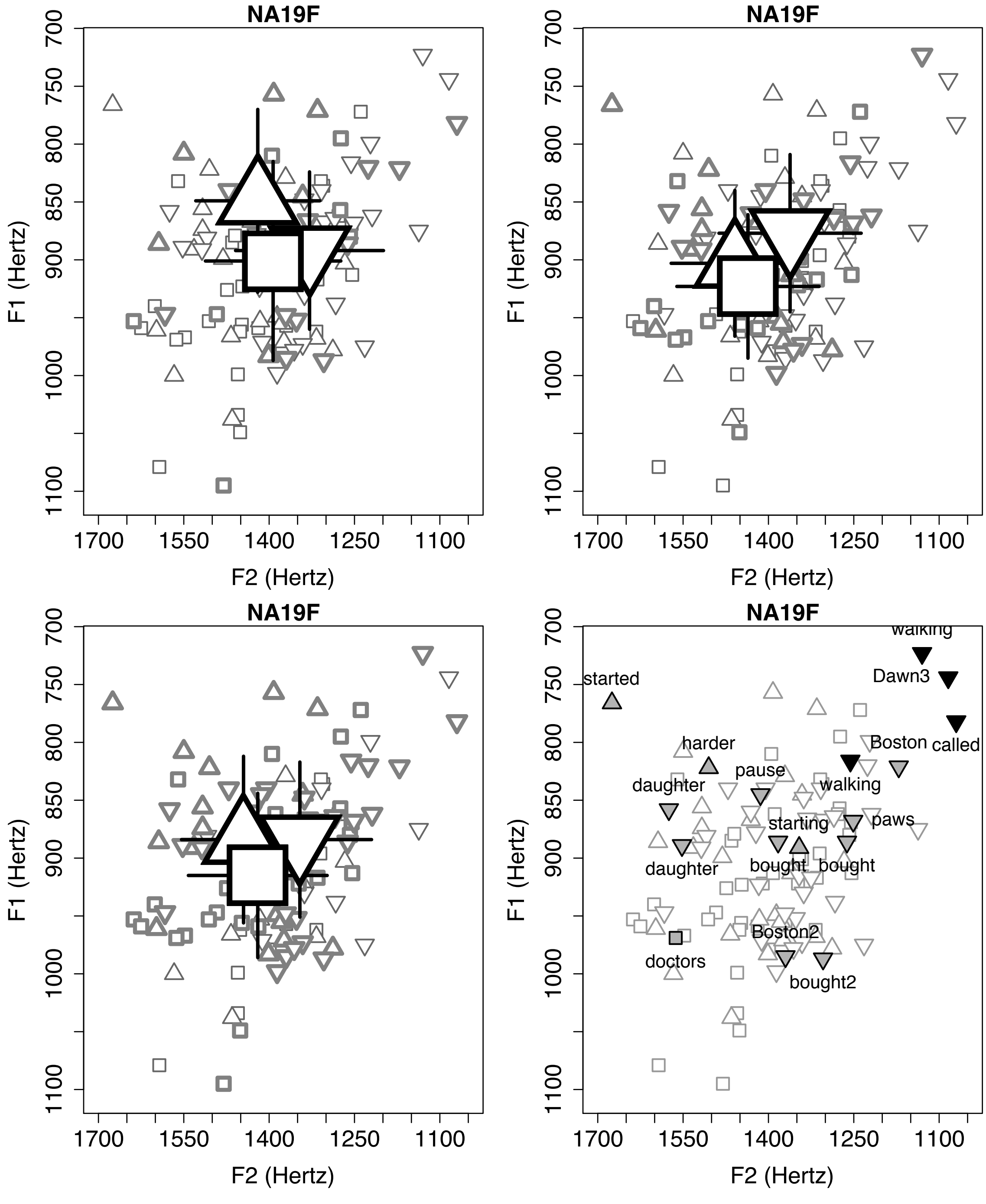

Figure 4.22: NA19F: Means of /ah/, /o/, /oh/ from spontaneous speech tokens (top left), unpaired reading tokens (top right), both combined (bottom left); selected tokens illustrating overlap and likely 3-way merger (bottom right)

When unpaired two-sample t-tests are performed on these unpaired reading tokens, /ah/ and /o/ are, unsurprisingly, found not to be significantly different ($p = 0.41, 0.61$). But when /oh/ is compared with the other two classes (or with /ah/ alone), the 100-Hz difference in F2 is significant using the customary threshold ($p = 0.04$).

And if the data from spontaneous speech and the unpaired reading pairs are combined, as shown in the lower left panel of Figure 4.22, these fairly small differences persist, and their significance levels are substantially improved by there being more data points.

The combined mean of 20 /ah/'s is (884, 1445), that of 27 /o/'s is (915, 1420), and that of 28 /oh/'s is (884, 1346). According to the unpaired t-test, the 99-Hz front-back difference between /ah/ and /oh/ is very unlikely to be due to chance ($p = 0.006$), and the F2 difference of $+74$ Hz between /o/ and /oh/ is also likely to be a real effect ($p = 0.04$).[70]

This is the situation described in §4.4.1, such as when Herold (1990) found apparently significant acoustic differences between word classes in the speech of people who sounded merged to the ear, and who also claimed to be pronouncing the word pairs the same.

If speakers really can unconsciously produce small word-class distinctions within a large cloud of overlapping tokens, it would be interesting to know how this comes to pass, and whether exposure to dialects that clearly make the relevant distinction is essential.

Before concluding this about NA19F, however, we will attempt to account for her word-class differences by seeing if they are really phonetic conditioning effects in disguise.

One of the phonetic environments which greatly affects F2 is that of a following /l/. The fact that /oh/ is more common than /o/ in the position before /l/ may be the single biggest reason why a naive acoustic analysis of a sample of connected speech will usually show a low back distinction, regardless of whether it really exists.[71]

[70] If we combine further and compare the 47 tokens of a supposed /ah = o/ jointly with the 28 examples of /oh/, the p-value from a two-sample t-test is 0.006, the same as for the /ah/∼/oh/ comparison by itself.

[71] In the 1995 General Service List (http://jbauman.com/gsl.html) of 2284 common words, there are 13 with /ohl/ (mean rank 579): *all, also, call, small, always, almost, fall, wall, hall, ball, salt, tall,* and *false.* Twelve words on the list have /ol/ (mean rank 1353): *follow, college, dollar, solid, colony, solve, holiday,*

In the 75-word sample of spontaneous and unpaired reading tokens, there were four examples of /ohl/ (*ball, called, fall* x2), and two examples of /ol/ (*college, doll*). Removing just these six words cuts the F2 difference between /ah/ and /oh/ from +99 to +76 Hz, and the p-value rises from 0.006 to 0.03. Comparing /o/ and /oh/, the difference drops from +74 Hz to +64 Hz, and the p-value goes from 0.04 to 0.06.

Another phonetic position that makes vowel measurement difficult, and also affects formant values, is after the glides /y/ and /w/. Two unpaired reading tokens of *walking* bear this out; they were measured as among the furthest back of any of these tokens, although auditorily they did not sound it.

When these were removed – there were no /wah/- or /wo/-initial tokens – it obviously lessened the overall mean backness of /oh/, with the result of cutting the /ah/∼/oh/ difference to +61 Hz ($p = 0.08$), and the /o/∼/oh/ difference to +49 Hz ($p = 0.15$).

So just by removing the most likely sources of bias, and eight words out of 75, the effect under investigation, whereby /oh/ appears to be further back than the other word classes, has been reduced by one-third in absolute terms, and appears 14 times more likely than before to have occurred by chance, no longer meeting the usual threshold for significance.

The comparison of tokens more-or-less randomly selected from conversation is certainly adequate for the delineation of vowel classes, in particular whether they are clearly distinct or might be merged. However, it is not suited for settling the question of whether or not a speaker maintains a regular small difference between two classes despite their virtually complete overlap in phonetic space.

Even the measurement of many tokens will not necessarily help the problem, because vowels that were historically different do not appear with the same frequency in the same phonetic environments, as we have noted. A method where tokens are paired, or at least

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polish, solemn, collar, hollow, and *apology.* Note also that 11 of 12 /ol/-words – and none of the /ohl/-words – have the shape /ˈolV/, where the intervocalic /l/ will likely be ‘lighter’ and have less effect on the vowel.

collected in coherent phonetic groups, seems essential.

Unfortunately, it does not seem to be the case that just a few phonetic environments are bad, and that most are neutral and good for measurement. For example, two of the highest F2 values in this set of words are 1675 Hz for *started* and 1625 Hz for *(short)stop.* Is this a phonetic effect of the initial /st-/ cluster, or just coincidence?

Three things converge to make the case of NA19F rather confusing. First, she is less consistent than some other subjects (cf. Figure 4.11, for example) in producing phonetically similar realizations of similar or identical words from the same word class. A reading token of *paws* was at (868, 1251) while a spontaneous token of *pause* was at (845, 1414); while *started* was far front, as noted, a token of *starting* was 329 Hz further back; and so on.

Secondly, NA19F showed some clustering that indicates phonetic conditioning. For example, among the /oh/-class words, two tokens of *Boston* had F2 values below the mean: 1171 and 1370. Three tokens of *bought* did as well: 1262, 1304, 1383.[72]

The word *daughter,* on the other hand, was produced much further front: 1552, 1575, in the company of similar words from the other classes, like *doctors* (1563) and *harder* (1505). These illustrative tokens are labeled on the bottom right panel of Figure 4.22.

Neither variation on individual words nor regular phonetic variation over a wide range would help contribute to any consistent word class difference, or make the existence of one seem more plausible. And yet, when the classes are averaged, even after removing the most obvious offenders, an F2 difference of roughly 50 Hz remains between /ah = o/ and /oh/.

I believe that differences such as these are not due to chance, but that they are not word-class differences either. Rather, they are statistical regularities stemming from the different frequencies of various phonetic environments within the vocabulary of each class.

[72]In the case of *Boston,* this could be similar to the effect discussed in note 53, where the pronunciation of a proper name – though here a very common one – is influenced by hearing it from particular speakers. However, NA19F's high-back production of *Boston* is closer to the Rhode Island pronunciation of the city's name, rather than a native one. And clearly, no such explanation is available for *bought,* so ordinary phonetic conditioning is probably a more likely explanation.

However, the similarly small and equally subliminal /o/∼/oh/ distinction observed with the phonetically-balanced paired words raises the alternative possibility that though NA19F is three-way-merged for all practical purposes, vestigial differences are maintained.[73] If that is the case, then she can actually "say it differently" better than she thinks she can.

Table 4.13 summarizes all 110 low vowel tokens measured for NA19F, divided into four equal groups along the front-back (F2) dimension. At a glance, the table appears to indicate more of a difference between word classes than the vowel plots have.

But the table also reveals the imbalance in phonetic environments. For example, 7 of 41 /oh/'s are before /n/, while only one of 28 /ah/'s is; 5 /oh/'s are before /l/, but no token of /ah/ is.[74] Conversely, a disyllabic or open syllable environment, which appears to favor fronting, is much rarer for /oh/.

Since NA19F is meant to illustrate a new and different pattern, it is important to demonstrate as conclusively as possible that her low vowels are merged. Certainly, she hears them that way, and my auditory impression is that most pairs are very close, if not identical. Note that only 160 Hz separates the leftmost and rightmost column of Table 4.13.

It has not been possible to rule out the possibility that NA19F produces, overall, a slight F2 distinction between /ah = o/ and /oh/. Without denying the importance of investigating such patterns further, we can still label her 3-M in recognition of the "completely different sound" of her low vowel(s).

4.4.3.4 Summary of Young Adults

Figure 4.23 compares the means and standard deviations of the vowels from the young adult speakers, ABS26F, NA30M, and NA19F. The two female speakers' vowels are displayed

[73] If 'vestigial' micro-differences are those retained from parental or early childhood exposure, similarly small differences that have arisen from accommodation to recent interlocutors could perhaps called 'ambient'.

[74] It will be seen that many of the fronter tokens of /ah/ are pre-/r/. NA19F realized post-vocalic /r/ variably, but usually pronounced it to some extent in most of these words. The phonological consequences of rhoticity on the low vowel systems is discussed below, in §4.5.

	$1675 \leq F2 \geq 1470$	$1470 > F2 \geq 1380$	$1380 > F2 \geq 1310$	$1310 > F2 \geq 1070$
	ah	**ah**	**ah2**	
	are	balm	**balm**	**balm2**
	car	calmer	aunt	
	card	*calming*	*far*	
/ah/	farther	lager	lager1	lager3
	farther	**lager**	lager2	
	harder	*market*	father's	
	heart		*part*	
	smartie		*starting*	
	started			
	bothers	bomb		*college*
	doctors	**bomb**	**bomb2**	con
	dodge	common	clock	doll
	Donna	*contact's*	*hot*	*Foxboro*
	honor	cot	logs	*lot*
	John	**cot**		Don
/o/	*not*	**Don**	**Don4**	**Don2**
	Roxy	jogging		possibly
	Roxy2	logger	**logger**	sod
	shot	lot		
	(short)stop	Molly		
		mom		
		not		
		popular	popular	
	daughter	**caught**		caught
	daughter	bought		*bought*
	Shaw's	Shawn		*bought2*
			aw	**aw**
		lawn	dog	**aw2**
		Dawn4	Dawn	**Dawn**
			talk	**Dawn2**
	talks		*talk2*	**Dawn3**
/oh/				mall
			fall	*fall*
				ball
		cost		*called*
		cost	*Boston2*	*Boston*
			boss	toss
		pause		paws
	off2		*off*	walking
	sawed		saw	**walking**

Table 4.13: NA19F: Low vowels by word class & F2 (*spontaneous,* reading, **minimal pair**)

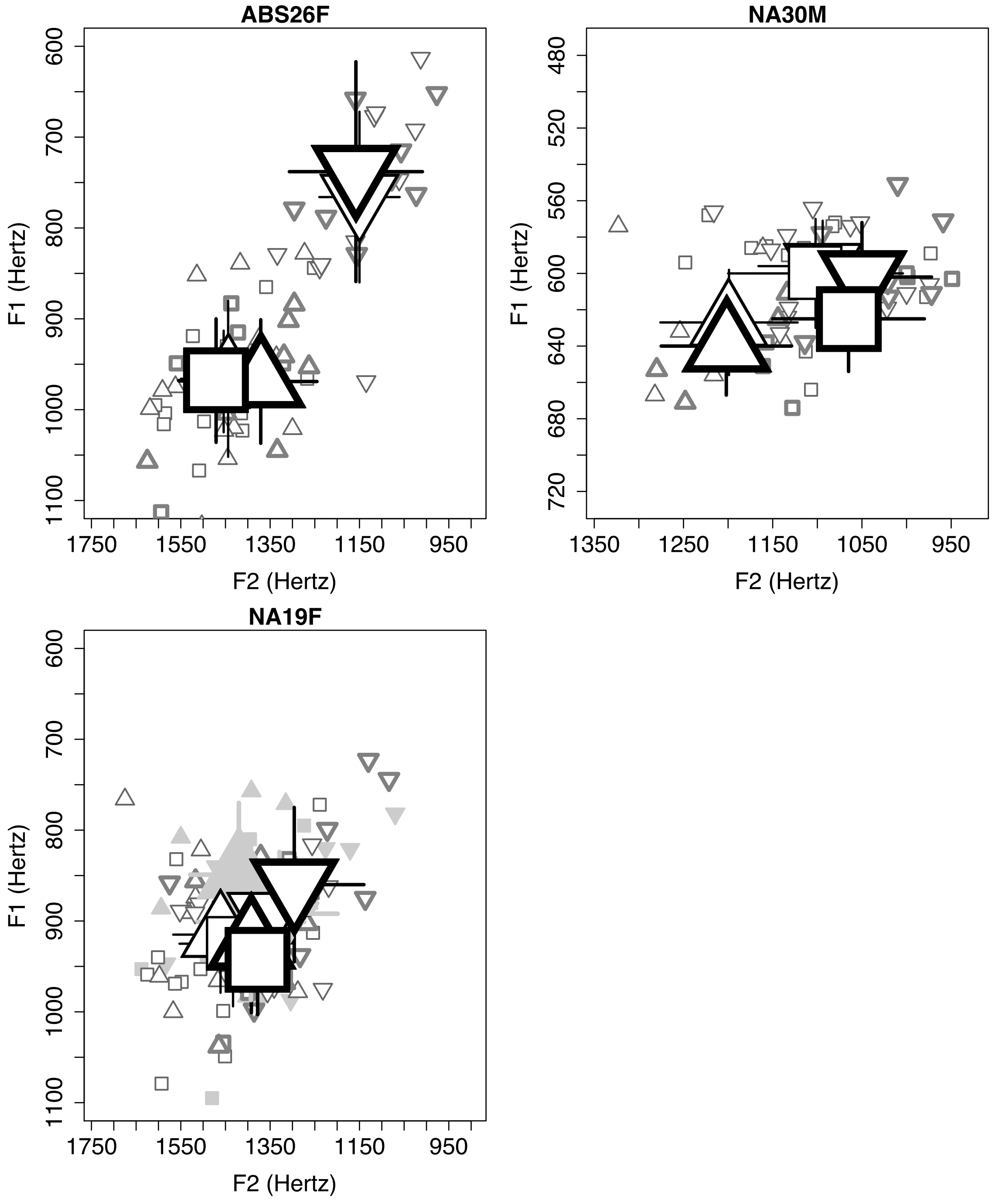

Figure 4.23: Young adult systems: ABS26F – MAIN (top left); NA30M – ENE (top right); NA19M – 3-M (bottom left); regular: unpaired, covert; bold: overt; grey: spontaneous.

on axes that are intermediate in scale between the two scales used for the male and female seniors in Figure 4.16. This tends to slightly understate the degree to which ABS26F's /ah = o/ and /oh/ have gotten closer together, with respect to the older MAIN pattern exemplified by ABS62M. But the general shape of their systems are very similar.

Comparing NT86F on Figure 4.16 with NA30M on Figure 4.23, we see that the distinct /ah/ vowel appears to be roughly twice as close to the merged /o = oh/ for the younger speaker. This is despite having had to zoom in on NA30M's plot to a startling degree, so that its scale is half that of the female speakers.

The standard-deviation whiskers indicate that NA30M simply has an unusually compact vowel space, in terms of Hertz. Impressionistically, his ENE pattern was clear, and the usual amount of internal structure could be discerned (see Figure 4.20) despite the smaller differences in absolute acoustic terms.

The system of NA19F is plotted on the same scale as ABS26F, and despite the convolutions of the previous section, it is obvious that NA19F's low vowel pattern is something quite different from either MAIN or ENE. For one thing, differences between styles for each word class are at least as great as the differences between word classes for each style.

Although comparing different speakers can be risky without normalization, NA19F's 3-M vowel does not seem to occupy as much phonetic space as either of the systems with distinctions. This matched the auditory impression, which was of a moderate range, some tokens more back and rounded, some more front and unrounded, some monophthongal, some mildly ingliding, but none occupying the more extreme positions of /ah/ in ENE or /oh/ in MAIN dialects.

Among younger speakers in the small focus area – South Attleboro is five miles from North Attleborough along Route 1 – we observe great diversity in low vowel systems. ABS26F has a solid MAIN system; NA30M has a definite ENE pattern, although it shows some approximation; and NA19F has collapsed her low vowels down to one intermediate category, which may still show some hints of word-class differentiation.

It is not known what in her background triggered this reorganization,[75] found also in a few other young speakers, just as it was not known why certain seniors retained a presumably older three-way distinction while most had reduced their low vowels to two.

4.5 The interaction of rhoticity and low vowel systems

Besides her merged vowel qualities, another way in which the speech of NA19F differed from the other 'typical' speakers analyzed was that she usually pronounced post-vocalic /r/, especially in the reading tasks.

PEAS connects these phenomena by suggesting that a phonemic distinction between /ah/ and /o/ is only found in non-rhotic areas:

> The free low vowel /a ∼ ɑ/ occurs only in areas in which post-vocalic /r/ is not preserved as such, that is, in Eastern New England, Metropolitan New York, the Upper South, and the Lower South. It appears in such words as *car, garden* and *calm, palm, father,* in Eastern New England also in *half, glass,* etc., though without any consistency. (Kurath and McDavid 1961: 5)
>
> The dialects that preserve post-vocalic /r/ lack the free /ɑ ∼ a/ as a feature of their vowel system. A word-final low vowel occurs in these dialects only in a number of peculiar words, the exclamations *bah, hurrah,* the affectionate *ma, pa,* and several loan words such as *shah, pasha,* and should therefore be regarded as an exceptional use of the checked vowel /ɑ/ of *rod,* with which it agrees both in quality and length. (Kurath and McDavid 1961: 113)

The implication from *PEAS* is that while fully-rhotic speakers can certainly possess a MAIN low vowel system, as happens in Connecticut, the Philadelphia area, and the Inland

[75] NA19F's parents also grew up in NA (Table 4.8 has parental information on the seven speakers of §4.4).

North,[76] the ENE system with its distinct /ah/ may be restricted to non-rhotic (and possibly partially-rhotic) speakers.

The vowel /ah/ occurs very frequently before underlying coda /r/, while /o/ never does. So once post-vocalic /r/ began being pronounced regularly, the two would be in nearly complementary distribution, which could lead to them being reintepreted as allophones of one phoneme. Instead of numerous minimal pairs of the type *card∼cod, there would be none, greatly decreasing the functional load (Martinet 1955) of the opposition. The combination of these two processes would constitute what could be called merger-by-allophony.*

Is there a correlation, though, between rhoticity and the /ah/∼/o/ merger – and if /o/ and /oh/ are already merged, a three-way-merged system? Speakers like NA19F, who are largely rhotic and who also display a 3-M system, do not demonstrate that the two innovations – from an eastern New England point of view – are linked, only that they can coexist. There are few such speakers in any case.

Table 4.14 cross-tabulates speakers' low vowel patterns with a simple three-level rhoticity rating that divided speakers into three categories, based on spontaneous speech and behavior with the reading cards: 'mostly r-less', 'somewhat *r*-less', and 'completely *r*-ful'. No senior citizens fell in the most-rhotic category; all were *r*-less at least to some degree. On the other hand, only a tenth of the young adults fell in the least-rhotic group.

Aside from the strong trend toward rhoticity between the generations, we can observe several suggestive tendencies, although none reach the level of statistical significance. First, we see that two-thirds of seniors overall are mostly *r*-less, but an even greater fraction of the three-way-distinct speakers (five of six) are in that category. It makes sense that a conservative vowel system would go along with conservative behavior on /r/.

Second, it appears that speakers in the MAIN dialect area – that is, in Rhode Island and

[76]Rather than free /ah/ being an exceptional use of checked /o/, we could say that the two are merged as a free vowel, /ah = o/ (Labov, p.c.).

	RHOTICITY	LOW VOWEL SYSTEM					
		3-D	MAIN	ENE	3-M	UNCLEAR	TOTAL[a]
SENIOR CITIZENS	mostly *r*-less	5	19	18	—	—	42
	somewhat *r*-less	1	6	14	—	—	21
YOUNG ADULTS	mostly *r*-less	—	7	6	1	—	14
	somewhat *r*-less	—	31	19	3	7	60
	completely *r*-ful	—	10	12	2	13	37

[a]Four seniors and two young adults were accidentally left out of this analysis.

Table 4.14: Cross-tabulation of 174 low vowel systems by degree of rhoticity

certain adjacent parts of Massachusetts – are somewhat more non-rhotic than the average person interviewed in 'Massachusetts proper'. Among senior citizens, 76% of MAIN speakers (19/25) fell in the least rhotic category; only 56% of ENE speakers did (18/32).

For the young adults, a similar discrepancy is visible. Few speakers in either area are mostly non-rhotic, but a slightly greater proportion of ENE speakers are completely rhotic: 32% (12/37) vs. 21% (10/48).

Addressing the question that originally motivated this section, we observe that the small number of speakers with a likely three-way-merged system (3-M) are not noticeably skewed towards rhoticity.[77] More importantly, a healthy number of speakers (12) maintain the ENE pattern – including a clear /ah/∼/o/ distinction – despite being completely *r*-ful.

This suggests that the correlation identified by Kurath and McDavid (1961), between non-rhoticity and the presence of an independent low central vowel, may be more of a typological generalization than a statement about structural incompatibility. Or, it could be that the type of pattern shown by those 12 speakers – with /ah/ distinct from /o = oh/ despite full rhoticity – is indeed inherently unstable, and that over time the ENE low vowel pattern will necessarily collapse, if post-vocalic /r/ is fully reintroduced to the area.

[77]One, a 16-year-old young man from Dartmouth MA, is even in the 'mostly *r*-less' category. This is one of the speakers whose 3-M pattern can be understood as a reaction to 'competing' parental two-vowel systems; his mother is from Fall River (MAIN), his father from Dartmouth (ENE).

4.6 Discussion

The three original low vowels of southeastern New England have undergone two generations of merger. The first occurred when /o/ either 1) remained rounded, lengthened, and fell in with /oh/, as in most of eastern Massachusetts, or 2) unrounded, lengthened, and combined with /ah/, as in Rhode Island and certain adjacent parts of Massachusetts. In the first, or 'Eastern New England' area, this process was likely complete by 1900, while on the 'Mid-Atlantic' side some speakers continued to acquire three distinct vowels for another two decades or so, before undergoing their own merger.

After many decades where two complementary two-vowel systems, ENE and MAIN, 'faced off' across a dialect boundary, a second generation of merger is affecting young people today. Its eventual result, as far as the low vowels are concerned, will be to dissolve the boundary that crystallized most prominently during the two-vowel stage. One wonders whether the same forces that caused the first generation of merger are at work a century later, or whether today's changes have different causes.

It was suggested above, in §4.1.3, that the first generation of mergers had largely internal causes. There are two reasons for saying this: first, the 19th-century data of Chapter 2 shows that the first mergers were less advanced then – there are more three-vowel systems than there are today – but the mergers were not restricted to a smaller geographic area. Even Boston, a likely point of origin under a wave model, had at least one three-way-distinct speaker.

Secondly, the early 20th-century data, from the senior citizens in this chapter, shows a sharp boundary between two two-vowel areas, one that more or less matches the original settlement areas of centuries before. There is neither an area of overlap (reached by both mergers) nor one of 'underlap' (untouched by either merger).

If we also note that the /o/$\sim$/oh/ merger was observed in the most distant parts of Maine no later than in Plainville MA, which is about nine times closer to Boston, an internal explanation becomes even more attractive, even though it must rely on the following speculation:

All New England communities were seeded with a phonologically identical three-vowel system. From some original difference(s) between settlement areas in phonetic structure – perhaps amplified over the years – the communities in each area evolved in parallel, leading them to undergo one or the other merger at roughly the same time.[78]

It is possible that social, migratory, and economic networks among communities helped spread changes. But since these networks tended to coalesce within the original settlement areas, rather than between them, it is usually impossible to tell.

We can see this persist into recent patterns of migration. Among the senior citizen subjects, 8% had one parent from the other side of the dialect boundary; no more than 3% had both parents from across the line.[79] The most common family background was for both parents to have grown up on the same side of the dialect boundary as the subject. 52% of seniors had such parents.[80] It was also not uncommon for seniors to have one foreign-born parent – 13% – and having two was even more likely – 24%.

Among the young adults, foreign-born parents were half as common: 9% of subjects had one foreign parent, 9% had two. And probably because of this decrease in the proportion of immigrants, parents who grew up in the United States, on the same side of the dialect boundary as their children, represent a larger majority for the young adults: 69%.

Somewhat surprisingly, given the widespread belief that families in recent years are more mobile, 19% of the young adults are growing up in the same city or town that both their parents grew up in. That is, the young adults' families are slightly *more* 'rooted' than

[78]Chapter 2 proposes that it was a difference in the realization of /o/ that was the original difference.

[79]The 3% was a 63-year-old woman from Attleboro with a Connecticut mother and a New York City father, and a 79-year-old from New Bedford, who implied his parents had come from Fall River, but refused to say. Both subjects had clear ENE low vowel systems, despite their parents being from areas that are now MAIN.

[80]Out of this group, one-fourth (13% of seniors overall) showed an even greater degree of rootedness. They have lived their whole lives in the same city or town where both their parents also grew up.

the seniors' (though obviously the seniors *themselves* have lived longer in one place).

And the proportion of young adults with a parent from the 'opposite' dialect area was almost as low as for the senior citizens: 11% (one parent) and 2% (both parents).[81]

It would be hard to attribute the general weakening and sporadic collapse of the ENE and MAIN systems among the young adults – the beginnings of the 'second generation of merger' – to dialect contact through migration, if the degree of inter-dialect migration was almost equally large back when the senior citizens were acquiring their stable systems.[82]

Nor is non-migratory contact between adult speakers of the ENE and MAIN systems likely to be responsible for community change, despite the increasing number of such contacts, in the workplace, especially. People originally from the Fall River area, for example, may tend not to *relocate* across the boundary, but quite a few of them do cross it daily to get to jobs in places as close as Dartmouth, as far away as Boston, or even further (see §4.3.4).

The suggestion that non-migratory adult-to-adult dialect contact does not lead to lasting change in low vowel systems rests on two points. First, that the vowel systems of most adults are fairly immune to change. Senior citizens whose data was excluded from the analysis in §4.2.1, because they had not lived most of their lives in the same community, almost always retained the low vowel pattern of the place they had lived in early childhood.

An extreme example of this stability over the lifetime was a 73-year-old man in Fairhaven MA, who had moved with his family from Warwick RI at the age of 7. In his spontaneous speech and on reading passages, his low vowels were pure MAIN, even after 67 years spent in the ENE environment. On minimal pairs, however, which he treated very

[81] The 2% was a 20-year-old Blackstone woman with parents from Sudbury MA (northwest of Boston), and a 22-year-old Seekonk woman with parents from Whitman and Raynham MA (see Figure 4.2). BS20F (probably) and SK22F (definitely) had ENE patterns, thus agreeing with their parents, not their communities.

[82] The seniors, recruited at senior centers, may be more representative of their populations than the young adults, found working in retail businesses and municipal facilities. The young adults might have skewed more 'local', and if so, inter-dialect migration may have risen much more than the above figures imply.

deliberately, he had learned to separate /ah/∼/o/, but not to merge /o/∼/oh/.

Another type of adult dialect contact occurs in personal relationships between people with different dialect backgrounds. A long marriage is perhaps where one would most expect mutual accommodation to occur. But in the case of a 78-year-old woman from Uxbridge MA and a 76-year old man from adjacent Millville MA, 55 years of marriage have had no obvious effects on their low vowel systems. UB78F produced the ENE pattern in speech and on the formal methods, while MV76M produced the MAIN pattern.[83]

However, each of them did judge one /o/∼/oh/ pair as sounding the way their spouse would pronounce it, not the way they pronounced it themselves. This, at least, may be due to the spouse's influence.[84]

The second point supporting the view that it is not adult dialect contact that causes change in low vowel systems is the following: Even if adults did substantially accommodate in contact situations, it would not lead to dialect change of the rapid type observed in some communities in this study, unless parents quickly abandoned a distinction, and abandoned it thoroughly enough that their children stopped acquiring it in initial input. Otherwise, a merger would take root only by gradual approximation through the generations, which is not what we find.

Adults' acquisition of another dialect, or accommodation to it, may have some limited effect on the initial input they give their children, but parents can affect their children's linguistic future much more dramatically by migrating to another dialect area.

When families migrate with young children (or before they are born), it sets up a contrast between the initial dialect they are exposed to, that of the parents, and the one they are exposed to from around the age of four, that of the peer group.

[83]A 2-vowel system might be more susceptible to change through contact with a 1-vowel system than through contact with the other 2-vowel system (with its comparable *inventory* but incompatible *incidence*).

[84]When other speakers' judgments did not match their productions – which did not happen very often – the judgments often seemed to reflect early childhood or parental patterns.

If a single child joins a peer group with a different vowel system, we can ask to what extent the individual will adapt to the group, and what factors promote or prevent this adaptation (see Chapter 3). But the larger group – and by extension, the community – is unlikely to change unless joined by a critical mass of speakers who differ.

Migration is the most likely way for this child-to-child dialect contact to arise; except in some pre-schools and some after-school activities, and setting aside contact with cousins and other relatives, most children have little contact with children living in other communities, even adjacent ones.[85]

So it is appealing to propose, where /o/ and /oh/ are merging – in places like South Attleboro and South Bellingham (as seen in §4.3), or in Seekonk, Cumberland RI, and Warwick RI (see Chapter 5) – that it is being caused by a substantial number of people migrating from the ENE side of the boundary, where those classes have long been merged.

It is true that over the last few decades, as real estate prices closer to Boston have risen, people have migrated further and further away from the city and its older suburbs. And perhaps for the first time, this expansion of Greater Boston is passing beyond the old dialect boundary, reaching places such as the ones just mentioned: Seekonk, South Attleboro, etc.

A careful correlation of demographic data with the linguistic observations in several places could support or reject this hypothesis.

The two phenomena which make up the second generation of merger are essentially parallel. Linguistically, they are more or less complementary, give or take some phonetic details. The primary theory being defended is that a certain critical mass of ENE families arrived in places like South Attleboro, and through their children's interaction with the natives, helped to change the local MAIN pattern into 3-M. This is superficially plausible, awaiting only detailed demographic support (presented in §5.8.6.1); the correct type of

[85]Note one consequence of this: if young children and their reorganizations of input are the major source of dialect change, the concept of changes spreading from place to contiguous place is difficult to account for.

immigration is certainly present.

It was thought at first that the other phenomenon, the recent appearance of three-way merger on the ENE side of the dialect boundary – that is, /ah/ falling together with /o = oh/, of which there were four clear examples in the geographic study, and ten unclear ones (see Table 4.7) – posed a problem for the hypothesis attributing merger to migration. As opposed to the numerous anecdotal comments made by subjects about people moving into the study area from closer to Boston, I was unaware of there being much parallel movement from Rhode Island or other distinct areas into the ENE communities in the study area.

But it turns out that comparable levels of migration do exist in the opposite direction, from places like Rhode Island, Connecticut, Western Massachusetts, and the Mid-Atlantic states proper, into Eastern New England (see §5.8.6.2 for more details). This would make it possible to attribute both types of recent merger to in-migration from areas that already have that merger. Not only is a sufficient current level necessary, but it is also critical that the level has recently been on the increase. If in-migration has been constant for decades, then the question of why these mergers are happening now becomes a substantial problem.

If the second generation of merger is *not* caused by juvenile dialect contact as the result of migration, what else could account for it? Presumably, whatever internal pressure may have existed in the old 3-D days, to simplify a 'crowded' three-vowel system, is not likely to apply now to the ENE and MAIN systems. Some further discussion of other possibililities is found in §5.8.7.

We must say at this point that the causes of the second generation of merger – which transforms both ENE and MAIN patterns into three-way-merged ones – are unknown. And though the young adults in this sample were old enough to show little effect of the new mergers, other evidence points to substantial expansion of the 3-M pattern in the near future.

Although the geographic study area of 40 communities was fairly large, it did not extend very far on either side of the original dialect boundary. So when a change is observed in a study area community, it is possible that the change is happening there *because* it is near the dialect boundary, but not certain; it could be occurring over a wider area, or it could indeed be occurring mainly near the boundary, but not *because* of it, that is, not because of the proximity of speakers of the opposite dialect.[86]

We could test this by comparing places farther from dialect boundaries, that receive little immigration from other dialect areas. If children today turn out to be merging *cot* and *caught* in rural southwestern Rhode Island, or rhyming *father* and *bother* in small towns in Maine, then we would know for sure that these changes have nothing to do with migration across a dialect boundary.

In that case, we would have a basically unconditioned change, and might revert to a language-internal explanation – as yet an unspecified one – to explain it, or, as a last resort perhaps, to an account involving the mass media.

Focusing on a small, densely populated area along a dialect boundary, the geographic study has shown how 350-year-old phonetic patterns developed in parallel into distinct, internally uniform phonological dialect areas. Once fully manifested, they remained stable for several generations despite being in close contact, which argues in favor of the reality and autonomy of dialect areas, and against the view that change primarily proceeds by contagious diffusion.

This study had neither the time depth nor the spatial width for a full chance of observing the expansion of merger predicted by Herzog's Principle. However, it did demonstrate the possibility of dialects being in close contact for some time *without* the spread of mergers,[87]

[86]Even a simple 'moving boundary' can be of three types: 1) change spreads from place A to adjacent place B (contagious diffusion); 2) change reaches A, then B (hierarchical or relocation diffusion; no link needed between A and B); 3) A develops change before B (internal evolution; no link needed between A, B).

[87]Since these low vowel patterns, MAIN and ENE, each had complementary mergers already, only a third pattern, 3-M, could easily emerge from their contact. A simpler example would involve vowel systems where the only difference is a single merger. There is no obvious reason why such a situation should be less stable, but it may be that the MAIN and ENE patterns are in fact structurally – rather than socially – unsuited to

and it also revealed a very local and temporary case where a distinction expanded *along with* a complementary merger.

This chapter has looked at the phonological patterns among three low vowel word classes, /ah/ as in *father,* /o/ as in *bother,* and /oh/ as in *daughter.* If low vowel systems had no meaningful correlations with other phonological and lexical differences between dialects, then this study would have little relevance beyond the subfield of vowel mergers.

Clearly, not every linguistic (let alone cultural) phenomenon persists and simplifies in the same way these vowel systems have. Lexical innovations must necessarily spread quickly through contact, while patterns of vowel shift may be even more structurally predestined than those of merger.

But if, as I believe, the low vowel systems found in the dialects of the geographic study area are not isolable from the rest of their phonologies, then further work will show the principles sketched here to bear more generally on the processes underlying dialect stability and change.

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influencing each other.

Chapter 5

The Family Study

5.1 Overview of the family study

The family study focused on merger at the level of the speech community, as opposed to the dialect area (Chapter 4) or individual (Chapter 3). Speech communities are more socially real than the dialect areas containing them,[1] and the speech of a community is more consistent than the idiolects which comprise it (Weinreich *et al.* 1968: 188). In the current work, the primary speech community is taken to be the residents of a city or town; when linguistic divisions demand it, smaller units have been employed.

While speech communities so conceived differ from typical large urban ones in that many of their residents do, nowadays, travel to work outside their boundaries, they are similar when one takes the point of view of the children growing up there. For these schoolchildren, especially the younger ones, almost all peer contacts are with residents of the same community.[2]

[1]Although not everyone knows each other even in the smallest communities examined here, a social network connects the population of a town of 10,000 in a much realer sense than a dialect area of several million. And in New England, judging from personal as well as fieldwork experience, most people's primary geographic identification is with their city or town; only in the larger cities do neighborhoods take over this role.

[2]The primacy of the town as a small societal unit is particular to the New England states. Municipal

Traditional dialect geography, both in Europe (Pop 1950) and New England (Kurath *et al.* 1939), also took the town or village as the usual unit of sampling, the unit that combines to form dialect areas. This was especially reasonable in the rural and agrarian regions covered by most earlier dialect atlases, because villages and towns were largely self-sufficient entities, especially in those times. But as was seen in Chapter 4, small towns are still a valid unit of linguistic patterning, even when many of the communities are now more or less suburbs of urban centers.

One of the goals of the family study was to further the work of Herold (1990) by focusing on the relatively short period over which a speech community's children can stop acquiring a vowel distinction, and learn a merger instead.

Herold showed in Tamaqua PA that this period of merger can be as short as ten years. In South Attleboro MA, the geographic study results (see §4.3) suggested that merger can overtake a (sub-)community even faster: in two or three years.

However, the overall backdrop emerging from the geographic study is one of substantial stability, not wholesale change. Comparing Figures 4.3 and 4.4, the boundary between the ENE pattern where /ah/ $\neq$ /o = oh/, and the MAIN pattern where /ah = o/ $\neq$ /oh/, is mostly in the same position, and not much less sharp, after five of six decades of apparent time.

True, there are a fair number of unclear or three-way-merged systems among the young adults (23%), many more than among the seniors (4%, all in one community). But the changes do not give the impression of an orderly shifting of the boundary line.

Of the young adult change away from the two-vowel systems, more was found on the Massachusetts side of the boundary, where 'only' 68% remained ENE. The Rhode Island (and adjacent) territory is still quite solid, with 77% MAIN systems.

Other than three subjects from South Bellingham and Assonet, where community change

government is strong; county government weak or nonexistent. There are no unincorporated areas in Southern New England, and public school district boundaries universally coincide with town lines, except for the combined 'regional' middle and high schools set up jointly by some smaller towns.

is clearly in progress (see §4.3), most of the young adults who deviate from the MAIN pattern are isolated cases. Two in Blackstone and Seekonk were earlier 'explained' as following the ENE pattern of both their parents rather than their community's norm.[3]

One Rhode Island community, Barrington, contained a small cluster of non-MAIN young adult subjects. This 'upscale' town is known for having a large proportion of transient and non-native residents. This was reflected in the parental background of the subjects, which was largely out-of-state. It seems likely that this demographic peculiarity is leading to the breakdown of the traditional Rhode Island pattern in this particular town.

Barrington, in fact, would have made a good target community for the family study, except that speakers in their twenties there already display change from the historically-dominant pattern. Methodologically, targeting parents and their younger children living at home provided a better means of assessing how change spreads through communities.

Figure 5.1 shows the location of the family study communities, using the young adults' map from the geographic study as a background. We see that the family study mostly took place within territory of rightward-pointing triangles, that is, the historically 'Mid-Atlantic' area where the /ah $=$ o/ $\neq$ /oh/ pattern was observed for young adults as well as seniors.

For the children of families in historically-MAIN territory, the 'remaining' relevant merger was almost always /ah $=$ o/ $\sim$ /oh/. In the remainder of the chapter, the bare terms 'merger' and 'distinction' will often be applied to refer to this potential contrast.

The first family study community was Attleboro MA. It was known that the adults of Attleboro were divided between MAIN systems in South Attleboro and ENE systems in the rest of the city. Given this, the intention was to observe the vowel patterns of their children at different stages of schooling – as they were mixed together in the city's one high school, in particular. Since the divided municipality had shown long-term stability, the nature of

[3]Another young adult, from Rehoboth MA, had a German mother, a father from Boston, and a close-to-ENE low vowel system, matching the father, it seems.

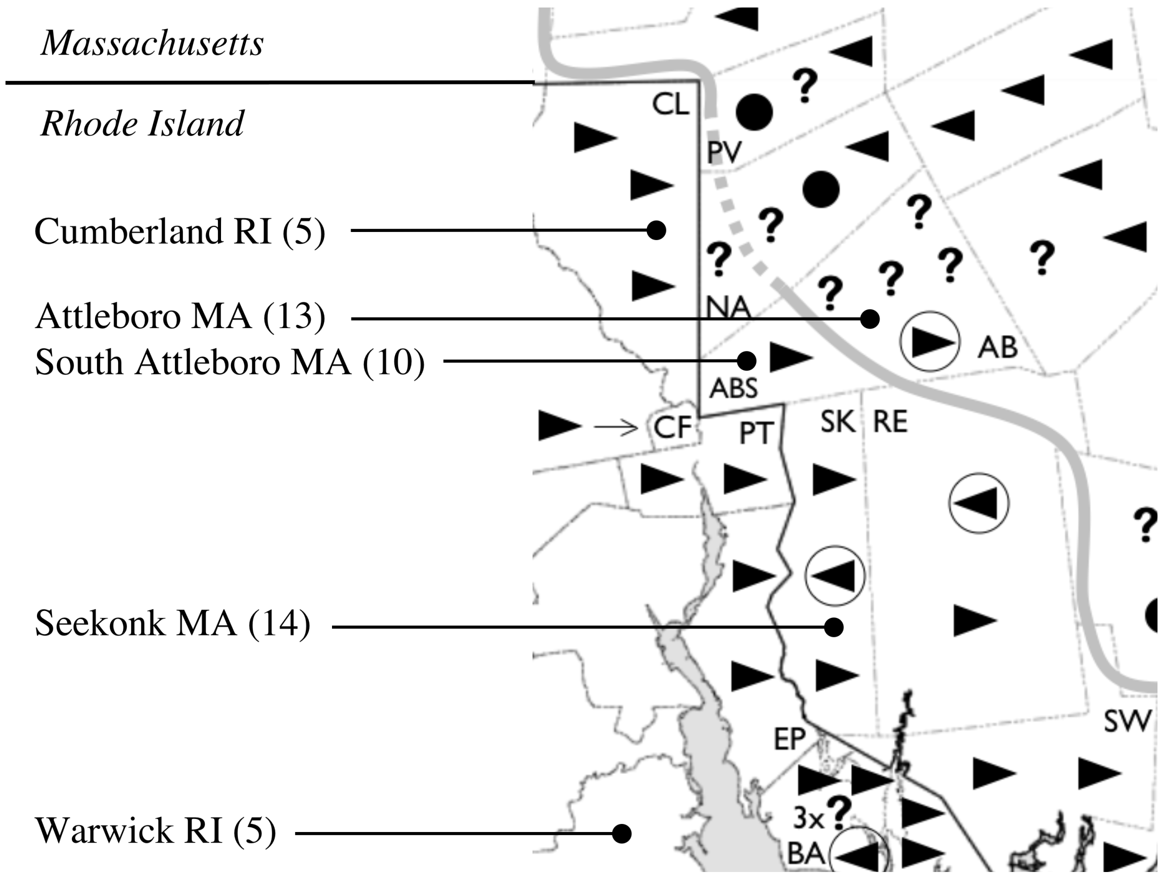

Figure 5.1: Location of 47 families interviewed

that ‘equilibrium’, and how it persisted, was of interest.

In South Attleboro, ten families were interviewed, in which there were 18 children ranging in age from 5 to 19. In the remainder of Attleboro, thirteen families were interviewed, with 26 children who ranged in age from 3 to 18.[4][5]

We will see in §5.2 that South Attleboro children, of all ages, did not retain the /o/∼/oh/ distinction of their parents (assuming their parents had the distinction; children of merged

[4]Most of the (South) Attleboro families were recruited by making an appeal at a parent-teacher meeting at one of the public schools. The likely effect of this method was to skew the sample towards a higher socio-economic bracket than was representative of the city overall.

[5]Usually both parents were present for the interview. When one was not, attempts were made to have the absent parent fill out the school survey questionnaire, which usually sufficiently specified his or her low vowel system.

parents, in all parts of the city, were also merged, but less surprisingly so).

For this reason, there was no way to track the progress of the merger among these families. It was essentially too late to evaluate possible effects of contact between South Attleboro and Attleboro children at different stages of schooling.

The focus was shifted south and west, then, in search of communities where children either preserved the low back distinction, or at least had not universally lost it.

The locality that proved to be the most productive was Seekonk MA, where fourteen families were interviewed, including 34 children, ages 3-17.[6] Discussion of the Seekonk data will constitute the bulk of this chapter (§5.3) because of the cleavage discovered in the community between children over 10, who maintained their parents' low back distinction, and children under 10, who were merged. The break appears to depend mainly on age; several cases were observed of distinct older siblings and merged younger siblings within the same family.[7]

The five families interviewed in Cumberland RI, who had 13 children between them (ages 5 to 16), presented the same overall pattern, whereby older children were distinct and younger ones merged, within families. But the absolute age of the children was a much less reliable predictor of low back vowel status than in Seekonk; for example, there was a distinct five-year-old, but a merged eleven-year-old (in different families).[8]

[6]The method of recruiting families in Seekonk was derivative of the school survey. When elementary and middle school parents signed permission slips for their children to participate in the school survey, they were given space to leave a telephone number if they were interested in participating further. Not very many did so, and only about half of those who did agreed to in-person interviews. As in Attleboro, the family sample is likely to skew higher, socioeconomically, than the population of the community as a whole. The linguistic relevance of this unrepresentativeness is unknown, but not believed to be very great.

[7]§5.3.2 will discuss a Seekonk family with distinct parents, a distinct 14-year-old son, and an 8-year-old daughter who was merged in accordance with the change in progress. Yet their 3-year-old son was clearly distinct. This pattern suggests that young children acquire their parents' vowel inventory first, before adjusting it to match that of their peer group.

[8]This was despite the fact that unlike the miscellaneous Seekonk sample, the five Cumberland families – who had been recruited through a chain of friendships stemming from a South Attleboro interview – all lived in the same affluent section of town close to the Massachusetts border, and most of their children attended the same elementary school.

The appearance of the low back merger among young children in Seekonk and Cumberland was an almost total surprise. In the geographic study, only one young adult from Seekonk,[9] and no one at all from Cumberland, had deviated from the MAIN or 'Rhode Island' pattern, with its low back distinction. Yet now, in the family study, subjects only ten or fifteen years younger than those young adults were routinely showing the merger.

It could, in theory, be proposed that this an age-grading effect, that children do not develop the low back distinction or do not show it until roughly their teenage years. However, this suggestion is defeated by the Seekonk 3-year-old mentioned above, whose vowel distinction was extreme.[10] The necessary conclusion is that children in Seekonk and Cumberland (like those in South Attleboro before them) are merging their low back vowels, thereby differentiating themselves from their parents and older siblings.[11]

Whenever community change such as this occurs near a related boundary – something usually construed as 'the boundary moving' – we may ask whether it is happening because of that location, or whether the change is going on more broadly, and simply including places near the boundary, like any others.

The first option would include possibilities like 'the merger is spreading from town to town' (contagious diffusion), 'the influence of Boston (speech) is becoming wider and wider' (hierarchical diffusion), or 'people from Greater Boston are moving further and further out from the city' (relocation diffusion).

The second option would encompass any internal (structural) explanations for merger that might apply to a wider area, as well as an account appealing to the influence of the mass media, a growing national standard, or any other such large-scale process.

To resolve this issue to some extent,[12] a final family study community was selected

[9]This was SK22F, who agreed with her parents' ENE pattern. See §4.6.

[10]The age-grading hypothesis, a straw man really, would also not explain why in South Attleboro people take longer, until age 20 or so, to manifest their distinction.

[11]Two family interviews conducted in the city of Pawtucket RI were more equivocal, but at least one child (of three) showed the merger there too.

[12]A proper investigation of this point would have to study communities truly in the interior of dialect areas,

slightly further from the original linguistic boundary of the MAIN system. This was Warwick RI, a large suburb south of Providence, on the opposite side of the city from Seekonk (east) and Cumberland (north), which could also be considered Providence suburbs.

Warwick is a city which has a large proportion of Rhode Island natives.[13] Five families were interviewed there, with twelve children aged 4 to 15. Four of the families had native Rhode Island parents; the other parents were from Maine and Texas, and their children presented an interesting example of the acquisition from peers of local norms, including the low back vowel distinction.

But that distinction, though it appeared to be stronger in Warwick than in any other family study community, was not universally maintained among the children even there. The impression I obtained was that Warwick might be five or ten years behind Seekonk or Cumberland in the same progression towards low back merger. Because Warwick is such a typical, locally-rooted Rhode Island community, if merger were taking hold there it would probably indicate the recessive status of the distinction everywhere in the vicinity.

community	families	children	recruited	/o/∼/oh/ in adults	/o/∼/oh/ in children
Attleboro	13	26	PTA	merged	merged
S. Attleboro	10	18	PTA	distinct	merged
Seekonk	14	34	survey	distinct	under 10 merged
Cumberland	5	13	network	distinct	younger merged
Warwick	5	12	PTA	distinct	incipient merger?

Table 5.1: Summary of families in the study

The distribution outlined above, of subjects in the family study, is shown in Table 5.1. In each community, parents and children were interviewed talking about their lives and personal backgrounds, to obtain spontaneous speech, and with formal methods to obtain a concentration of the vowels of interest.

to see if merger is happening there just as much. See §5.8.7.

[13]76% of Warwick's 2000 population was born in Rhode Island. See §5.6 for further discussion.

A smaller set of reading cards was used compared to those for the geographic study, and the vocabulary was kept simple so that young children could read them. In (South) Attleboro and Cumberland, five cards were used, that contrasted the pairs *cot∼caught, Don∼Dawn, knotty∼naughty, tot∼taught,* and *Otto∼auto.* In Seekonk and Warwick, the *Otto∼auto* card, which had proved difficult for some children, was replaced with cards focusing on two other low back vowel minimal pairs: *nod∼gnawed* and *tock∼talk.*The full text of the cards, which contained other low vowel tokens besides the ones specifically contrasted, is given in Appendix B.

As in the geographic study, each pair was impressionistically coded as 'same' or 'different' when it was uttered, and the subject was asked to give the same judgment after reading the paired words in isolation on the back side of each card. This second repetition, with full attention being paid to the minimal pair, will again be called the *overt* instance of the pair, while the original reading of the words in sentential context will be known as the *covert* pair.

For subjects who were too young to read the cards described above, a series of picture flashcards were used. These simply had a photograph or drawing of a common object – *ball, chalk, clock, doll, pasta* with *sauce,* etc. – and the child would identify the picture.

Based on auditory impressions of their productions of the words elicited with these cards (and subjects' perceptions, in the case of the minimal pairs), as well as their spontaneous speech, almost all adults and most children in the family study were easy to label as either 'merged' or 'distinct' with respect to the low back vowels. More precisely, of 86 parents interviewed, 75 (87%) were judged clearly merged or distinct, 8 (9%) were judged probably merged or probably distinct, and only 3 (3%) were more profoundly unclear.

Among the children, the level of certainty was not so high. 65 of the 107 children (61%) were confidently assigned as merged or distinct, while 40 (37%) were thought probably merged or probably distinct. Again, there were very few (2, or 2%) who seemed to have a truly unclear or intermediate pattern.

There are several reasons why a given child might have been judged ‘probably’ rather than ‘definitely’ merged or distinct. Children who did not produce very much spontaneous speech were harder to judge, as were the young children who used the picture cards – which lacked direct pair contrasts – rather than the reading cards.

But many of these children showed positive evidence of being intermediate between the usual merged and distinct patterns. Sometimes this was consistent across styles; for example, in reading or in normal speech, a child would pronounce most /o/- and /oh/-words alike, with a low unrounded vowel, but would pronounce one or two /oh/-words with a vowel that was more back and raised.

Frequently, however, a child would give greater evidence of the low back merger in his or her spontaneous speech, but on the formal methods – usually in pronouncing overt minimal pairs – they would show greater evidence of the distinction. The difference between styles was never extreme nor particularly consistent, however.[14]

The next sections discuss the family study results from each community in more detail.

5.2 The families of Attleboro and South Attleboro

5.2.1 The low back merger: /ah = o/ $\sim$ /oh/

The 44 children of the 23 Attleboro and South Attleboro families are shown on Figure 5.2. In this figure and subsequent ones like it, each vertical line represents one family, and the children are arranged according to age along that vertical line. Boys are represented by

[14]While this behavior seems logical – spontaneous speech matches the peer group (or incoming norm), and more conscious pronunciation mirrors the original dialect learned from parents (or older norm) – it goes against something that has usually been reported for situations of merger-in-progress. In a well-known study of adolescents at a swimming pool in Pottsville PA, it was more common for speakers to pronounce low back minimal pairs differently, but to judge them to be the same (hence the saying ‘perception leads production’). The perception/production relationship is not equivalent to the stylistic dimension, but they are certainly related (Herold 1990: 94-99).

squares, and girls by circles.

Children with an unambiguous low back merger are filled solid black, and those with a probable merger are filled solid grey. Children with a clear low back distinction are filled white with a black outline, and those with a probable distinction are filled light grey with a black outline. (Truly unclear or intermediate cases will be filled a medium grey with a thin outline, but there are no such subjects on Figure 5.2.)

The children in Figure 5.2 are divided between Attleboro and South Attleboro, and each of those categories is subdivided according to the low back vowel status of the parents.

The Attleboro (left) side of the figure, with 26 children, is something like a control group; this community has had the low back merger for many decades. We see that regardless of parental background, there are 14 children judged 'definitely merged', and 11 judged 'probably merged'. Though the numbers are small, it is worth noting that when both parents are merged, 5 of 5 children (100%) are 'definitely merged', when one parent is merged, 6 of 12 are (50%), and when neither parent is merged, only 3 of 9 are (33%).

Only one child in Attleboro proper, a 6-year-old girl, was judged 'probably distinct', and her family's case is informative. In the Lucas family[15] – second from the right under "Both Parents Distinct" in Figure 5.2 – both parents grew up in upstate New York, and both have a clear low back distinction. At least as importantly, before moving to Attleboro, the family lived in eastern Connecticut, another area of low back distinction.

Nora Lucas, the six-year-old who showed a 'probably distinct' low back vowel system, had in fact spent pre-school and half of kindergarten in Connecticut, and was in the middle of first grade in Attleboro when interviewed. We might expect that such a speaker would continue to accommodate to the merged pattern of her current peers, as the years go on.

Nora's four-year-old sister Missy had not attended school in Connecticut, and was in her first year of pre-school in Attleboro when she was interviewed. Her 'probably merged'

[15] All names are pseudonyms.

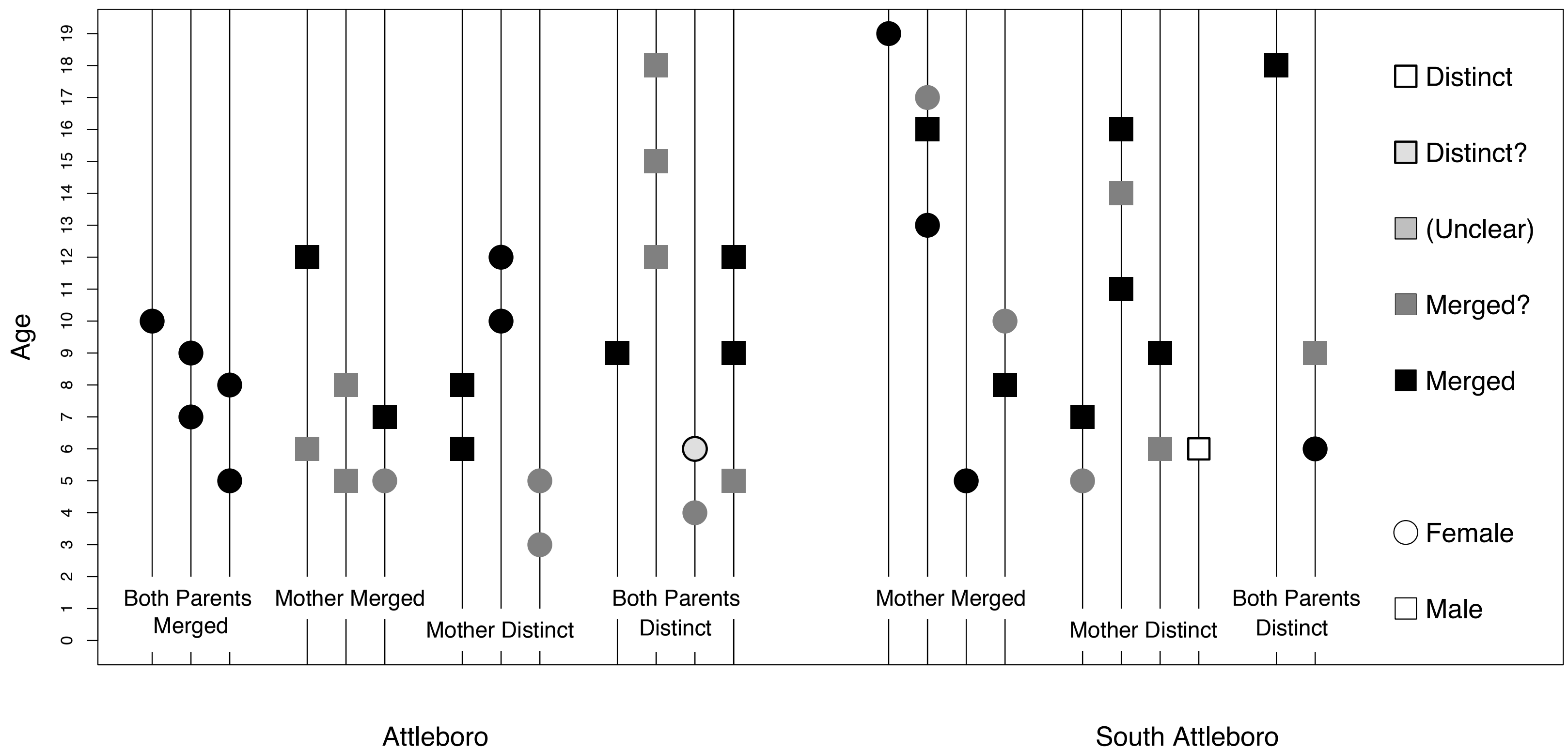

Figure 5.2: The children of Attleboro and South Attleboro

pattern is consistent with other Attleboro children of her age range. Both sisters have had the same distinct parental exposure; it was Nora's exposure to the distinct pattern *from peers* that led to her anomalous status among the otherwise-merged children of Attleboro.

Moving to the South Attleboro (right) side of Figure 5.2, we are looking at a community with a different history. Recall (from §4.3) that South Attleboro adults aged 20 and over exhibit the distinct pattern, which on this figure would be shown by a white symbol. But among these 18 children, there is only one such symbol. Eleven of the children are 'definitely merged', the other six 'probably' merged.

In recruiting these families, there was an emphasis on interviewing a range of different parental-background types, but it should be understood that the most common family type in South Attleboro as a whole is for both parents to be distinct.[16] This type, while particularly important for tracking the appearance of community merger – merged children of distinct parents *must* be acquiring the merger from peers – was unfortunately under-represented in the sample. We note, at least, the rightmost family, where a 9-year-old boy, Evan Mikulski, is probably merged and his 6-year-old sister Amy is definitely merged.

The lone exception to merger among the South Attleboro children was the first grader Caleb Hayas, age 6. He is found under "Mother Distinct" in the right section of Figure 5.2. Caleb's mother came from Rhode Island and had a strong low back distinction. His father had come from South America in his twenties, and his English low vowels did not follow any clear pattern of merger or distinction. Caleb's spontaneous speech was judged definitely distinct, and his identification of the picture flashcards was judged probably distinct – overall, he receives the rating of definitely distinct.

There are several ways to interpret the exceptional behavior of this one subject. We could take the case of Caleb Hayas as counterevidence to the proposition that all South

[16]Of the school survey subjects from South Attleboro, having two distinct parents was the most common condition, followed by having two merged parents.

Attleboro children have merged /o/ and /oh/. But given the evidence from the geographic study, and here, that teenagers and older children have merged the two word classes, it seems unlikely that Caleb Hayas has a distinct peer group while Amy Mikulski – also in first grade at Hill-Roberts Elementary – does not.

My suggestion is that Caleb Hayas is a late example of something that will be seen in the next section from a 3-year-old from Seekonk, Casey O'Connor. Despite being three years older, Caleb may still be under the linguistic influence of his mother, and her distinct pattern. While I did not gather information specifically with respect to his integration with peers at school, my general impression was of Caleb as somewhat socially awkward and/or immature. His parents also spoke of him having had a delay in learning to speak, some years previously. All in all, rather than treating him as an exception to the low back merger in South Attleboro, I will consider him a late bloomer as far as adopting the linguistic patterns of his peers; if this is correct, he will soon enough be merged.

5.2.2 The low central merger: /ah/ $\sim$ /o $=$ oh/

Most Attleboro parents who have the low back merger also maintain a distinct low central vowel /ah/; that is, they have the Eastern New England two-vowel system. Children whose parents both have this system would have the best chance of retaining it. However, some children deviate from their parents, merging /ah/ with the already-merged /o $=$ oh/ vowel.

There are three Attleboro families, at the left of Figure 5.2, where both parents are merged; all five of the children in these families also have the merger of /o/ and /oh/.

With respect to the status of /ah/, the situation is not perfectly clear. Unfortunately, few /ah/-words were specifically elicited in the formal methods, where the focus was on /o/ vs. /oh/. No overt pairs with /ah/ were consistently obtained, and the mainly-rhotic pronunciation of the young children meant that covert pairs such as *large*$\sim$*lodge* were of limited use for comparison.

In the LeClaus family, leftmost on Figure 5.2, the 35-year-old mother had grown up in Attleboro; her /ah/ was judged probably distinct.[17] The 10-year-old daughter, Alice, had an /ah/ that was at least very close to her merged /o = oh/, but possibly distinct.

The Leary family presented clear ENE patterns among the adults: the maternal grandmother (age 60) and mother (age 37) were both Attleboro natives, and exhibited a clearly distinct front /ah/.[18] Jessica Leary, age 9, produced tokens of /ah/ that were similar enough to her /o = oh/ to be judged as probably the same phoneme. However, her younger sister Hilary, age 7, appeared to narrowly distinguish the same words.

The parents in the Hughes family were even clearer examples of the ENE pattern. The 35-year-old mother, who grew up in Attleboro as well, made an especially large distinction between a well-fronted /ah/ and a back rounded /o = oh/; the father definitely had the same system. Yet their daughters, 8-year-old Tina and 5-year-old Eleanor, used low central vowels in all three word classes. The auditory impression was of the same vowel in *father* and *bother.* While there was not enough data to be definitive, these girls seem to have the three-way-merged system (3-M) rather than the ENE system of their parents.

Despite some variation and uncertainty, it is clear that unlike their parents and grandparents, young Attleboro children do not maintain an /ah/ vowel that is consistently and clearly further front and lower than their merged /o = oh/ vowel. On the other hand, it is rarely obvious that the word classes have merged, either. Many tokens of /o = oh/ retain a lightly rounded, back quality which is not shared by observed examples of /ah/. This suggests that an underlying distinction is maintained, at least for some children.

The impression derived from this apparent-time evidence, from speakers of a wide age range in the Attleboro area, is that the word class of *father* and that of *bother, daughter*

[17] The father was not interviewed, but may or may not have had the distinct-/ah/ pattern as he grew up as an expatriate in Europe as well as in Eastern New England.

[18] Again, the father was not interviewed in person, but based on his response to the school survey, he probably has the ENE pattern, since he said that *father*∼*bother* and *Tommy*∼*salami* did not rhyme.

are in the process of merging by approximation. Recall from Chapter 4 that the sample ENE senior citizen (§4.4.2.2) had a dramatic acoustic difference between paired tokens of /ah/ and /o = oh/ – averaging over 300 Hz in F2 – while the ENE young adult speaker (§4.4.3.2) made a consistent difference that was only half as large, with the F2 of /ah/ about 150 Hz greater. Judging by ear, the younger children at the edge of the ENE area seem to be continuing this trend of phonetic approximation, which is now at a degree of closeness that would require a large number of tokens to accurately analyze.

5.3 The families of Seekonk

The 34 children from the 14 families interviewed in Seekonk are shown on Figure 5.3. The families are divided into two major categories: the five on the left had one parent with the low back merger (or in one case, an unclear pattern), and the nine on the right are those where both parents clearly had the low back distinction. Many of these parents were also Seekonk natives; others came from Rhode Island or another part of the MAIN territory.

We immediately see that in the five families with a merged parent, all twelve children are either definitely or probably merged. This suggests that the peer groups of these Seekonk children do not maintain the the low back distinction uniformly or strongly enough to reverse parental influence in cases like these.[19] This group of merged children will not be discussed further.

For the nine families where both parents were distinct, there is a noticeable effect of age on the vowel patterns of the children. We can best interpret this by saying that the Seekonk community – meaning the series of sub-communities constituted by the successive cohorts of children forming peer groups and entering (pre-)school every year – adopted the low back merger around the year 2000.

[19] In the discussion of Warwick RI in §5.6, we will see how a more thoroughly distinct peer group can reverse the influence even of two largely-merged parents.

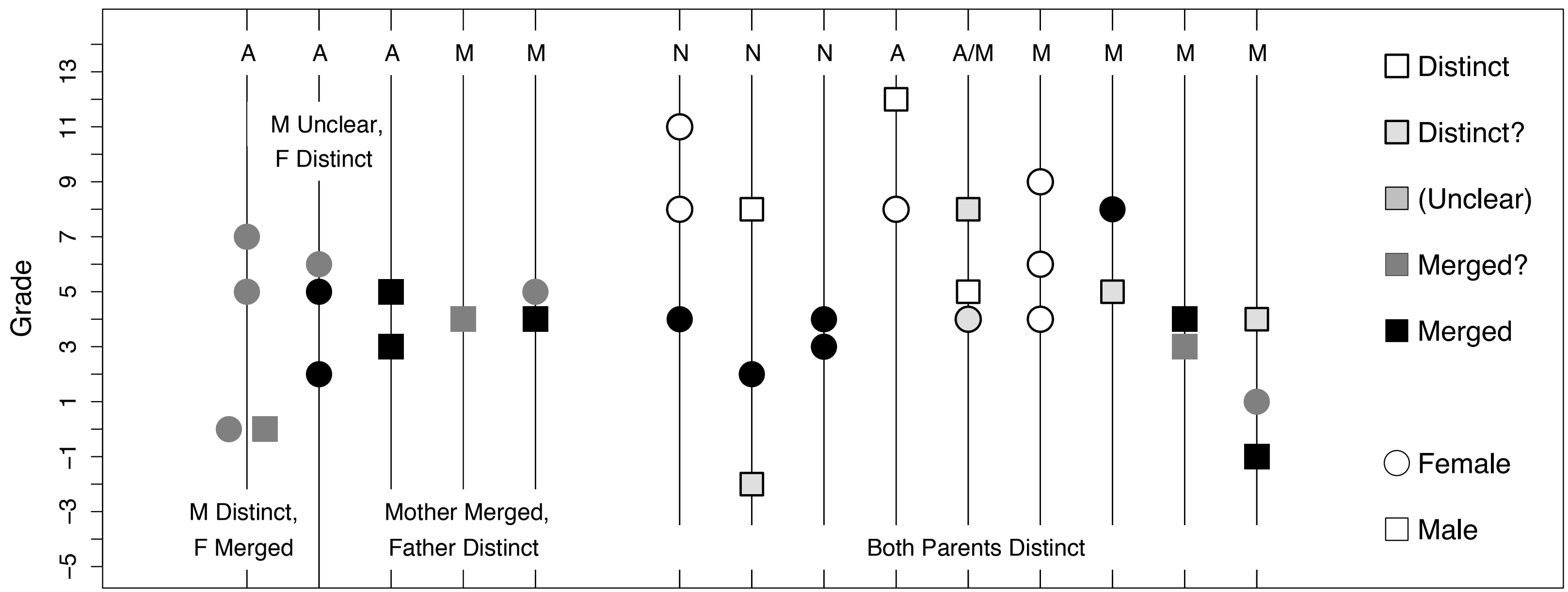

Figure 5.3: The children of Seekonk (elementary schools: A = Aitken, M = Martin, S = South)

Of the eleven children in fifth grade or higher – who are 10 years old or older – eight are definitely distinct, and two probably distinct; only one eighth grader was judged as merged.[20] The six fourth graders – in pre-school in 2000 – are evenly split, with three being definitely merged, two probably distinct, and one definitely distinct. And of the six children in third grade or lower – age 9 and younger – three are definitely merged, two probably merged, and only one (the youngest of all; but see §5.3.2) probably distinct.

The families in Figure 5.3 are annotated according to the part of Seekonk they live in, and hence the K-5 elementary school their children attend or attended: North (near the border with Attleboro), Aitken (in the central part of town), or Martin (in South Seekonk). We can see that there is no evidence of elementary school affiliation having any bearing on when the merger was generally adopted. Data is lacking, especially for Aitken, but nothing here is inconsistent with the merger having happened throughout Seekonk at the same time.

Nor does the pattern of Figure 5.3 indicate that either boys or girls are in the lead in adopting the merger. Age, by itself, is a nearly perfect predictor of vowel system, within the group whose parents are distinct. This is particularly noteworthy for those families who had one or more children above the crucial age, and one or more below it.

There are three such families here, who show that the process of linguistic change can separate siblings from one another: the leftmost two within the group of nine, the Koslowski and O'Connor families, and the farthest family to the right, the Ventura family.

For the Koslowskis, the break is between their definitely distinct 8th-grade daughter, April, and their definitely merged 4th-grade daughter, Sharon. In the O'Connor family, 8th-grade son Daniel is distinct, and 2nd-grade daughter Alison is merged.[21] The same

[20]There was no obvious reason for this girl, 13-year-old Mara Parente, to be ahead of the curve – and ahead of her younger brother – in adopting the low back merger. Indeed, in asking about her social contacts, I learned that her best friend and cousins were Rhode Islanders, hence likely distinct. But Mara was fully merged in production, and also marked all seven pairs "same" on the school survey.

[21]The O'Connor's three-year-old son Casey, however, was judged distinct. As discussed in §5.3.2, this is likely not due to any reversal in the regular shift towards merger, but rather because Casey is too young to have a peer group and therefore still follows his parents' pattern.

difference is less clearly observed in the Ventura family, where the 4th-grade son Jacob is probably distinct, and the 1st-grade daughter Jessica probably merged.

The fact that siblings can radically differ in their low vowel systems should not imply that they never have any influence on each other. Note, for example, that unlike Sharon Koslowski and Jacob Ventura, the other four 4th-grade children do pattern with their siblings. That is, the two fourth graders who have younger siblings – the third and eighth families in the group of nine – are, like those siblings, merged, and the two who have older siblings – the fifth and sixth families in the group – are, like those siblings, distinct.

But the case of families where the merger does split younger from older siblings dramatically illustrates the power of the peer group to overthrow the linguistic patterns imparted to children not only by their parents, but also by their older siblings, who have been called, reasonably enough, their "first peer group" (Payne 1976: 268).

5.3.1 The Koslowski family

In the Koslowski family, the parents, Tom (PT42M) and Lonnie (PT43F), have very robust low back distinctions. The older daughters, Amber (SK16F) and April (SK13F), have distinctions that are much less extreme, but nevertheless clear. The youngest daughter, Sharon (SK09F), however, has a total merger of /o/ and /oh/.

5.3.1.1 Tom and Lonnie Koslowski

Like many adults who live in Seekonk MA, Tom Koslowski, who works as a driver, and Lonnie Koslowski, a travel agent, grew up in the adjacent city of Pawtucket RI. And unsurprisingly, given the results of the geographic study for that city, they both maintain a robust distinction between /ah = o/ and /oh/. As seen in Figures 5.4 and 5.5, the token clouds for the two categories are small and well separated from each other; this separation is particularly dramatic for the mother.

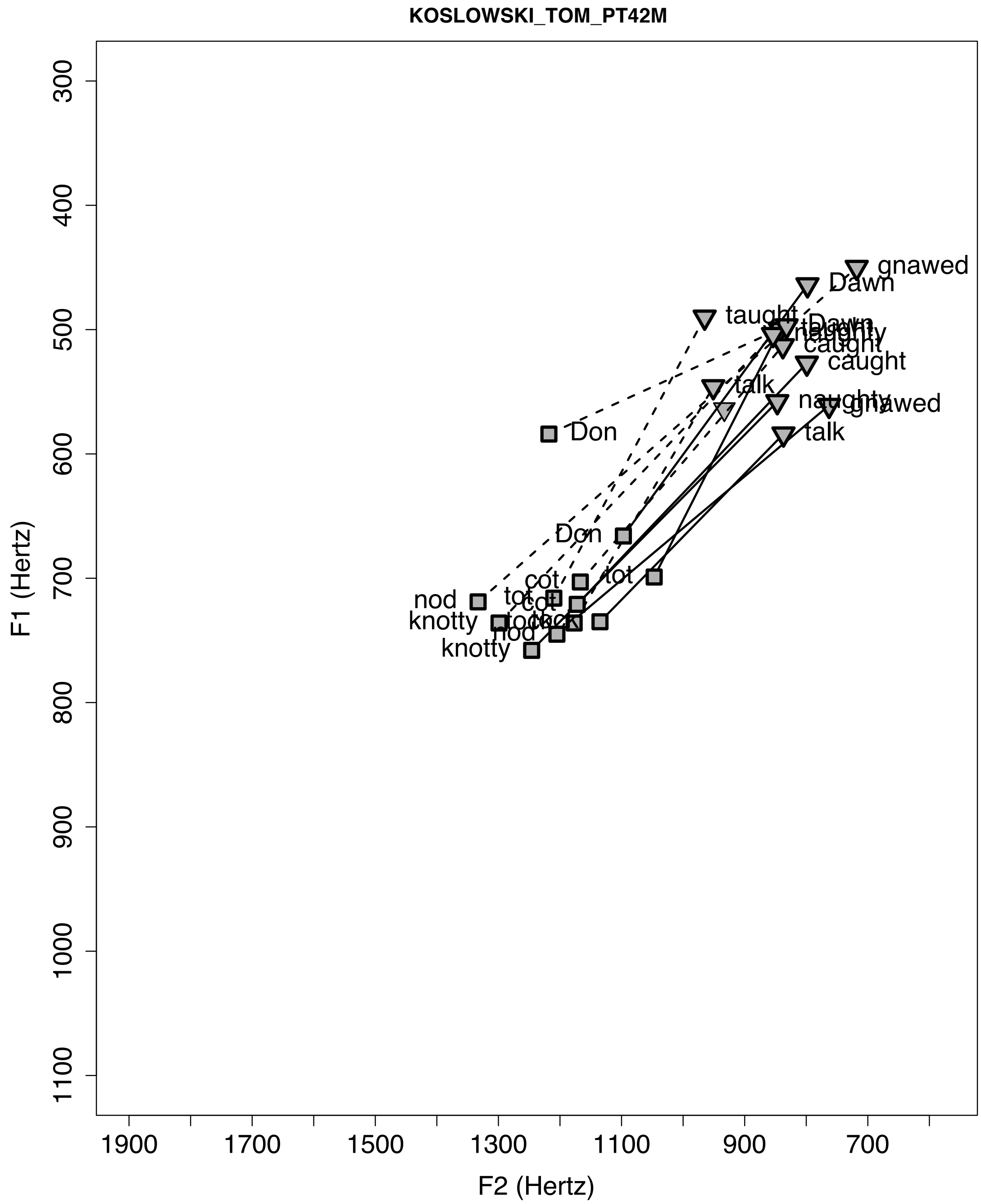

Figure 5.4: Tom Koslowski (father): reading card tokens of /o/∼/oh/ pairs

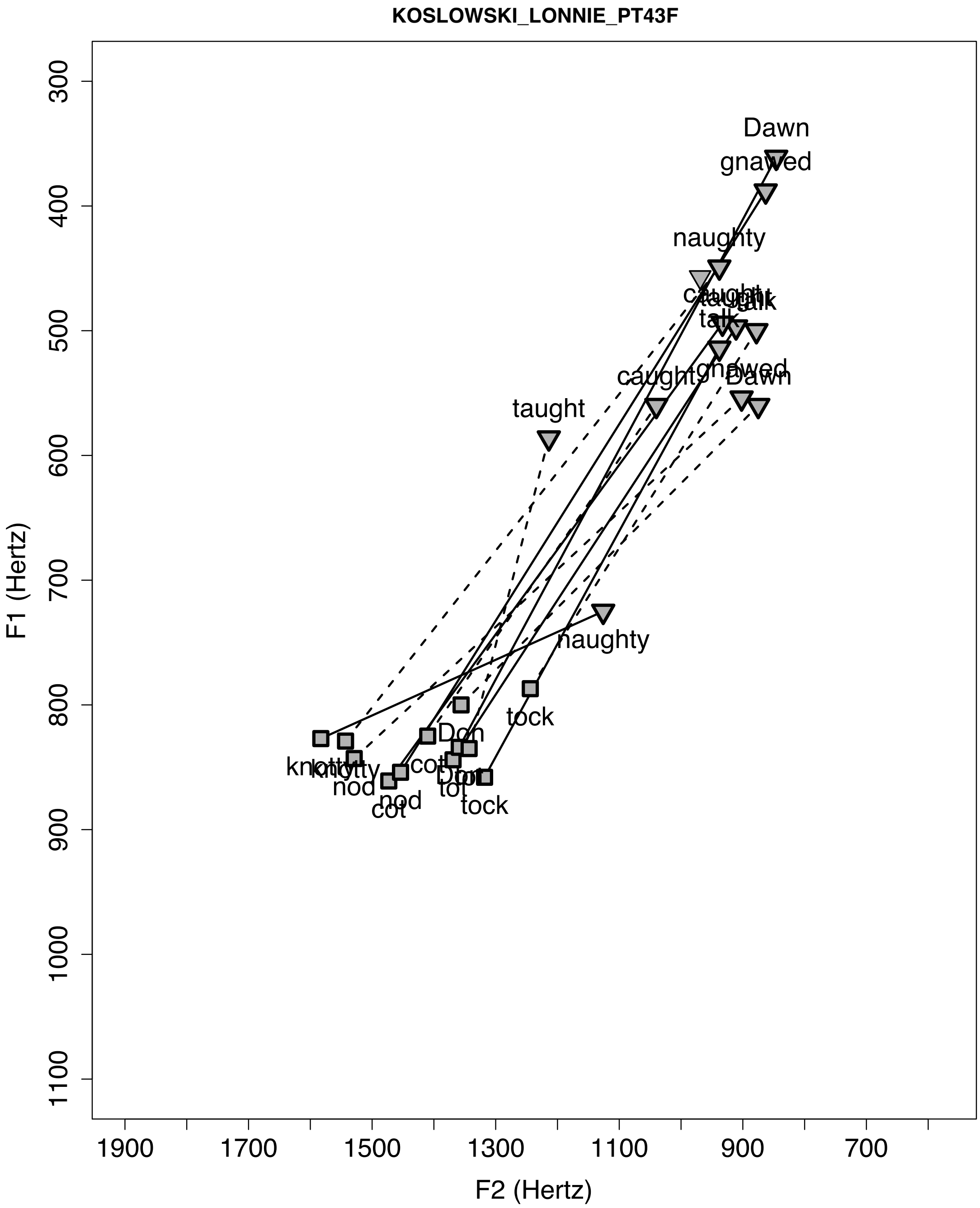

Figure 5.5: Lonnie Koslowski (mother): reading card tokens of /o/∼/oh/ pairs

Applying the paired t-test technique – described in §4.4.1.2 – to the six /o/∼/oh/ pairs elicited with the reading cards, the following statistics emerge for each parent, conclusively demonstrating the distinctness of the word classes. We see very low p-values for Tom, otherwise known as PT42M:

Δ/o/ – /oh/ (PT42M, C, 6) = +199 ±65 (0.0006), +374 ±151 (0.002);

Δ/o/ – /oh/ (PT42M, O, 6) = +188 ±20 ($3x10^{-6}$), +336 ±90 (0.0002).

The average difference in F1, for Tom Koslowski, is almost 200 Hz, and the difference in F2 is around 350 Hz; the difference between overt and covert styles is small, and in fact the reverse of the usual trend, where overt pairs are further apart. Indeed, Tom appeared to be pronouncing the minimal pairs very carefully. Perhaps needless to add, none of these pairs sounded even close to the analyst, and the subject agreed, judging them all "different".

For Lonnie Koslowski, codename PT43F, the six pairs also all sounded different, and this was borne out by the analyst's impression and by the acoustic measurements:

Δ/o/ – /oh/ (PT43F, C, 6) = +285 ±53 ($4x10^{-5}$), +430 ±194 (0.003);

Δ/o/ – /oh/ (PT43F, O, 6) = +350 ±141 (0.002), +490 ±78 ($2x10^{-5}$).

This distinction is extreme – over 300 Hz in F1 and 450 Hz in F2, on average – and is slightly larger in raw acoustic terms than that described in §4.4.2.1 for the subject ABS62M. The usual trend is seen, whereby the overt pairs are slightly more distinct than the covert pairs, although there is one exception to this: the overt repetition of *naughty* sounded "corrected", and indeed measured closer to the group of /o/ tokens than to the other examples of /oh/.

5.3.1.2 Amber and April Koslowski

Amber Koslowski (SK16F) has lived in Seekonk her whole life, and when interviewed was an 11th-grade student at Seekonk High School. The impression given by her low back vowels was of a distinction, but a close one – "close" being the summary word used in my field notes. Amber herself judged all the minimal pairs "different", and they did sound different, but nothing like the widely distinct vowels of her parents.

Acoustic measurement, as shown on Figure 5.6, confirms this. Not only is the absolute position of the classes quite different, both being fronter and lower, there is also some overlap between the tokens of /o/ and /oh/. For the most part, each pair is distinct in the 'correct' direction, but this is most clear for the overt pairs. The covert pairs are truly very close, and do not all reflect the normal difference in both formants.

Δ/o/ – /oh/ (SK16F, C, 6) = $+110 \pm 114$ (0.06), $+66 \pm 123$ (0.23);

Δ/o/ – /oh/ (SK16F, O, 6) = $+147 \pm 139$ (0.05), $+216 \pm 154$ (0.02).

Examining the six overt pairs first, we see that only one measured truly close, though in the expected direction for both formants: *tot*∼*taught,* (+58, +41). The next-closest pair, *tock*∼*talk,* , was nearly 100 Hz apart in both formants, and the other four pairs all had a 100+ Hz difference in one formant, or both.

For the covert pairs, only one was robustly distinct: *Don*∼*Dawn* (+310, +303).[22] Two other pairs had a 100+ Hz difference in F1 and not much of one in F2, and two more had at least a 50+ Hz difference in F1. The sixth pair, *tot*∼*taught,* was pronounced more or less identically: (−11, +35).

Given the covert-pair results, we must acknowledge that Amber's distinction shows some signs of weakness. Part of the reason that she was nevertheless judged definitely distinct, as opposed to probably distinct, was that in her spontaneous speech she exhibited the same close-but-distinct behavior, and also that she showed no hesitation in judging all the pairs to be different.

Furthermore, if we were to boost the sample size by ignoring the division between covert and overt tokens, we would obtain a t-test result highly indicative of a modestly sized, but undeniable distinction:

[22] As was seen several times in Chapter 4, the particular pair *Don*∼*Dawn* often behaves anomalously.

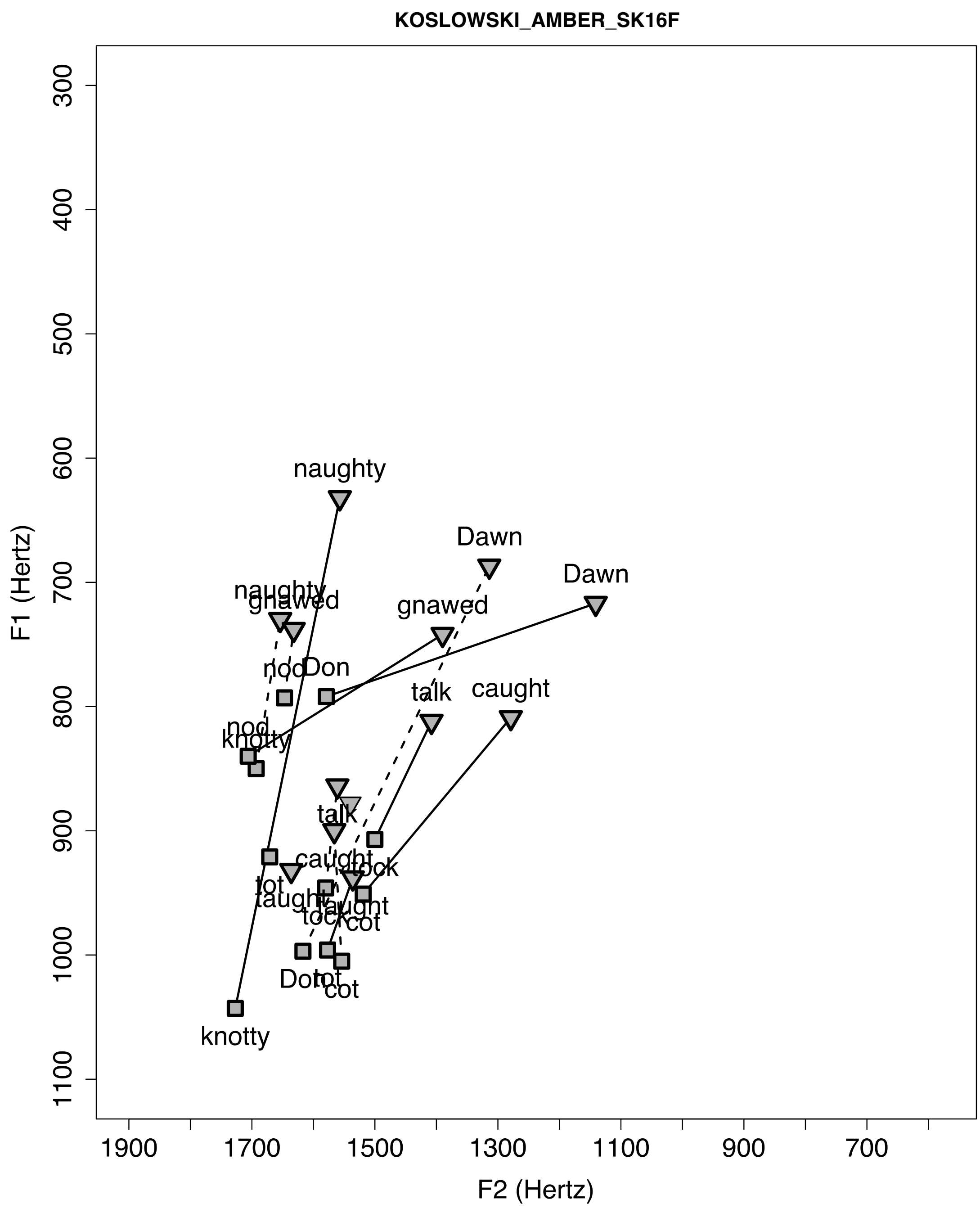

Figure 5.6: Amber Koslowski (oldest sister): reading card tokens of /o/∼/oh/ pairs

Δ/o/ – /oh/ (SK16F, CO, 12) = $+128 \pm 74$ (0.003), $+141 \pm 95$ (0.008).

The middle Koslowski sister, April (SK13F), has also always lived in Seekonk and was in the eighth grade at Seekonk Middle School when interviewed. She had already filled out the school survey and marked 6 of 7 /o/$\sim$/oh/ items "different" on it, so it was a matter of seeing if she was as distinct in her production. Like her older sister and unlike her parents, April did not produce gross phonetic differences between /o/- and /oh/-words. However, I noted at the time that her distinction was "clear". She also identified every pair as different.

As seen on Figure 5.7, her tokens of /o/ and /oh/ form two adjacent clouds, which touch, but overlap in only a few cases. The effect of phonetic environment can be seen particularly clearly in the case of the overt repetition of *nod$\sim$gnawed.* That token of *nod* appears in the middle of the cloud of /oh/ tokens, and this would seem to challenge the idea of a regular word class distinction, were it not for the fact that the complementary token of *gnawed* is also an outlier, measuring higher than all other tokens of /oh/.

When such regularities are taken into account, by using the paired t-tests, the results support a moderate but clear distinction. For the covert pairs, the distinction is more consistent in F2 (unlike Amber's), and for the overt pairs it is strong in both formants:

Δ/o/ – /oh/ (SK13F, C, 6) = $+107 \pm 137$ (0.10), $+212 \pm 137$ (0.01);

Δ/o/ – /oh/ (SK13F, O, 6) = $+168 \pm 47$ (0.0003), $+138 \pm 64$ (0.003).

The closest pair April produced was the covert instance of *cot$\sim$caught:* (+40, +83). By contrast, Amber produced four pairs, three covert and one overt, that were closer than that, measuring along the F1 / F2 diagonal.

Echoing the geographic study, we see that the low back distinction of these younger speakers is acoustically markedly closer than that of their parents. But it would be premature to conclude that this shows approximation of the word classes on the community level. For one thing, the Koslowski parents are not actually from Seekonk. It would be more appropriate to compare these two girls to native Seekonk adults who grew up in

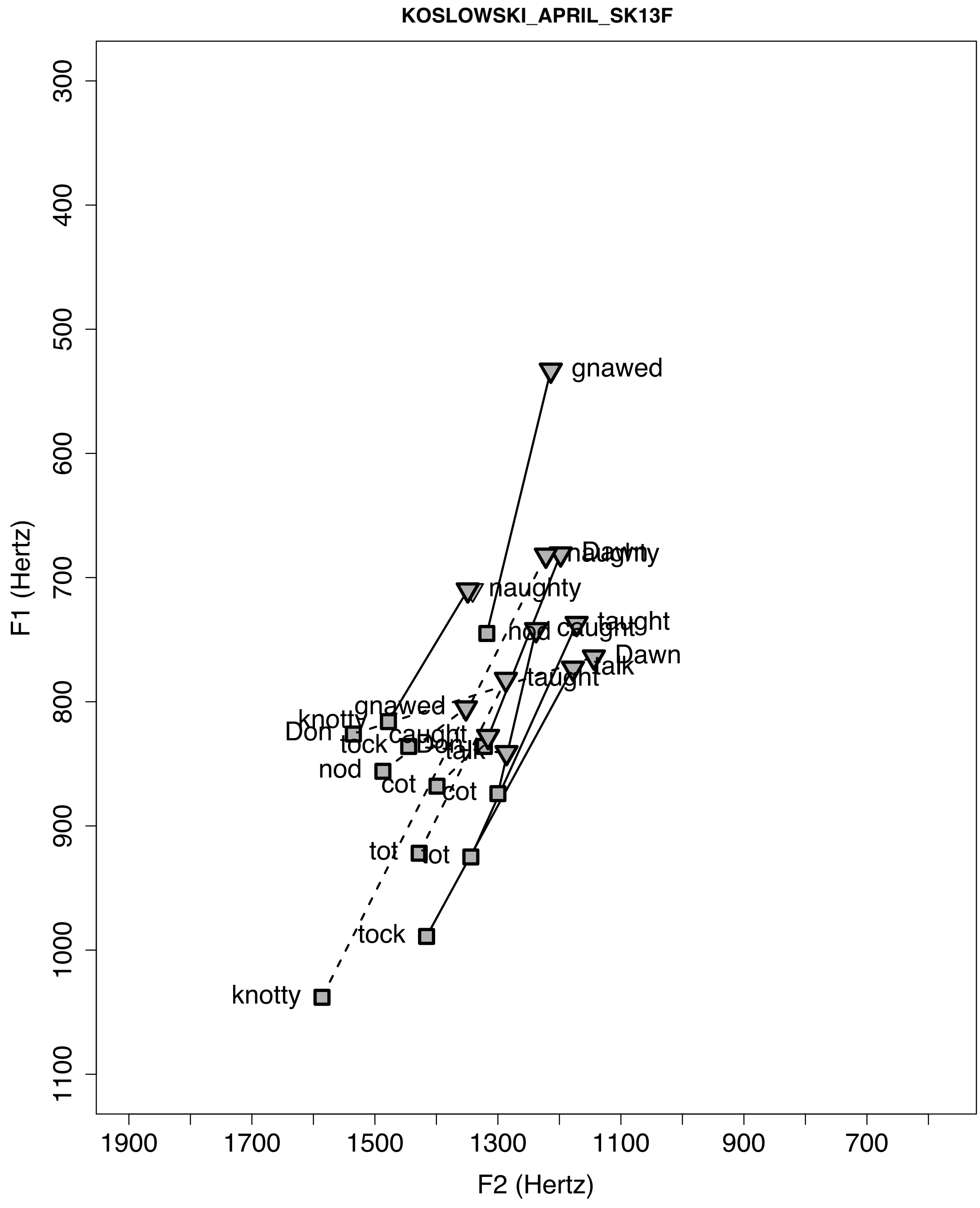

Figure 5.7: April Koslowski (middle sister): reading card tokens of /o/∼/oh/ pairs

comparable socioeconomic circumstances, rather than to their own parents, who grew up in the less affluent Pawtucket environment.

That being said, we acknowledge two facts that are not contradictory, but exist in some kind of tension. First, the low back distinctions of Amber and April Koslowski are functional, audible, and phonologically intact. Second, their distinctions are phonetically rather narrow – especially Amber's – and while it would not be surprising for such close distinctions to reproduce themselves in a community over time, it might be naive to express any great shock at the idea of such a distinction collapsing, either.

5.3.1.3 Sharon Koslowski

For the youngest Koslowski daughter, Sharon (SK09F), this collapse has occurred. Sharon was a fourth grader at North Elementary School in Seekonk, and had therefore taken the school survey, where she marked 6 of 7 /o/$\sim$/oh/ pairs "same". Of the six pairs from the family study cards, she declared them all to be the same, too. And auditorily they did all sound the same, except for the first (covert) instance of *nod$\sim$gnawed.*

Figure 5.8 plots Sharon's low back vowels on the same set of axes used for her parents and sisters. The phonetic area occupied by the tokens of /o/ and /oh/ is virtually identical to that of her older sisters. And there are considerable acoustic differences between the members of most pairs. However, there is no regularity at all to the direction of these differences. For example, the overt token of *knotty* is 361 Hz higher in F1 – hence markedly lower, perceptually – than *naughty;* but *nod* is 212 Hz lower in F1 than *gnawed,* the reverse of the difference that any speaker with a MAIN system would produce. The paired t-tests return non-significant results in all respects:

Δ/o/ – /oh/ (SK09F, C, 6) = $+54 \pm 109$ (0.26), $+43 \pm 138$ (0.46);

Δ/o/ – /oh/ (SK09F, O, 6) = -6 ± 203 (0.95), -49 ± 92 (0.23).

Although none of the mean differences are further from zero than might easily occur

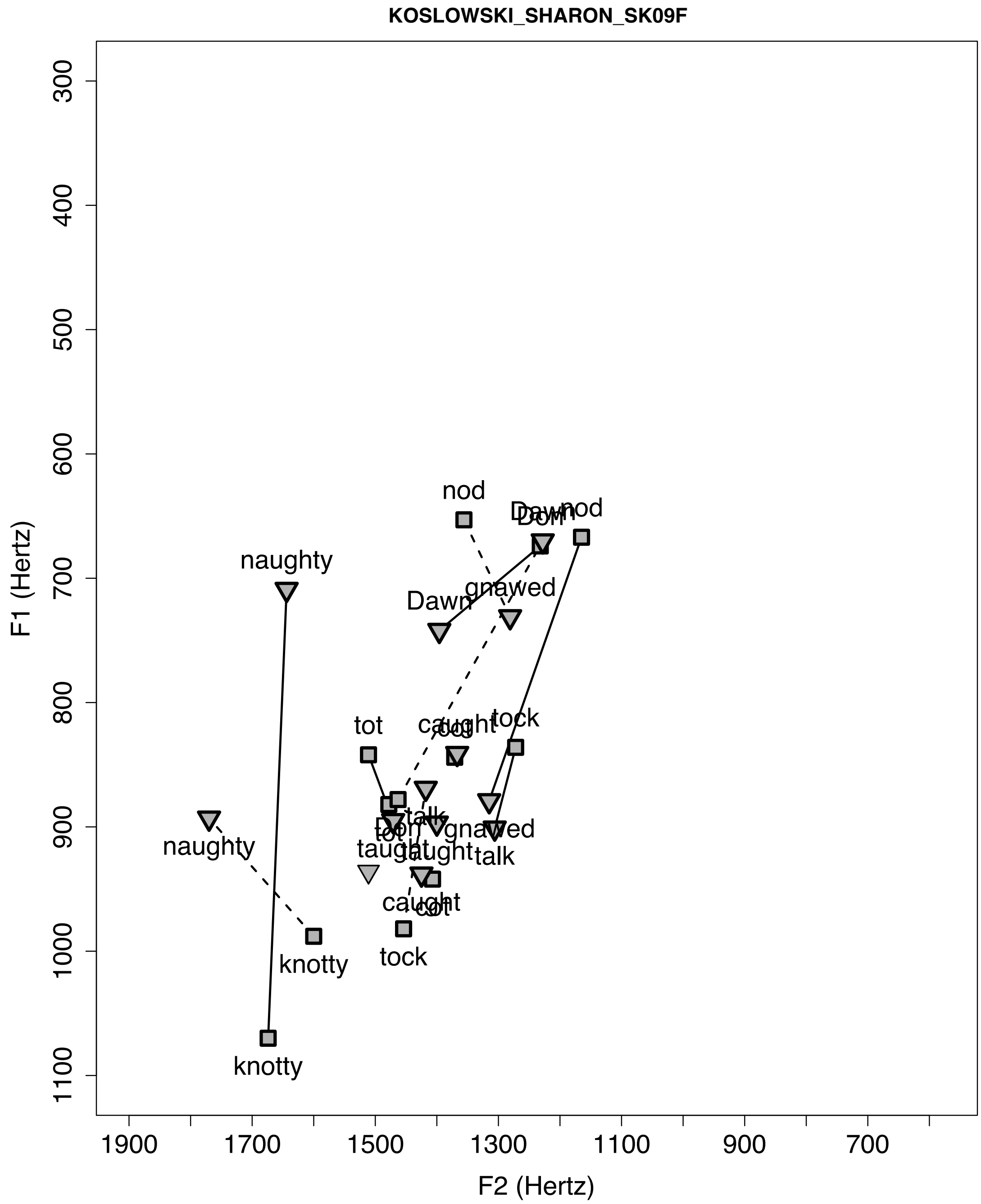

Figure 5.8: Sharon Koslowski (youngest sister): reading card tokens of /o/∼/oh/ pairs

by chance, it is interesting that the differences among the covert pairs do average out in the 'right' direction, while the overt pairs, on average, go the other way, towards a reversal of the historic phonetic distinction.

Despite this merged performance, when Sharon was asked if she could say the words differently, she was able to produce an accurate imitation of a distinct pattern. That is, she consciously knew which words belonged in which class, perhaps dating from their initial acquisition from her distinct parents. But clearly, her normal production pattern is to completely ignore this knowledge. This makes Sharon Koslowski an excellent example of merger-by-expansion. The merger has taken place within a generation, literally: only four years separate April and Sharon Koslowski.[23]

	F1, F2 MEASUREMENTS (HZ)					
SPEAKER	COVERT PAIRS			OVERT PAIRS		
	mean /o/	mean /oh/	Δ/o/ – /oh/	mean /o/	mean /oh/	Δ/o/ – /oh/
Tom	699, 1234	500, 860	+199, +374	721, 1150	532, 815	+188, +336
Lonnie	820, 1404	535, 975	+285, +430	846, 1426	496, 936	+350, +490
Amber	919, 1627	809, 1561	*+110, +66*	922, 1601	775, 1385	+147, +217
April	891, 1480	784, 1268	*+107,*+212	864, 1363	696, 1225	+168, +138
Sharon	871, 1454	817, 1411	*+54, +43*	838, 1377	844, 1426	*−6, −49*

Table 5.2: The Koslowski family: summary of reading card productions

A summary of each speaker's mean values of F1 and F2, for the paired tokens of /o/ and /oh/, and the mean F1 / F2 differences between word classes, is given in Table 5.2.[24] Figures in italics represent non-significant differences ($p > 0.05$) on the paired t-test.

[23] Although they did not seem to have been aware of it before my visit, neither Sharon nor her sisters were very interested in the linguistic difference revealed to exist between them.

[24] The differences between /o/ and /oh/ sometimes appear to be off by one unit, because of rounding.

5.3.2 The O'Connor family

The O'Connor family of Seekonk replicates the essential pattern of the Koslowskis: clearly distinct parents, Jeff (SK37M) and Rochelle (SK37F), a distinct teenage child, Daniel (SK14M), and a fully merged child under the age of 10, Alison (SK08F). But unlike the Koslowskis, the O'Connors also have an even younger child, Casey (SK03M), who is of pre-preschool age. Although his destiny is to be merged if he follows the community pattern, he currently exhibits the distinction, reflecting the strong influence of parents on children his age.

5.3.2.1 Jeff and Rochelle O'Connor

While Mr. and Mrs. Koslowski were Pawtucket natives who moved to Seekonk in adulthood, Jeff and Rochelle O'Connor grew up in the town and both attended Seekonk High School. Jeff is a correctional officer, while Rochelle stays home taking care of Casey and an infant (pre-verbal). Their robust low back distinctions are very similar to those of the Koslowski parents, as seen in Figures 5.9 and 5.10.

For the father, Jeff, the tokens of /o/ and /oh/ form tight clouds that are noticeably separated; his realizations of /o/ are especially consistent. Jeff judged all six pairs as "different", and applying the paired t-tests confirms this diagnosis of a definite low back distinction:

Δ/o/ – /oh/ (SK37M, C, 6) = +129 ±60 (0.003), +385 ±79 ($6x10^{-5}$);

Δ/o/ – /oh/ (SK37M, O, 6) = +154 ±97 (0.01), +392 ±83 ($7x10^{-5}$).

Note that there is only a very small increase in separation when Jeff O'Connor pronounced the minimal pairs with overt focus, compared to the in-context examples. Both styles yielded the same large /o/$\sim$/oh/ distinction.

Rochelle O'Connor, like Lonnie Koslowski, produced an even greater distinction than

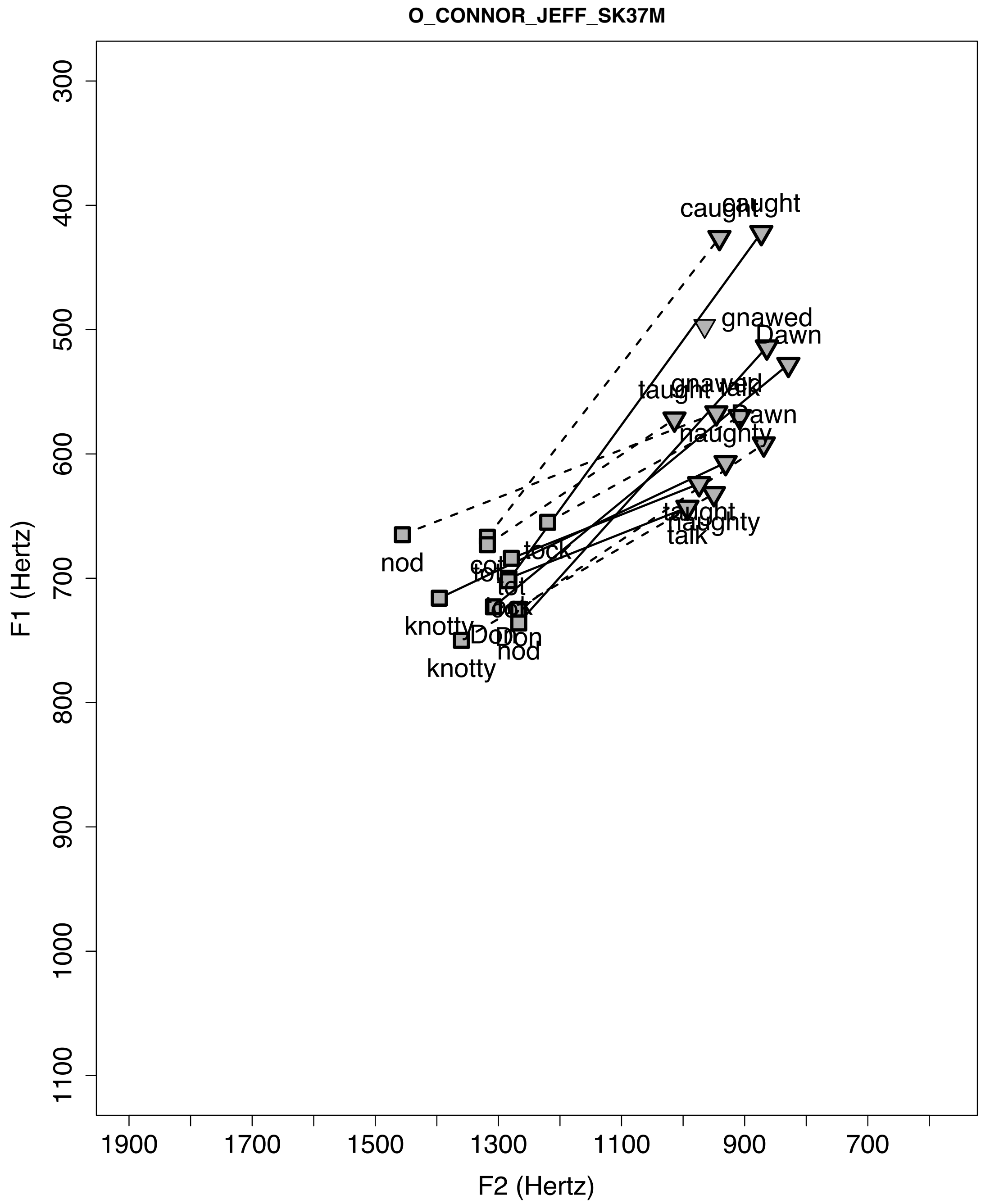

Figure 5.9: Jeff O'Connor (father): reading card tokens of /o/∼/oh/ pairs

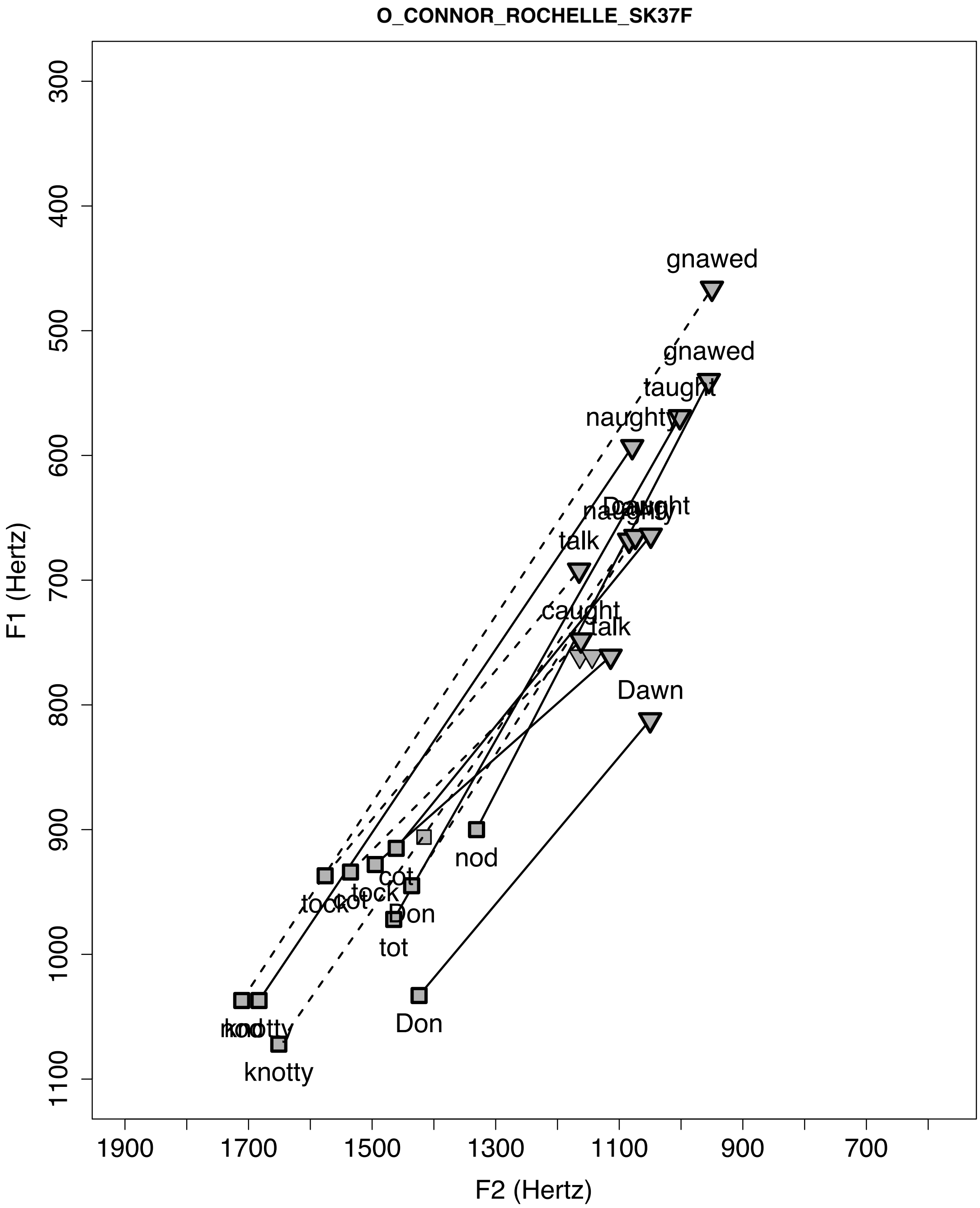

Figure 5.10: Rochelle O'Connor (mother): reading card tokens of /o/∼/oh/ pairs

her husband. She judged all six pairs different, although only five covert pairs are available for comparison, since the initial pronunciation of *taught* was indistinct. While Mrs. O'Connor's /oh/ was not as high and back (in absolute acoustic terms) as Mrs. Koslowski's, her /o/ was noticeably fronter and lower, so the overall distinction size was comparable:

Δ/o/ – /oh/ (SK37F, C, 5) = +337 ±190 (0.008), +495 ±211 (0.003);

Δ/o/ – /oh/ (SK37F, O, 6) = +308 ±116 (0.001), +435 ±94 ($8\text{x}10^{-5}$).

We note that Rochelle's behavior on the covert pairs is slightly more distinct than it is on the overt pairs, suggesting a small degree of correction or stylistic awareness of the distinction. But in both scenarios, the distinction is extreme. Her closest pair, acoustically, was the overt *tock*∼*talk,* at (+167, +381); her most distinct pair, the covert instance of *nod*∼*gnawed,* differed by a mammoth (+571, +761).

Since we know that merger is occurring among children in Seekonk, we might wish to look at the behavior of the parents' generation as reflecting an incipient change in progress. But as women usually lead changes, it is striking that the two mothers analyzed here display distinctions that are acoustically larger than their husbands'. Part of this may simply reflect their smaller vocal tracts, which cause all formant values from a female voice to tend to be higher and thus more separated when compared with a male voice. But impressionistically, too, the women seemed to have larger distinctions.

The point is simply that 25 years or so before the moment of merger, the low back distinction was very healthy in Seekonk. There is no hint of women beginning to reverse the separation of /o/ and /oh/, unless one counts the very small amount of correction observed for Mrs. O'Connor, or the larger shift in the overt token of *naughty* from Mrs. Koslowski.

5.3.2.2 Daniel Peterson

Daniel Peterson (SK14M) is the oldest child of Rochelle O'Connor, by her first husband. Daniel's father was a native of Wisconsin and Florida, hence very likely to have possessed a low back distinction, though surely not one of the magnitude of his mother's. In any event, Daniel has lived with his mother and stepfather, Jeff, since the age of 4, and is now an 8th grader at Seekonk Middle School. He completed the school survey, and marked all seven /o/∼/oh/ items "different". When he was interviewed, therefore, it was with the tentative expectation that the low back distinction would also be present in his speech production.

This indeed proved to be the case; impressionistically, he produced a distinction that was much closer than his parents', but one that was still clear and consistent. Daniel himself judged all six minimal pairs to be different, although he stumbled enough on the first token of *gnawed* that it was left out of the analysis below. Of the eleven pairs measured, shown on Figure 5.11, only one was acoustically close – the covert *tot*∼*taught* pair, at (+47, +13) – though several others were close in F1 only. The usual paired t-tests achieve significance for the hypothesis of non-merger in all cases, and also show that the overt pairs are somewhat more distinct than the covert pairs:

Δ/o/ – /oh/ (SK14M, C, 5) = +68 ±54 (0.03), +175 ±135 (0.03);

Δ/o/ – /oh/ (SK14M, O, 6) = +83 ±13 (2×10^{-5}), +267 ±68 (0.0002).

In terms of absolute position, Daniel Peterson's vowels do not show the downward and frontward shift that was seen in the older Koslowski sisters. His /o/ is in the same place as his stepfather's, and his /oh/ is shifted up and back from it in the same direction as his stepfather's, but only half as far.

Since Jeff and Rochelle O'Connor are also Seekonk natives, an apparent-time comparison with Daniel is fair. There has definitely been phonetic approximation of /o/ and /oh/ over the 23 years between his mother and stepfather's development of their dialects, and his own. However, Daniel's vowels are still functionally distinct in perception and production, and even in the more informal covert context – as well as spontaneous speech – they are not acoustically all that close. Compared to Amber and April Koslowski, Daniel's typical pair is closer, but he is more consistent between pairs, both in distance and absolute position.

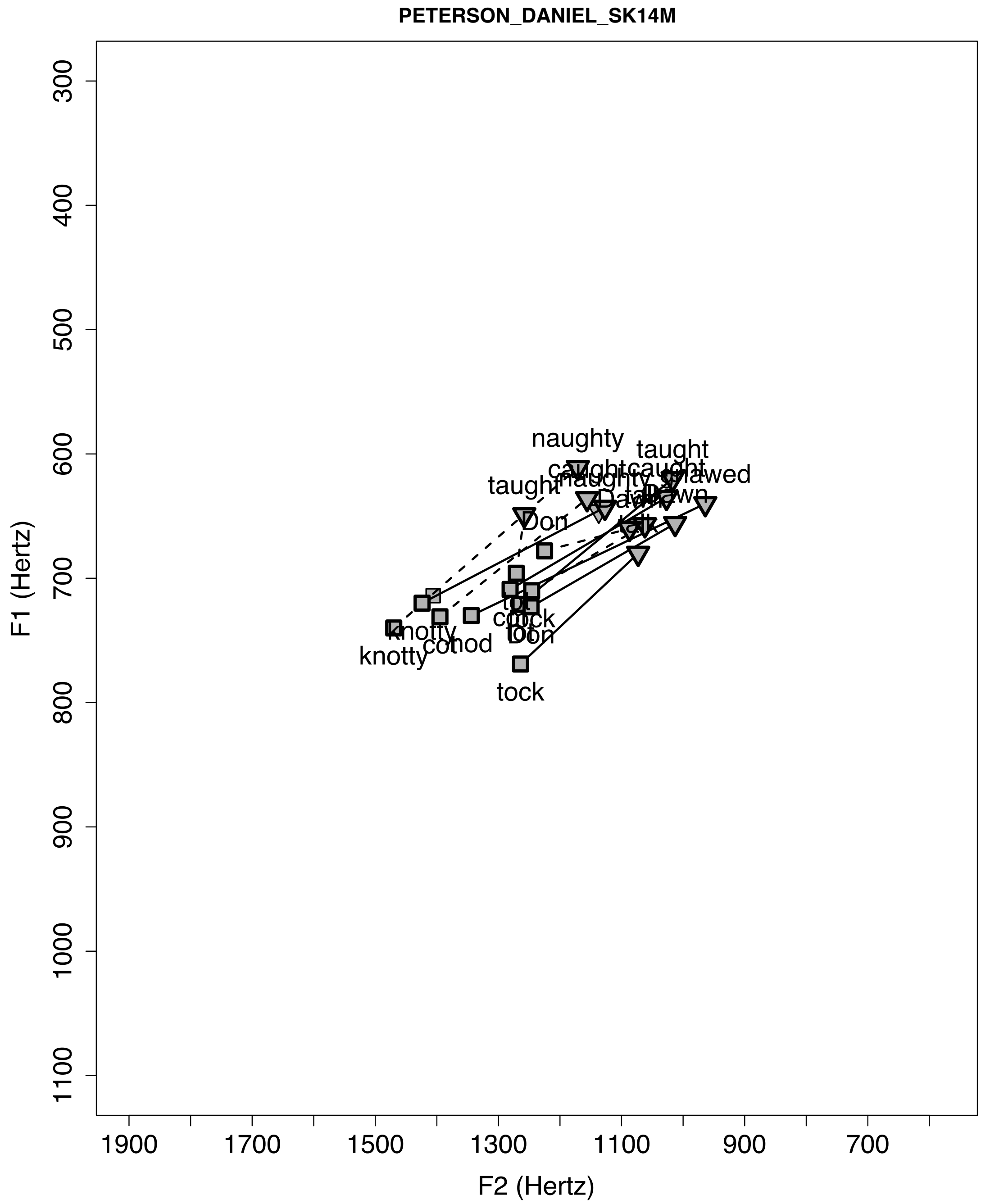

Figure 5.11: Daniel Peterson (oldest brother): reading card tokens of /o/∼/oh/ pairs

5.3.2.3 Alison O'Connor

If Daniel Peterson's low back vowels are roughly equivalent to those of his classmate, April Koslowski, in being fairly close yet definitely distinct, his sister Alison O'Connor (SK08F) produced vowels that were similar overall to Sharon Koslowski's, being merged in low-central position. Alison has lived in Seekonk her whole life, and was in the second grade at North Elementary School when interviewed.

Given her age, Alison was administered both the picture flashcards and the reading cards. She read fairly well, but hesitated on some of the key words in context (the covert condition). When this happened – or when Alison said e.g. *catched* for *caught* on one of the picture cards – her mother would model the word for her, and Alison would then repeat it. Her repetitions of her mother's pronunciation were quite faithful, including a high back /oh/. But when Alison then produced the same words as overt minimal pairs, this phonetic quality disappeared, and the pairs sounded more or less the same (rather than very much the same, as Sharon Koslowski's had). Alison also did not express strong opinions regarding whether the pairs were the same or different.

Alison O'Connor's low vowel tokens, excluding those that were directly repeated after her mother, are plotted in Figure 5.12.[25] The configuration resembles Sharon Koslowski's, in appearing essentially random. And the two pairs with the greatest distance between their members both differ in the opposite direction than they would in a distinct pattern: covert *knotty* is 303 Hz higher than *naughty,* and overt *Don* is 587 Hz higher than *Dawn.*[26] Such productions would presumably be inconceivable for a speaker with the low back distinction, and there are other, less dramatic 'reversed' pairs. Together, they generate non-significant t-test results, indicating the null hypothesis of merger:

Δ/o/ – /oh/ (SK08F, C, 3) $= -116 \pm 452$ (0.39), $+28 \pm 588$ (0.86);

[25]The axes for this figure have been shifted down by 100 Hz, to accommodate her lowest tokens.

[26]Although these pairs do sound 'reversed', for whatever reason they do not sound nearly as distinct as the measurements would suggest.

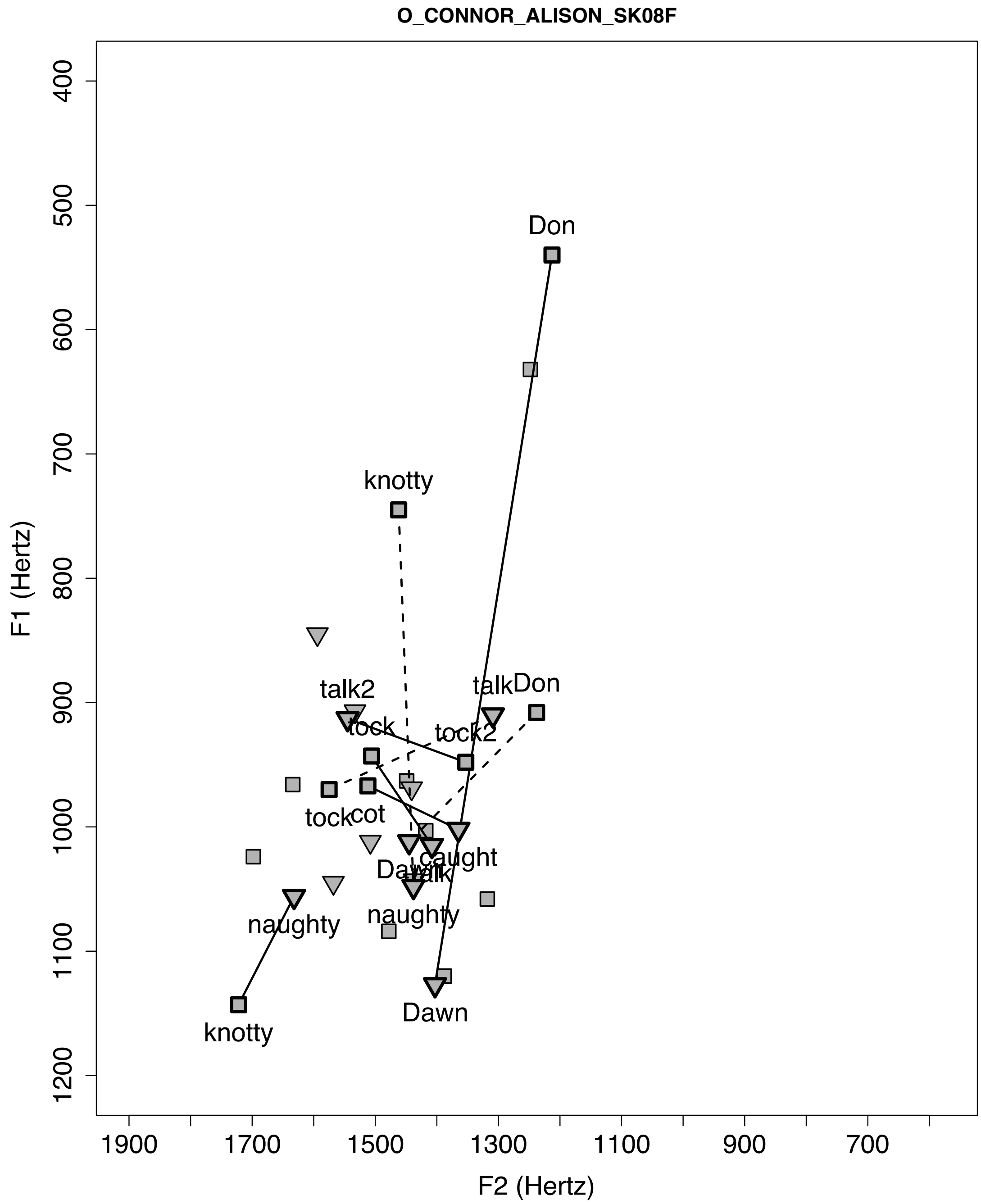

Figure 5.12: Alison O'Connor (middle sister): reading card tokens of /o/∼/oh/ pairs

Δ/o/ – /oh/ (SK08F, O, 5) = -114 ± 337 (0.40), -9 ± 208 (0.91).

When it was requested of her, Sharon Koslowski demonstrated active competence in the low back distinction, but in her natural speech – and on these formal methods – she produced a wide-ranging low central merger of /o/ and /oh/. Alison O'Connor, two years younger, produces essentially the same merged pattern. Her ability to imitate her mother's distinct pattern does not carry over to her own, self-initiated productions. The O'Connors are a second example of merger-by-expansion cutting through a family, here with a six-year difference between the distinct 14-year-old, Daniel, and 8-year-old Alison, who is merged.

5.3.2.4 Casey O'Connor

The youngest child in the O'Connor family is Casey (SK03M). At age 3, he does not yet attend any pre-school, and is taken care of by his mother at home. Casey was given the picture flashcards to try to identify, and a selection of the resulting tokens, along with some from his spontaneous speech (symbols bolded), are plotted in Figure 5.13.[27]

Other than one token of *Bob,* which is very high, one of *box,* which is fairly high, and one of *all,* which is fairly low, the /o/- and /oh/-words form two discrete clouds, which are widely separated. Since there are no minimal pairs among the words on the picture flashcards (nor those produced in spontaneous speech), the usual paired t-test comparison cannot be run. However, an ordinary two-sample unpaired t-test indicates a highly significant distinction for both formants.

Figure 5.13 includes 12 tokens of /o/ and 15 tokens of /oh/. The mean value of F1 is 1273 Hz for /o/ and 818 Hz for /oh/, a difference of 455 Hz. The p-value associated with the F1 difference is 9×10^{-8}. For F2, the mean is 1793 Hz for /o/ and 1319 Hz for /oh/, a difference of 474 Hz. This F2 difference generates a p-value of 2×10^{-7}. By comparison,

[27] The scale of this figure is the same as for the other family members, but the axes have been shifted, since Casey's formants occupy a higher range. Indeed, to obtain the measurements, the formant maximum was often raised to 6000 Hz (5000 being the default for male voices, 5500 for females).

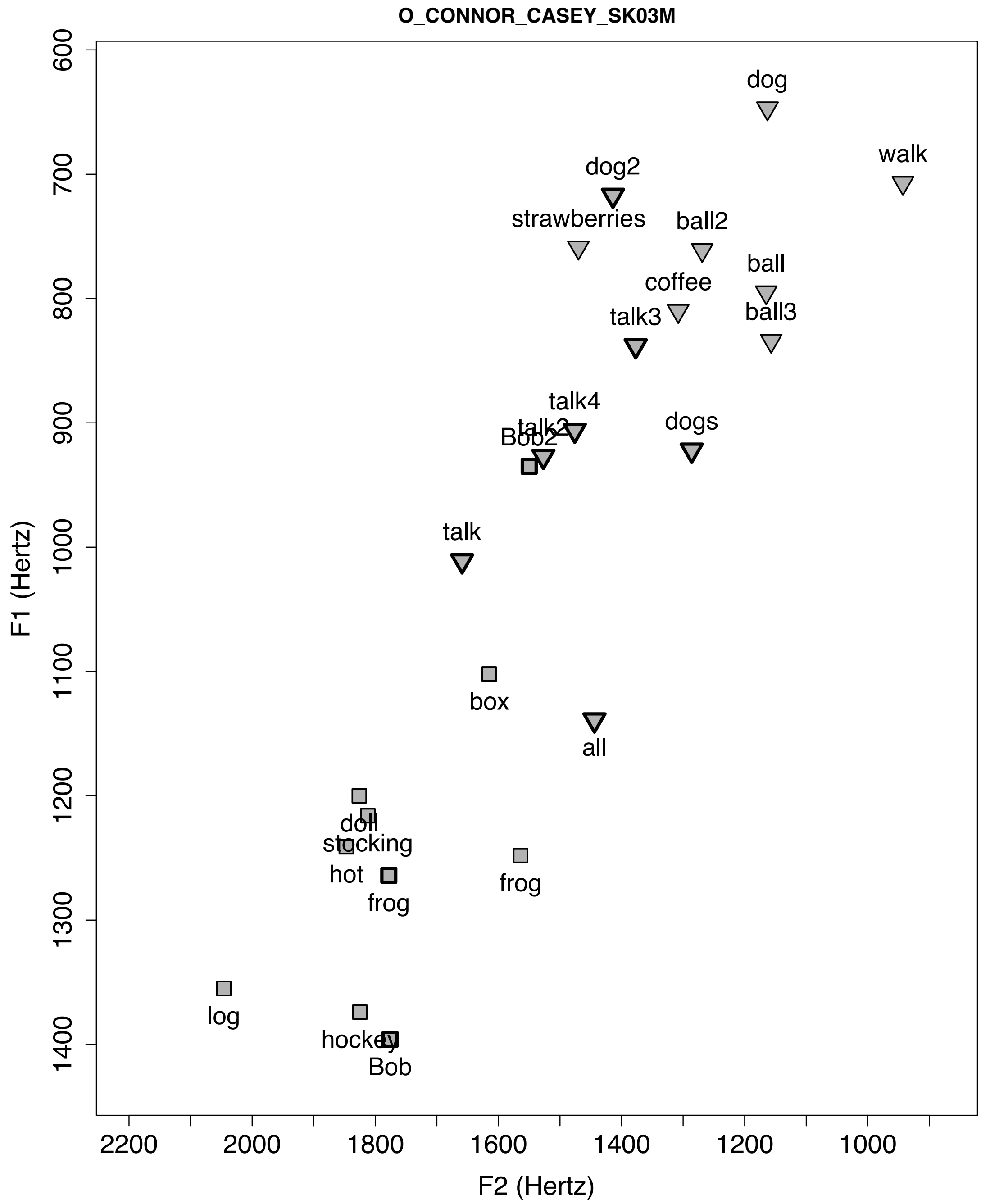

Figure 5.13: Casey O'Connor (youngest brother): reading card tokens of /o/∼/oh/ pairs

if unpaired t-tests are run on the (distinct) paired tokens of Rochelle O'Connor, or Daniel Peterson, the p-values that emerge are in the same $10^{-7} \sim 10^{-8}$ range.

Despite average difference of over 450 Hz for each formant, it would be going too far to say that Casey's distinction is the widest in the family. Although this is true in raw acoustic terms – and while the auditory impression of his vowels was very distinct – his small vocal tract is also responsible for the relative expansion of formant frequencies. Nevertheless, it is clear that by the age of three, Casey has fully acquired the distinct low vowel system of his parents (and step-brother).[28]

Assuming that the conversion of successive grades of Seekonk schoolchildren to the merged pattern is permanent, we expect that as Casey O'Connor acquires peers, and goes on to attend pre-school and kindergarten, he will reorganize his low vowel system in concordance with the new Seekonk norm, like his sister Alison before him.

This process will probably happen quickly, judging by the evidence of the Ventura family (rightmost in Figure 5.3). In that family, the parents are clearly distinct, and their older son (age 10) is probably distinct as well. Their daughter (age 7) is probably merged, and their younger son, 4-year-old Esau, is definitely merged. Like Casey O'Connor, Esau Ventura was taken care of by his mother at home, and so his merged status was somewhat unexpected, since he hardly had a full peer group. Whether he had acquired the merger from his older sister, or from the "little friends" he was confirmed as having, is unknown. The latter option may be more likely, given the apparent ability of siblings to ignore each other linguistically, as seen in both the Seekonk families discussed in detail here.

Table 5.3 summarizes the paired vowel measurements for the O'Connor family (except for Casey, whose tokens were from picture cards and spontaneous speech).

[28]This fact regarding 3-year-old Casey dispels any potential suggestion that children such as 8-year-old Alison O'Connor (or 9-year-old Sharon Koslowski) are simply too young to have mastered the low vowel distinction. Casey O'Connor shows that this distinction is masterable by much younger children.

F1, F2 MEASUREMENTS (HZ)						
SPEAKER	COVERT PAIRS			OVERT PAIRS		
	mean /o/	mean /oh/	Δ/o/ – /oh/	mean /o/	mean /oh/	Δ/o/ – /oh/
Jeff	689, 1323	560, 938	+129, +385	710, 1303	556, 911	+154, +392
Rochelle	985, 1582	648, 1087	+337, +495	964, 1476	656, 1041	+308, +435
Daniel	711, 1321	643, 1147	+68, +175	729, 1304	646, 1037	+83, +267
Alison	874, 1425	990, 1397	*−116, +28*	908, 1461	1023, 1471	*−114, −9*
Casey	1273, 1793	818, 1319	+455, +474	—	—	—

Table 5.3: The O'Connor family: summary of reading card productions

5.3.3 Summary of Seekonk families

The children of distinct parents personally interviewed with their families in Seekonk showed evidence of a sharp change in time, with older children distinct (though not as much as their parents), fourth graders divided, and younger (school age) children merged.

There was a recent period where Seekonk children 'agreed to disagree' with respect to their low back vowels. That is, they do not seem to have drastically influenced each other; children maintained whichever system they had entered school with. This is best seen for the children in fifth grade and older, where those who entered school with a parentally-imparted merged system retained it, and almost all those who entered with a distinct system retained it, as well.

But more recently, the low back distinction – even though it is initially acquired at home, as seen for Casey O'Connor – has not been surviving the formation of the peer group and the transition to school. This is apparent in the data from Seekonk children in third grade and younger, where there are six subjects, aged 7-9, who have apparently learned the merger from their peers, and Esau Ventura, who has done the same by age 4.

Recall that the nearby community of South Attleboro (§5.2) went through the same change, though it dates back almost 10 years further there. South Attleboro also provided the exceptional case of Caleb Hayas, who had not adopted his peers' norm even by age 6.

The change in both places appears very sudden, occurring over the course of just a few years. But revisiting the results from the school survey suggests that in the wider population, there is somewhat more individual variation than this, both above and below the critical age range. In general, though, the school survey and family study results concur as to the dynamics of the recent merger in South Attleboro and Seekonk.

5.4 The family study and school survey: Seekonk and S. Attleboro

In Seekonk, the school survey was administered to 12th, 8th, and 4th (in one school, 5th) grade students. Based on the family study results, we would expect 12th grade and 8th grade Seekonk natives with distinct parents to maintain the distinction, and those in 4th and 5th grades to be mixed between the distinction and the merger.

The actual school survey results are not quite so dichotomous, but they mirror the trend observed in production fairly well, though with somewhat of a greater tendency to show merger. The results are somewhat hard to interpret, because while many students were inconsistent between pairs on the written questionnaire, few children interviewed in person were clearly merged on some pairs and distinct on others. The breakdown of responses for students who a) are Seekonk natives, b) have both parents from distinct communities, and c) were not interviewed in the family study, are shown in Figure 5.14.

For the 12th graders in the top panel of Figure 5.14, who were 17 and 18 years old and thus well above the age at which merger was observed in the families, nearly two-thirds (62%) of subjects marked all seven items "different". A quarter (27%) marked either one or two items as "same",[29] and a tenth marked 3, 4 or 5 items the same. No one gave a response that was fully merged, nor one with six items marked merged and one distinct.

[29] As discussed in §3.6.3.7, the pairs *Otto*∼*auto* and *Moll*∼*mall* were the most likely to be exceptionally marked "same" in this situation.

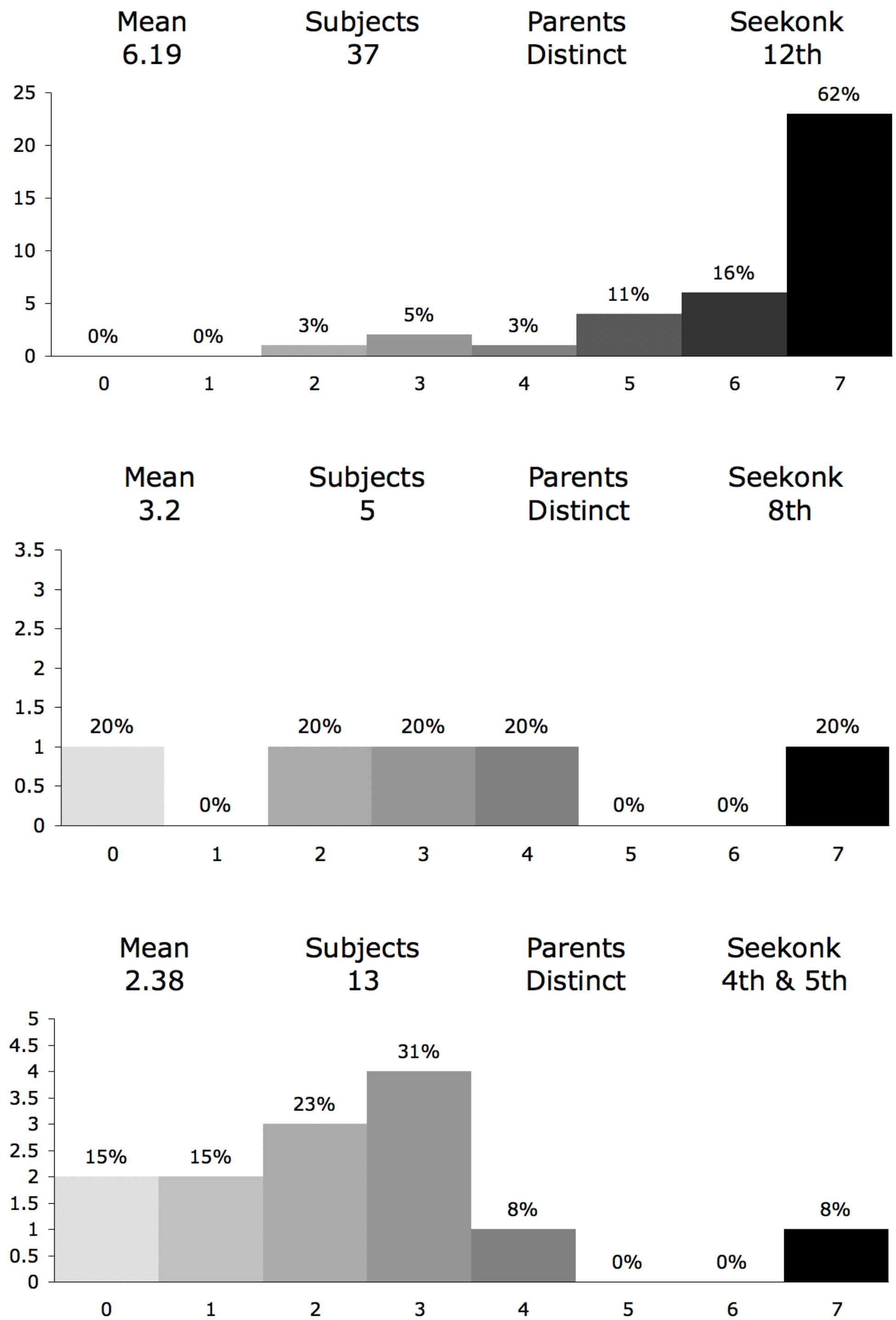

Figure 5.14: Seekonk school survey: Number of Subjects vs. Items Marked “Different”

For the 8th grade, recall that the family study had found mostly the distinction in that age range, but also one outlier of a merged child, Mara Parente (see note 20). The school survey results from the eighth grade were very sparse, and the five qualifying responses span the range from fully distinct to fully merged. In this case (as well as for the 12th graders), it is hard to know if intermediate survey responses indicate intermediate patterns of production – of a type not observed from anyone in person – or whether most of these subjects would appear distinct in speech, though the merger is affecting their perceptions.

For the 4th (and 5th) grade, the family study had found roughly an even split between distinct and merged children, but the school survey results find a decided preference in favor of merger. Only 2 of 13 (15%) of survey subjects marked more items "different" than "same", one of them marking all seven items "different". The most popular categories were the intermediate ones on the merged side, as 7 of 13 (54%) marked either two or three items "different" (thus four or five "same"). The remaining 4 of 13 subjects (31%) marked at least 6 of 7 items "same", with two subjects returning a fully merged response.

As a first attempt at understanding the dynamics of the Seekonk school population, we note that of all the students who have always lived in the town – termed 'natives' – most are the children of two distinct parents (this is the group whose responses were just analyzed). The proportion of natives that had two distinct parents was exactly two-thirds for both the 12th grade sample (37 of 55 students) and the 4th/5th grade sample (14 of 21), and 45% of the small 8th grade sample (5 of 11).

This subgroup, to which the merger has spread, did not shrink noticeably in its demographic importance during the period of change. The proportion of natives with merged parents, who at first merely retained that merger, then began to impose it on the rest, was neither large nor obviously growing. Other elements of the population, particularly non-native students (in-movers), from both the Rhode Island (distinct) and Massachusetts (merged) directions, have yet to be considered.

Turning to South Attleboro, recall that the geographic study and family study combined to indicate a rapid merger similar to the one in Seekonk, but one that occurred some ten years earlier, so that teenagers and younger children (with distinct parents) are merged, but comparable people in their twenties and older are distinct. This means that the change occurred for the cohort that entered preschool around 1990.

The data from the school survey, which reached a greater number of subjects, requires some moderation of the statement that no South Attleboro teenagers retain the distinction. Even the youngest South Attleboro children marked their school surveys in a more distinct manner than their age-counterparts from the rest of Attleboro. In fact, it is hard to avoid the conclusion that for South Attleboro, the school survey's 'perception' results are lagging, not leading, the production data obtained from the family study. Figure 5.15 shows the school survey results for the native South Attleboro students with both distinct parents.

The 12th grade data, from 10 subjects, is a fairly flat distribution ranging from fully merged (one subject) to fully distinct (one subject). Most responses were intermediate.

The 8th grade South Attleboro data, from 11 subjects, is not unlike the Seekonk 4th/5th grade results. No one marked more than four of seven items "different", with most marking only one or two "different", and one subject fully merged.

The 4th grade data, from only four subjects, is similar, showing a flat distribution from no items "different" to 4 items "different", and no one marking more than four "different".

One reason that the numbers are so small here is because of the restriction to subjects with two distinct parents. If a subject's mother or father was from South Attleboro, as many surely were, and they indicated their origin as "South Attleboro", then the parent was coded as distinct and the subject's response could be included here. However, if they merely wrote "Attleboro", then it could not be determined which part of the city was intended, and therefore the parent's origin had to be coded as unknown.

However, even if we count all South Attleboro natives whose parents grew up in a

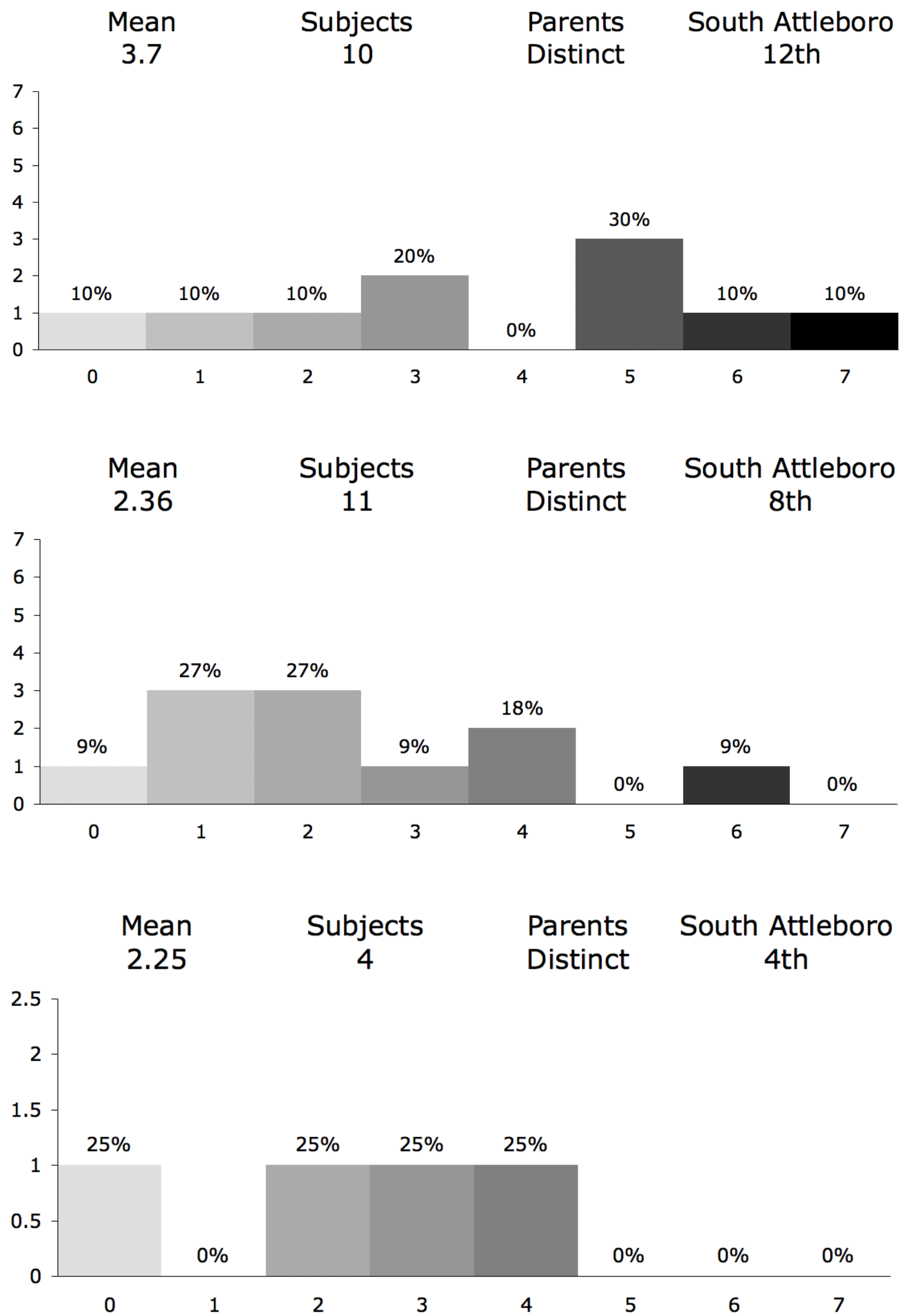

Figure 5.15: S. Attleboro school survey: # of Subjects vs. Items marked “Different”

known distinct community *or "Attleboro",* we see that their proportion of the total number of South Attleboro natives is much smaller than the corresponding proportion for Seekonk.

Of 61 native South Attleboro 12th graders, 22 (36%) had distinct or "Attleboro" parents. Of 58 eighth graders, 19 (33%) had such parents, and of 28 fourth graders, 11 (39%) did. With such low proportions, it is perhaps not surprising that the low back merger came to affect South Attleboro. Not much more than a third of the native children have family backgrounds that would strongly favor preserving the distinction. In adjacent Seekonk, on the other hand, closer to two-thirds of children have such backgrounds.

This type of reasoning, which will be expanded on below starting in §5.7.3, explores the idea that changing demographics within a community may trigger merger, as a greater proportion of children with merged family backgrounds enter the mix that combines to form each age cohort (or each peer group) as it begins school. On this view, merger does not spread from place to place in any direct sense, nor is it even necessarily passed down from older to younger children within a place.

Rather, merger(-by-expansion) is the 'natural' result of certain combinations of demographic and linguistic circumstances. Just as Herold (1990) found that wherever a large number of European immigrant miners settled in the anthracite coal fields of Northeast Pennsylvania, the low back merger appeared, it may be that whenever a certain percentage of Eastern New England families move to adjacent towns in the Mid-Atlantic territory, it will have the consequence of eliminating the historical low back distinction there.[30]

[30] A competing possibility takes into account that considerable, though not extreme, phonetic approximation of /o/ and /oh/ preceded merger by at least a few years in Seekonk, and possibly in South Attleboro as well. If sudden merger is actually the consequence of (exposure to) a certain degree of approximation, then we must say that young children are highly influenced by their older siblings and older peers, after all. As to what causes the phonetic approximation in the first place, it could be the type of contact-by-migration already discussed, or other types of social factors, or else internal ones.

5.5 The families of Cumberland

Like Seekonk, Cumberland RI is adjacent to Attleboro, but lying to the west rather than to the south; in fact, if one drives west from South Attleboro, one very soon enters a part of Cumberland. It is a large town, in terms of area, with a population of 34,000 (2005 estimate). The southern corner of the town, near Pawtucket, is very dense and urban; the northwestern portion touches the city of Woonsocket; but the northeastern part is more sparsely populated and more affluent.

The five families interviewed in Cumberland live in this northeastern section of town. The first mother was referred to me by one of the parents in South Attleboro, whose children had attended the same pre-school – For Pete's Sake, located in South Attleboro, but serving families from several nearby communities – as one of her children. Following the first interview, the four other families were recommended by the first one.[31]

The Cumberland families were a homogeneous group. Not only did all five of them live in the same part of town, but 12 of the 13 children either currently attended, or had graduated from, the same K-5 elementary school, called the Community School. Furthermore, all ten of the parents had the low back distinction, some being Rhode Islanders, and some from other Mid-Atlantic or Inland North states.

Despite this, the low back vowels of the Cumberland children did not pattern neatly by

[31]Through the same pre-school, two families living in Pawtucket RI were recruited to participate. While this is not enough to say anything about that city overall, the families did provide further evidence for some of the trends already seen.

In one family, the parents were from Rhode Island, hence distinct, and their three-year-old daughter was judged probably distinct. Since the daughter had only begun pre-school three months earlier, this could suggest that after such a short time with peers, children are still primarily under parental influence. However, it is not clear that all (or even most) children emerge from that particular pre-school merged, only that they are mainly merged a few years later, whether in South Attleboro, Seekonk, or Cumberland.

In the other Pawtucket family, both parents were again Rhode Islanders with the low back distinction; in fact, they were both from Pawtucket itself. Their four-year-old daughter was in her second year at For Pete's Sake pre-school in South Attleboro, and she retained a probable low back distinction. Their 8-year-old son was in second grade at a charter school in neighboring Central Falls, RI, and he was unequivocally merged. The charter school was said to draw students mainly from Central Falls, Pawtucket, and Providence, so this suggests that the trend towards merger may have reached the core of urban Rhode Island.

age. Unlike in South Attleboro and Seekonk, there was no cut-off age above which almost all children were distinct, and below which they were merged. However, a general trend towards merger could definitely be seen, including among siblings within families.

Figure 5.16 shows the 13 children in the five Cumberland families. Since there are so few families, it is possible to give a brief overview of all of them.

The leftmost family plotted is the Champagnes. Mr. and Mrs. Champagne both grew up in Rhode Island and are fully distinct (the wife was assessed by interview, the father by his marking 7 of 7 "different" on the school survey). The Champagnes have two daughters, one in 2nd grade and one in kindergarten at the Community School. The older child pronounced and judged all the reading pairs as different, while the younger child displayed the distinction on the picture flashcards.

The parents in the Gill family were also from Rhode Island. Their oldest daughter, in 6th grade at North Cumberland Middle School, was distinct. Their older son, in third grade at Community, was probably distinct. Their youngest son, in kindergarten at Community, was probably merged. There was no obvious reason why the Gills should show an apparent-time trend towards merger, while the Champagnes showed retention of the distinction.

The Graham family's pattern was similar to the Gills'. Mr. and Mrs. Graham grew up in Connecticut and Minnesota, respectively, and were both clearly distinct. Their son, in 5th grade at Community, was probably distinct, and their 3rd-grade daughter definitely so. However, their daughter, who attended pre-school in Cumberland, was probably merged.

The Springer parents were from New York City and New Jersey, and had distinct low back vowels. Their three children were older than those in the previous two families, but they showed the same apparent-time trend, with a distinct 12th-grade boy, a probably-distinct 7th-grade boy, and a definitely-merged 4th grade boy.[32] The youngest boy attended

[32]This 4th grader, Adam Springer, sounded merged in spontaneous speech, and pronounced all the minimal pairs the same. However, he judged most of them to be different.

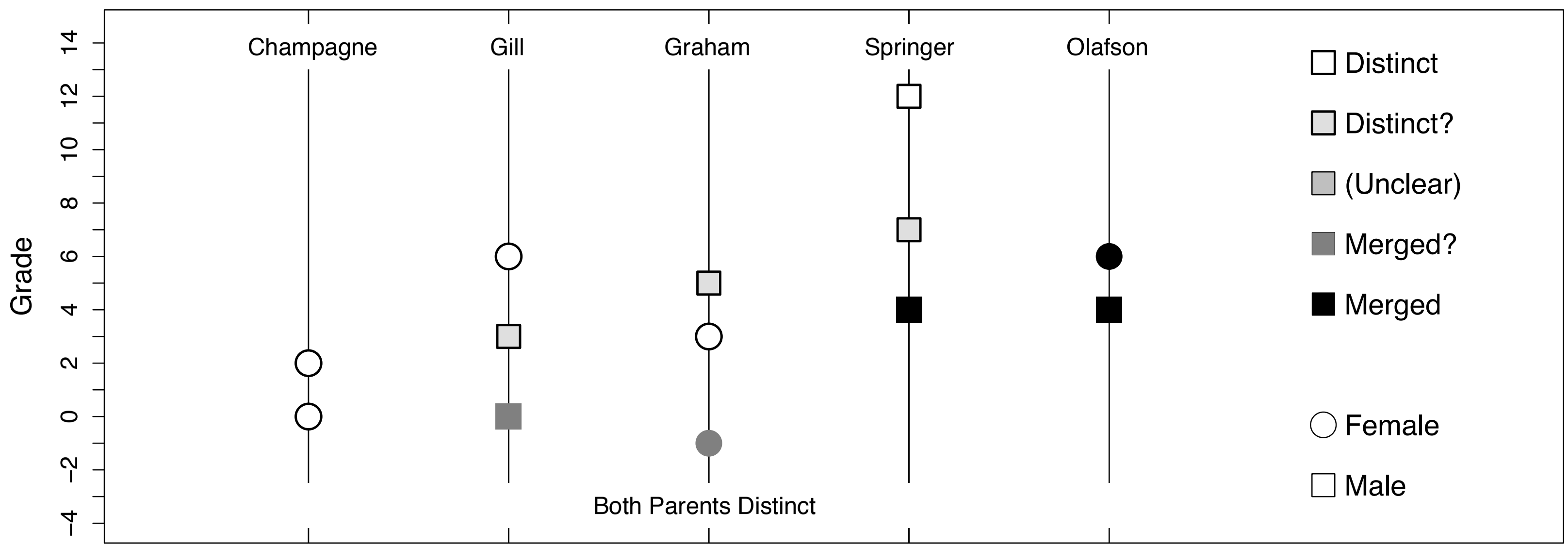

Figure 5.16: The children of Cumberland

Community School, while the older ones had moved on from Community to a private Catholic school in Woonsocket which has a mixed RI and MA student population.

Finally, in the Olafson family, where the parents were again distinct – mother from the NYC area, father from Minnesota – both the 6th-grade daughter and the 4th-grade son were definitely merged. While the daughter was exceptional in having attended a private girls' school in Providence since pre-school, the son had always attended Community School.

While there were certainly some exceptional children found in Seekonk – particularly the 13-year-old, yet fully-merged, Mara Parente – the Cumberland trend towards merger, though evident, is much less predictable. We have two definitely-merged fourth graders attending the same Community School where a third grader, a second grader, and even a kindergartner are definitely distinct. Clearly, other factors than a child's age cohort, and the vowel systems of his or her parents, affect whether someone growing up in Cumberland during this period develops a system of merged or distinct low back vowels.

But although these factors are unknown at present, it does not seem as though they are truly individual either, because in all cases (with one partial exception in the Graham family) the trend within families is from distinction to merger. Although children's social networks are hardly independent of those of their brothers and sisters, one still might not predict such regularity if, for example, there were merged and distinct 'crowds' at Community School, correlated with other personal characteristics, and either of which groups a child was more or less free to join.[33]

[33]There is another challenge involved in imagining a school where merged and distinct speakers are associated with different social groups or networks. Presumably, at first, the merger would be associated with a relatively small number of native children of merged parents, or in-movers from merged areas, and these children would likely be outsiders to the dominant or popular network. But within a couple of years, when the merger becomes the majority pattern, the distinction is relegated to a few children, perhaps those with unusually strong ties to older siblings or other older locals.

The merger's spread through a school community seems more likely to be an unconscious process, rather than one where the linguistic change piggybacks on a social transformation, such as children whose parents (or themselves) are from a certain area becoming the center of popular and influential groups within the school. Such a scenario could happen, but probably not with the regularity that we have seen the merger take over one elementary school in South Attleboro, three in Seekonk, and, probably soon, one in Cumberland.

5.6 The families of Warwick

At this point, the family study has made it clear that the low back merger is affecting young children in several communities for which the older subjects of the geographic study gave no hint of merger. A final community was selected that was predicted to retain the Rhode Island (MAIN) pattern more tenaciously.

This was Warwick RI, a large (2005 estimated population: 87,000) blue-collar suburb of Providence, located five miles south of that city. Warwick is thus located on the other side of Providence from Massachusetts communities like Seekonk and Attleboro, and it is very much a 'Rhode Island' community. According to the 2000 Census, 95% of Warwick residents were born in the United States, and of those, 80% were born in Rhode Island. Of the total Warwick population, 76% was born in Rhode Island.[34]

Five families were recruited to participate, one through a personal connection, and four through the PTA and principals of several local elementary schools. Exactly in line with the Census figures, four of the five Warwick families had Rhode Island parents, with the low back distinction, while one – the Patrick family – had out-of-state, merged parents.[35]

5.6.1 Native Rhode Island families

On the whole, the children of distinct parents in Warwick did show more retention of the distinction than in S. Attleboro, Seekonk, and Cumberland. But this was not total; several had unclear patterns that likely signal the incipient advance of the merger, even here.

In the Bloomberg and Barlow families, all four children were definitely distinct, like their parents; they ranged in age from 14 (9th grade) to 8 (2nd grade). In the Mahoney

[34] The other RI study communities have a lower percentage of native Rhode Island origin. In Cumberland, 91% of the 2000 population was born in this country, of which 76% were born in Rhode Island – 69% of the total. In Pawtucket, only 77% were born in the U.S., of which 75% were born in RI – 57% of the total.

[35] The father in the Patrick family, Mike, presented as merged, but acoustic analysis revealed that he had acquired some subtle semblance of the distinction. Nevertheless, it is believed that from the point of view of his influence on his children, he would have acted as merged. See §5.6.2.1.

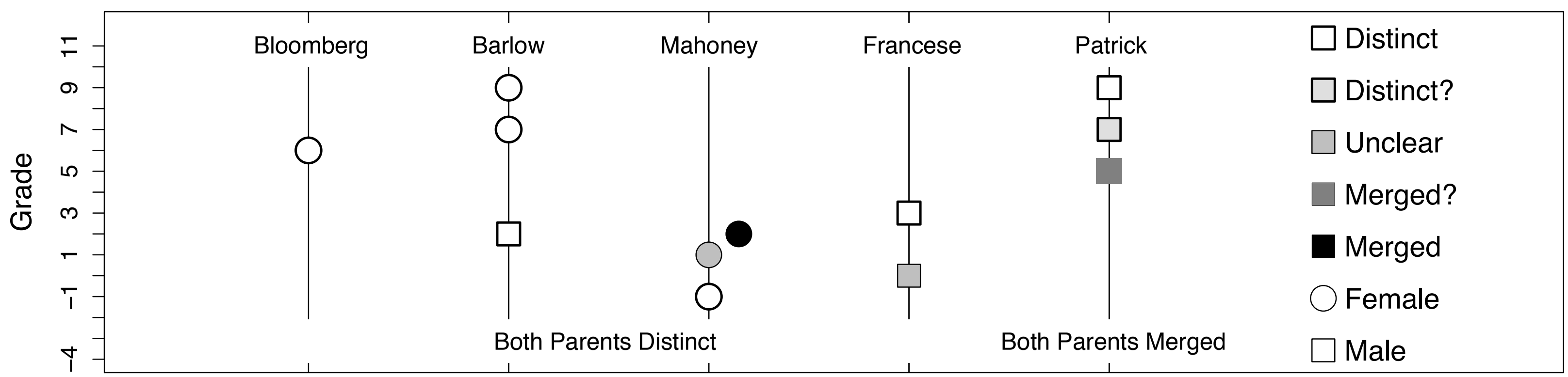

Figure 5.17: The children of Warwick

family, however, only the younger daughter, Celeste – age 4, and in pre-school – was distinct, probably still under her parents' influence. The older daughter, Hope – age 7, and in first grade – displayed an unclear pattern.

The nature of Hope Mahoney's 'unclear' pattern was as follows. In her spontaneous speech, and in her naming of the picture flashcards, she was simply judged 'unclear', meaning primarily that some pronunciations of /oh/ were raised and backed like a distinct speaker's, and some were front and unrounded like a merged speaker's. On the reading cards, however, she showed an interesting regularity, by pronouncing most pairs the same, or very close, when they were embedded in their sentential context, but then as clearly distinct when repeated as overt minimal pairs.

This was an example of a pattern that occurred for several other speakers, where more informal or spontaneous styles yielded pronunciations more associated with their (recent) peers, while the most self-conscious style led to productions reflecting earlier-acquired norms. In Hope's case, the early-acquired norm would be the distinct pattern of her parents. The recent peers in question could either be her Warwick friends, or more specifically her merged cousin Robin, who was over at the Mahoney home, and with whom she was playing immediately before the interview.

Seven-year-old Robin, a first cousin to Hope and Celeste Mahoney on their mother's side, was a wild card, both because her appearance at the interview was not expected, and because she originally lived in a more interior part of Rhode Island that had not been studied at all. This being Rhode Island, though, she had never lived far from Warwick.[36] Robin was rated as definitely merged in spontaneous speech, probably merged from her behavior on the picture cards. She pronounced and judged most of the minimal pair cards the same.

It may be that Hope Mahoney would have exhibited a more consistently distinct pattern

[36]Robin used to live in Coventry RI, attended day care in West Greenwich RI, and has lived in Warwick for two years, where she is in second grade at a parochial school.

had she not been interviewed during a visit from her cousin Robin, who she spends time with often – about twice a week – in any case. This would be a notable example of short-term accommodation of the low back vowels. But the fact that Robin is merged is significant on its own, since she is the child of distinct Rhode Island parents and has always lived in the central part of the state. Though Robin is only one speaker, her nearly-certain merger is a strong indication that the state of Rhode Island, where the low back distinction was universal (except in Barrington) 15 years previously, may soon succumb to merger.

The children of the Francese family also indicate the weakening of the distinction. Again, both parents are Rhode Islanders, and their older child Mark, a third grader, displayed a clear distinction. His distinction was unambiguous in spontaneous speech; on the reading cards, Mark produced two pairs that were very close in the overt context, one in the covert context, and said one pair was the same that sounded quite different to me.[37]

Mark's younger brother Greg, a first grader, produced a pattern judged as unclear overall. His spontaneous speech did not contain enough examples of /oh/ to be useful, and his naming of the picture cards returned a verdict of 'unclear', with some productions reminiscent of the distinct pattern, but others sounding merged.[38]

5.6.2 The Patrick family

The final Warwick family was different from the others, in that both parents came from out-of-state, and exhibited, at least at first glance, the low back merger. Unlike several Seekonk children with only one merged parent, who contrasted with their peers by showing the merger (see Figure 5.3), the children of the Patrick family showed varying degrees of

[37]Mark's performance on the reading cards may not sound consistent with judging him 'clearly distinct', but this was done in recognition of the two other minimal pairs, pronounced differently both times and identified as such, and also by giving some precedence to his spontaneous speech production, which was clearly distinct, as noted.

[38]Greg also repeated two of the minimal pairs after his brother, and those sounded distinct, but we learned from Alison O'Connor in §5.3.2.3 that the ability to immediately imitate a distinction does not really say much about a speaker's natural production system.

acquisition of the distinction, despite having two merged parents.

This shows that it is possible for the low back distinction to be acquired from peers, even after a merged system is acquired initially from parents. Presumably, the fact that the distinction is more entrenched – more years away from disintegrating – in Warwick than in Seekonk is related to the Patrick children's greater progress in acquiring it. Even without considering change in progress, the difference can be thought of in simpler demographic terms. It is likely that children with merged parents form a smaller minority of the school population in Warwick than they do in Seekonk. This would make the merged model less accessible to children in Warwick, and promote their learning of the distinction.

5.6.2.1 Mike Patrick

Mike Patrick, a 48-year-old attorney, grew up in southern Maine, a region where the ENE pattern and its component /o/∼/oh/ merger is regular. The spontaneous speech of Mr. Patrick (ME48M) sounded definitely merged, and his pronunciation of all but one of the minimal pairs sounded the same. The exception was *cot∼caught,* where he made, and identified, a clear difference. He also judged *tot∼taught* and *nod∼gnawed* to sound different, although they did not to the analyst.[39]

When acoustically measured, Mike's tokens of /o/ and /oh/ formed a single small cloud in mid-back position, as seen on Figure 5.18. This distribution is highly suggestive of merger. However, when we evaluate the pairs using the paired t-tests, the diagnosis of merger becomes less certain:

Δ/o/ – /oh/ (ME48M, C, 6) = +50 ±37 (0.02), +30 ±64 (0.28);

Δ/o/ – /oh/ (ME48M, O, 6) = +12 ±25 (0.27), +72 ±72 (0.05).

It appears as though Mike Patrick – who has lived in the MAIN dialect area for 30

[39] Mike Patrick still clearly kept a fronter /ah/ distinct from the low back vowels.

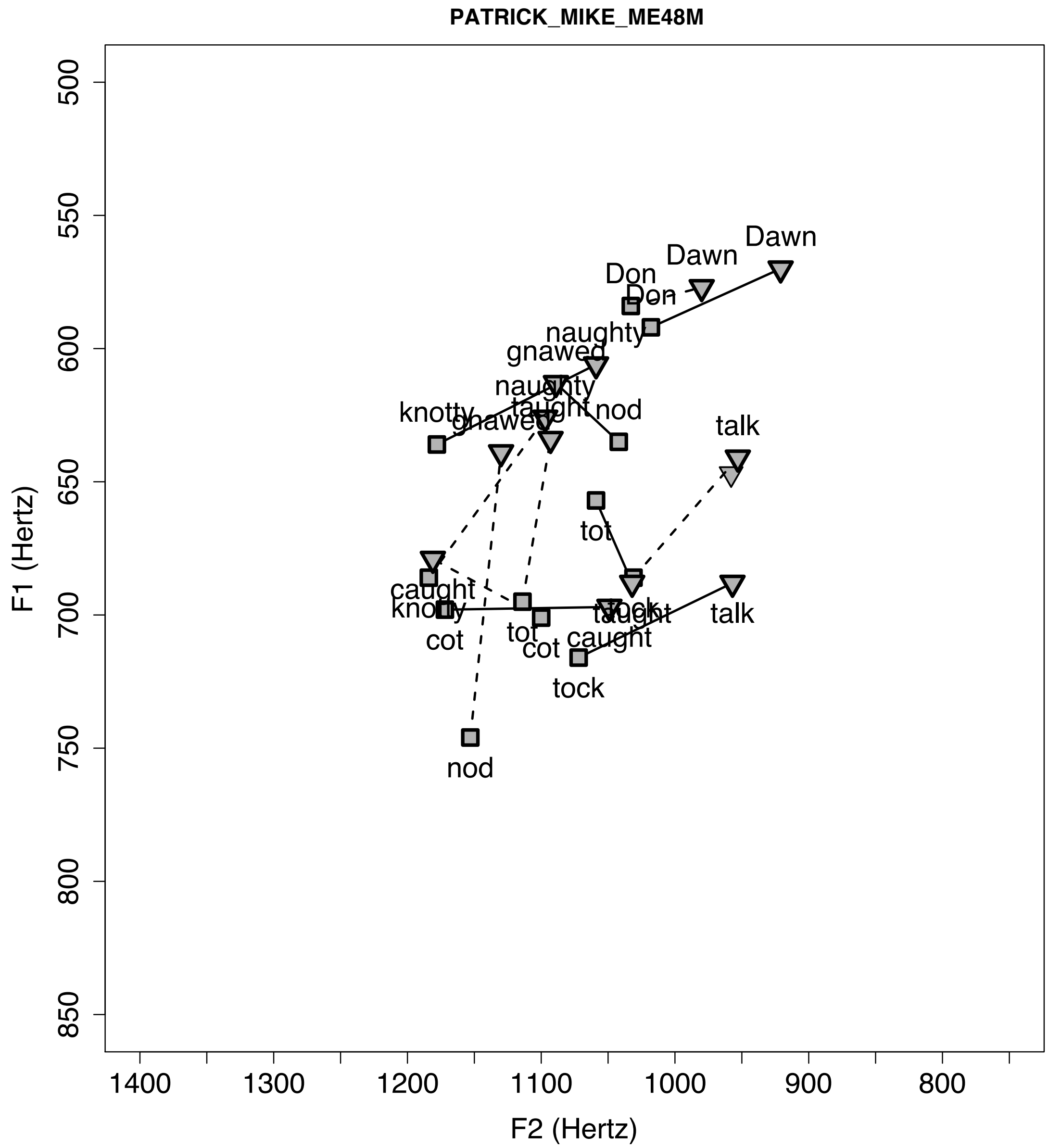

Figure 5.18: Mike Patrick (father): reading card tokens of /o/∼/oh/ pairs

years, since he started college[40] – has learned an almost subliminal version of the low back distinction. He pronounced six covert pairs and six overt pairs, and for each there was, of course, some formant difference in F1 and F2. Of these 24 opportunities for the pair to differ in the 'correct' direction – both formants higher for the /o/-class word – Mike produced the correct direction of difference 21 times, which is vanishingly unlikely to have happened by chance ($p < 0.0002$).[41] Mike Patrick does not have a truly merged system, where /o/-class and /oh/-class items are realized with an identical distribution.

The word class differences are small, and in fact were not noticed until acoustic measurements were performed.[42] One reason for that is the almost total overlap of the two classes in acoustic space. For F1, the lowest value for /o/ is 584, and the lowest value for /oh/ is 570. The highest F1 value is 746 for /o/, 697 for /oh/. For F2, the lowest value for /o/ is 1020, and the lowest value for /oh/ is 921. The highest F2 value is 1180 for both word classes.

It is clear that Mike Patrick does produce a small distinction between pairs, but given the overlap, it is reasonable to question whether people attending to his speech – his children, for example – would be able to learn anything of it. While the members of the average /o/~/oh/ pair differ by (+31, +51) – and if we only consider the nine that differed in the correct direction, by (+40, +79) – the differences *between* different pairs are often greater.

The between-pair differences may reasonably be attributed to phonetic conditioning, but they do pose a substantial learnability problem, in considering if Mike Patrick was functionally merged or distinct in his capacity as partial language-imparter to his children.

[40] Besides the Providence area, the Patricks lived in Washington DC for 12 years.

[41] Even if this calculation is rejected on the grounds that even merged speakers may tend to correlate their F1 and F2 for these vowels, the conclusion remains the same if the probabilities are calculated separately for each formant. For F1, the likelihood of at least 11 out of 12 differences falling in the correct direction by chance is 0.003; for F2, the chance of 10/12 (or more) differences being positive is 0.02. Or, if we simply assume that one-fourth of random (merged) pairs would have the correct direction of F1 / F2 difference, the chance that as many as 9 pairs out of 12 would have it is 0.0004.

[42] Oddly, the pair *cot~caught,* where a difference *was* heard, did not measure more distinct than other pairs.

For example, both the covert and overt examples of *Don∼Dawn* occur in the same area of phonetic space, with the tokens of *Don* being about 100 Hz further front, and very slightly lower, than those of *Dawn.* The pair *tock∼talk* is similar, in that the two tokens of *tock* are around 100 Hz fronter, and some 25-50 Hz lower, than those of *talk.* But the examples of *tock∼talk* are all substantially lower than those of *Don∼Dawn.* This raises questions as to the functionality of the F1 distinction, since the /oh/-word *talk* is lower than the /o/-word *Don* by a greater amount than the height differences within either pair.

The pair *knotty∼naughty* makes this point even more clearly. The tokens of *knotty* are fronter and lower than those of *naughty* by roughly 50 Hz in F1 and 100 Hz in F2. But though *naughty* is further back than *knotty,* it is slightly fronter than *Don.* While the hearer can adjust for allophonic differences stemming from phonetic environment, making the existence of partial overlap between two distinct classes unproblematic, it seems unlikely that a learner would be able to acquire the /o/ and /oh/ word classes from a pattern showing near-total overlap, such as this one.

After thirty years of living and working in the MAIN dialect area, Mike Patrick has not lost the characteristic ENE low back vowel position, nor the wide allophonic conditioning typical of that dialect. However, as an adult, he has certainly superimposed onto it a small but rather consistent implementation of the word class distinction between /o/ and /oh/. How common this process is, how it operates, and what it may have to say about the phonological representation of these sounds, is of some interest.

5.6.2.2 Clara Patrick

The mother in the Patrick family, 48-year-old Clara, worked for a non-profit agency. She was born in Mexico, and learned English upon moving to El Paso TX at the age of four. Mrs. Patrick (TX48F) still spoke with a light Spanish accent. She displayed the low back merger much more unambiguously than did her husband, judging all the minimal pairs to

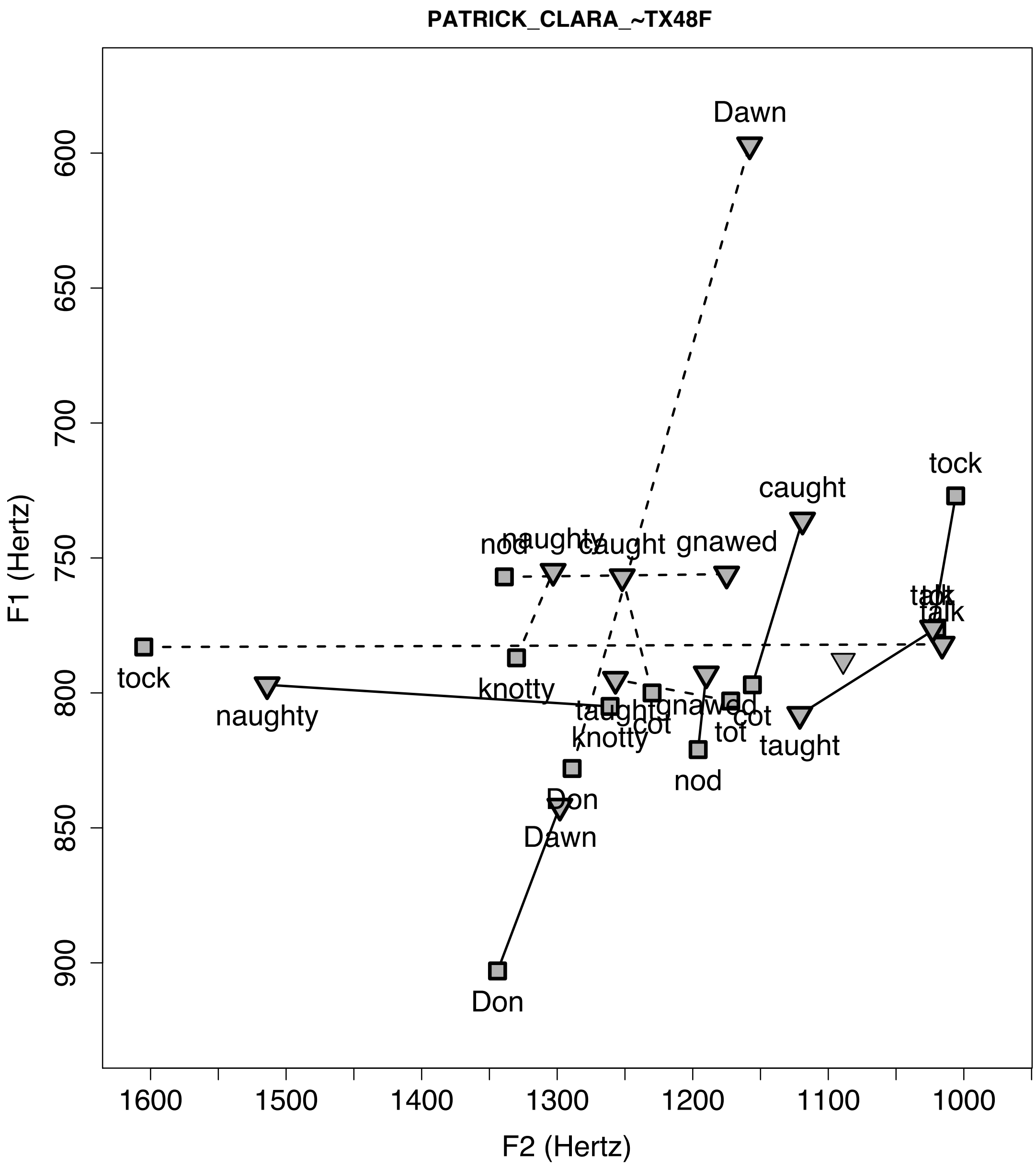

Figure 5.19: Clara Patrick (mother): reading card tokens of /o/∼/oh/ pairs

be the same, except one which sounded close. Her low back tokens are plotted on Figure 5.19, using similar axes to her husband's plot.

Whereas Mike Patrick had produced 21 of 24 total formant differences in the direction of someone with the distinction, Clara produced 17 of 24 in the correct direction. This would seem much better than a chance performance, but five of the 'correct' differences were smaller than 10 Hz, leaving a fairly unremarkable 12 of 19 ($p = 0.18$) among the remainder.[43] One pair showed an extreme difference in the right direction – the overt *tock* was 589 Hz fronter than *talk* – but another F2 difference was strongly in the reverse direction – the overt *knotty* was 253 Hz backer than *naughty*. The impression of definite merger was reinforced by the fact that the covert and overt instances of particular words were often realized quite differently. The paired t-test results suggest merger as well; although the mean differences for the covert pairs are in the right direction, there is wide variation and little consistency, leading to a non-significant result:

∆/o/ – /oh/ (TX48F, C, 6) $= +53 \pm 93$ (0.21), $+134 \pm 253$ (0.24);

∆/o/ – /oh/ (TX48F, O, 6) $= +13 \pm 49$ (0.53), -47 ± 119 (0.36).

Even though Mr. Patrick has, by now, acquired something of the low back distinction, the combination of his pattern and his wife's strongly suggests that their three children would not have been able to acquire the distinction from them. We therefore have a chance to see the degree to which children can learn the distinction secondarily, when immersed in a largely-distinct peer environment.

The Patricks' three sons have, in fact, learned the distinction, but to varying degrees. The oldest (age 15) was judged definitely distinct overall, the middle child (age 12) was judged probably distinct, and the youngest (age 11) was judged probably merged.

[43] Mike Patrick had two such tiny differences among his 21, still leaving a significant 19 of 22 ($p = 0.0004$).

5.6.2.3 Juan Patrick

When interviewed, 15-year-old Juan Patrick (WW15M) was a high school freshman in Warwick.[44] Like his brothers, he was a lifelong resident of the city, and had attended pre-school in Providence followed by the Warwick public schools. The impression from his spontaneous speech and from his reading the minimal pair cards was that he was "very" distinct. On only one of the pairs, *Don*∼*Dawn,* did he say that the words were the same – they sounded different in the covert condition, then the same when focused – and one other production sounded close.

The acoustic measurements of Juan's vowels – plotted on Figure 5.20, at the same scale as his mother's, but slightly shifted – did not reveal a distinction that was as large as it sounded impressionistically, but the existence of the distinction is clear.

Juan Patrick's /oh/-class forms a fairly tight cloud, with the notable exception of the two tokens of *naughty,* which are much lower and fronter (though they remain distinct from the corresponding tokens of *knotty*). The /o/-class, on the other hand, ranges very widely. For the most part, each word is consistent in its position. *Don* was realized near the /oh/-cloud, although it is still kept distinct from *Dawn.* The words *cot, tock,* and *tot* are further from /oh/, and *knotty* is the lowest and frontest, hence furthest from the bulk of /oh/ tokens, although not very far from its own paired word, *naughty.* Only the word *nod* showed a great difference in its realization between covert and overt contexts.

The results of the usual paired t-tests strongly indicated the distinction for the covert pairs, and for the overt pairs a more consistent difference, rather than a larger one, made the verdict even more definitive:

Δ/o/ – /oh/ (WW15M, C, 6) = +84 ±49 (0.007), +150 ±164 (0.07);

Δ/o/ – /oh/ (WW15M, O, 6) = +97 ±48 (0.004), +146 ±78 (0.005).

In terms of average raw distance between the members of the pairs, this is among the

[44] He was a classmate of the oldest child in the Barlow family, who was judged definitely distinct.

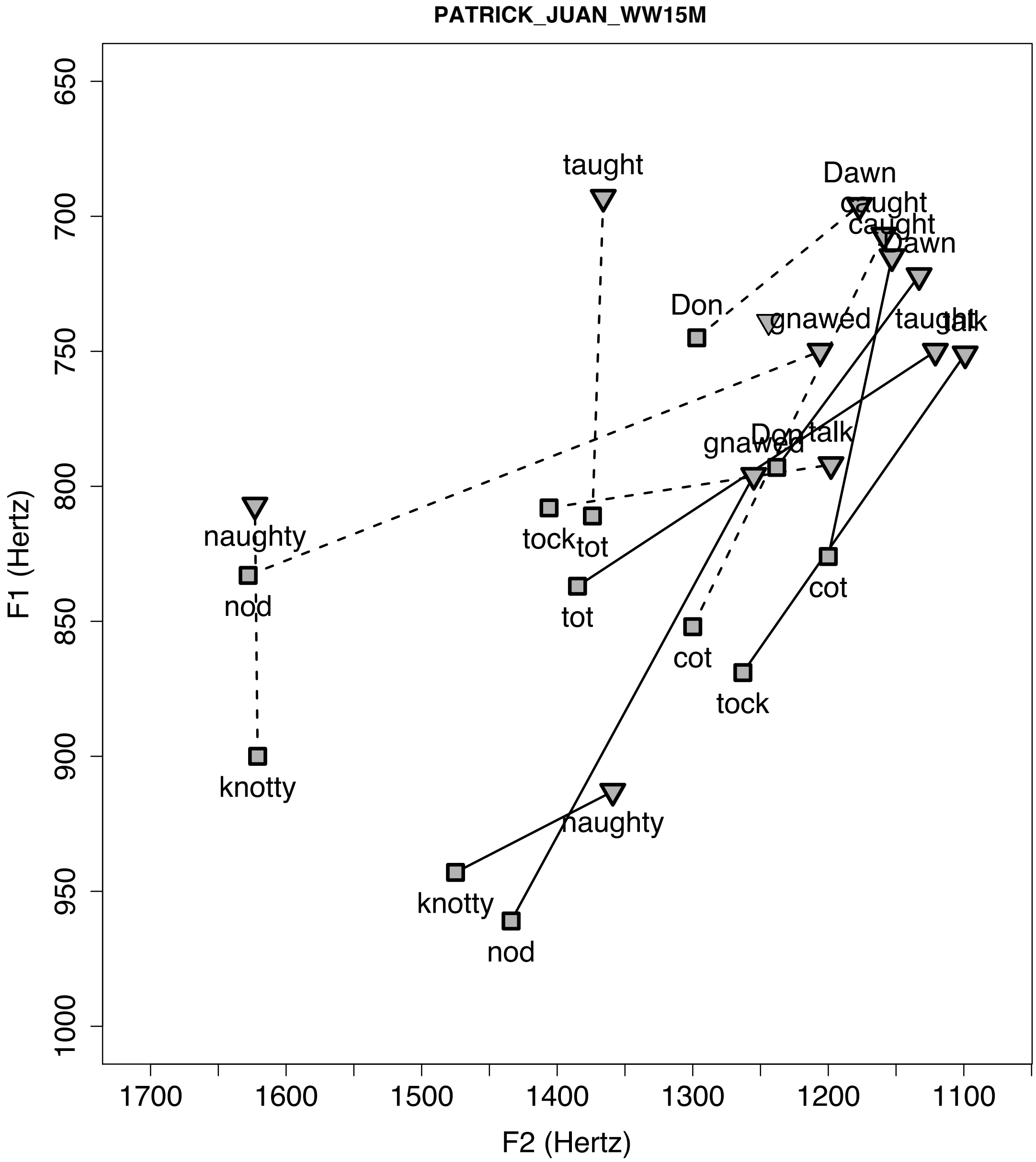

Figure 5.20: Juan Patrick (oldest brother): reading card tokens of /o/∼/oh/ pairs

smallest distinctions observed, but because of its consistency, it emerges as one of the most significant, statistically. There is no doubt that Juan Patrick has acquired the low back distinction, mainly or totally from his peers, but the resulting pattern is unusual in the way that /o/ varies, partially overlapping with /oh/, but never threatening individual pairs.[45]

5.6.2.4 Roberto Patrick

The middle Patrick child, 12-year-old Roberto, presented a more complicated situation with respect to the low back vowels.[46] In his spontaneous speech, Roberto gave the impression of being distinct, though not definitely so. However, his performance with the reading cards gave a different impression.

The pair *Don∼Dawn* sounded the same in both covert and overt contexts, and was judged the same by Roberto. The pair *nod∼gnawed* sounded close, and was judged the same. But the other four pairs were pronounced distinctly when read in context, but were then pronounced and judged the same, when presented as formal minimal pairs.

There were several examples in South Attleboro, Seekonk, and Cumberland where children had shown the reverse pattern, exhibiting the low back merger more clearly in more spontaneous styles, but showing some distinction on the minimal pairs. There, it seemed understandable that in normal speech, children would show a pattern closer to the mainly-merged norm of their peers, but when confronted with explicit judgments, they might reveal knowledge of a 'deeper' distinct pattern acquired earlier from their parents.

By this reasoning, Roberto Patrick is doing the same thing. He has been learning the distinction for something like eight years, from a mainly-distinct peer group in Warwick, and so he produces a version of the distinction – though not as clear a one as his older brother – when speaking relatively spontaneously. Presented with minimal pairs, however,

[45]The pattern of Amber Koslowski (Figure 5.6) was similar. For her, it was /o/ that was realized in a fairly consistent manner, and /oh/ that ranged from an overlapping phonetic position to a quite distinct one.

[46]A 7th grader, Roberto was a classmate of the middle Barlow child, who was judged definitely distinct.

he largely reverts to the merged system inherited from his parents in early childhood.

5.6.2.5 Paco Patrick

Although 11-year-old Paco Patrick was only a year younger than Roberto – and two years behind him in school, being in fifth grade – his low back vowels were more merged than his brother's, in all contexts. In spontaneous speech, he was rated probably merged. He also had what seemed like a light foreign accent, perhaps on the model of his mother.

Of the pair cards, there were three – *Don∼Dawn, tot∼taught,* and *tock∼talk* – that Paco pronounced the same in both contexts, and also judged the same. Another, *nod∼gnawed,* followed Roberto's pattern by being initially read differently, then the same when focused. But the two remaining pairs – *cot∼caught* and *knotty∼naughty* – went the other way. Paco pronounced them the same in context, then differently as overt minimal pairs. In the case of *knotty∼naughty,* he judged them to be different, but he still judged *cot∼caught* the same, despite his overt production.

So of the three brothers Patrick, the oldest is the most distinct, the middle one is intermediate, and the youngest is the most merged. This makes sense if we suppose that the Patricks' learning of the distinction, from peers, proceeds gradually; the older the child, the more time he has had to depart from the merged pattern of his parents. Another factor could be that the distinction is weakening in Warwick, and so the model offered by Paco's peer group may be less distinct than that of his older brothers' classmates.

Table 5.4 shows the average formant values and word class differences for Mike, Clara, and Juan Patrick, based on their productions of the overt and covert minimal pairs. Since Roberto and Paco's reading card performances were not representative of their speech as a whole, they have not been included.

	F1, F2 MEASUREMENTS (HZ)					
SPEAKER	COVERT PAIRS			OVERT PAIRS		
	mean /o/	mean /oh/	Δ/o/ – /oh/	mean /o/	mean /oh/	Δ/o/ – /oh/
<u>*Mike*</u>	683, 1102	633, 1072	+50, *+30*	656, 1090	644, 1018	*+12,* +72
Clara	793, 1328	740, 1194	*+53, +134*	805, 1164	792, 1211	*+13, −47*
Juan	825, 1438	741, 1288	+84, +150	872, 1333	775, 1187	+97, +146

Table 5.4: The (partial) Patrick family: summary of reading card productions

5.7 Results on three levels

5.7.1 Change on the individual level

From the children interviewed in the family study, the following generalizations have emerged regarding the trends and possibilities in individuals' phonological development. They have been observed regarding the low back vowels, but presumably would apply to other vowel oppositions as well, and perhaps even more generally.

5.7.1.1 Initial acquisition of vowel systems from parents

First, by quite an early age – sometimes as young as three – children fully acquire the low back vowel system of their parents, whether merged or distinct. Children probably learn this low back vowel pattern at the same time as other aspects of their initial phonology.[47]

5.7.1.2 Reorganization of vowel systems from peers

Second, as soon as children associate with other children their own age – as opposed to their siblings – they reorganize their low back vowel system in the direction of their peers' system, if it is different from their parents'. When the family pattern is distinct and the

[47] There is some evidence of an asymmetry between learning the merger and the distinction. A probably-merged 3-year-old in Attleboro, not previously discussed, had a distinct mother and merged father. The family study results from Seekonk, as well as the school survey results, also suggest that most children with one merged parent behave similarly to those with two. In terms of production patterns, it seems likely that if either parent is merged, the child will develop the merged pattern from the outset.

peer group is merged, this reorganization can happen very quickly. Among the children studied, there were several between the ages of 4 and 6 who exhibited the merger quite unambiguously, despite having parents who maintained the distinction.

Only the Patrick family was a good example of the reverse situation, where parents were essentially merged, and the peer group was largely distinct. From the evidence there, it appears that the distinction can be learned by children, but not as quickly as the merger usually is. Unlike his 14-year-old brother Juan, 12-year-old Roberto Patrick still had a decidedly incompletely-acquired distinction, whereas the oldest child to have failed to acquire the merger from peers was 6-year-old Caleb Hayas.

Not only does a distinction seem to be slower to acquire than a merger, it also seems to require a more homogeneously distinct peer environment.[48] Four children of merged parentage in Seekonk, aged 11 and 12, maintained the merger, despite being above the age at which the distinction was preserved among the children of distinct parents. Probably both patterns are present in sufficient numbers in these children's peer groups, and this removes the pressure – or even the potential – to acquire the distinction. On the other hand, the Patrick children, living in Warwick, are more fully surrounded by distinct peers, and so they do show gradual acquisition of the distinction.

In the geographic study, there were several examples of subjects who had fully acquired the pattern of the place they had lived all their lives, despite parents from other dialect areas. So an 87-year-old man from Mendon MA, whose parents were from England (where /ah/ $\neq$ /o/ $\neq$ /oh), had fully merged /o/ and /oh/, and a 63-year-old woman from Attleboro, with parents from New York City and Connecticut, had not only merged /o/ and /oh/ but also fully separated /ah/ and /o/ (assuming her parents had MAIN rather than 3-D systems).[49]

[48]This parallels the observation that a child needs two distinct parents to acquire the distinction initially.

[49]There were two young adults in the geographic survey who maintained their parents ENE patterns despite living in historically-MAIN communities. This suggests that the peers' pattern is not always adopted, except it is unclear how solidly MAIN their peers actually were when they were growing up. So these cases may be just like the four Seekonk children discussed above; in fact, one of these two subjects was from Seekonk.

5.7.1.3 Change in vowel systems in later life: phonological

The third generalization to emerge from the family study is that after the initial childhood reorganization, around the time of beginning school, a person's vowel inventory is very unlikely to change, regardless of their exposure to other systems.

Several pieces of evidence support this view. The fact that in Seekonk a sharp age cutoff separates older and younger children, including siblings in the same family, means that children who have established a distinct system along with their peers do not abandon it because of contact with younger speakers, including their own younger siblings. This echoes the implicit finding in Herold (1990), where older, distinct speakers did not pick up their younger neighbors' merger, nor their own children's, even after decades (see §1.2).

And as long as a child has established the distinction in a peer group, other or later merged peers of their own age have a limited effect, at most. Esau Ventura (age 4, Seekonk) was able to pick up the merger from peers before even starting school – that is to say, very quickly. But Nora Lucas (age 6, Attleboro) had maintained, at least for a year, the distinction she had learned in pre-school and kindergarten in Connecticut. It appears that as children get older, their susceptibility to merger declines, approaching zero for adults.

The parents in the family study provide support for this point. In Attleboro, there were fourteen parents who had grown up in the MAIN dialect area. In South Attleboro and Seekonk, across the historical boundary, there were ten parents who had grown up in a low-back-merged dialect area. Out of these 24 parents, not one exhibited the vowel pattern of where they currently lived. Their low back vowel systems could all be predicted on the basis of where they had grown up.[50]

There was one father in Attleboro who, despite having grown up there, showed fairly strong evidence of the low back distinction, especially on the formal methods. The only

[50] The most extreme example of this stability was found in the geographic study (§4.6): a 73-year-old man who had moved from Warwick RI (MAIN) to Fairhaven MA (ENE) at the age of seven, and who maintained a pure MAIN pattern in spontaneous speech (though he had learned to separate /ah/ and /o/ in formal styles).

obvious source for this pattern was his wife, a Rhode Islander. But the overwhelming majority of 'mixed' married couples did not seem to have influenced each other at all.[51]

5.7.1.4 Change in vowel systems in later life: phonetic

It is important not to equate a lack of change in a speaker's gross vowel inventory – minimal pairs are still treated the same way, a phonetic distinction is still clearly audible in the case of originally-distinct speakers, and no distinction is audible for originally-merged speakers – with the total absence of phonetic change in the vowels of older speakers exposed to, or immersed in, a different system than the one of their initial peer group.

For one thing, we have already seen that the teenagers who maintain the low back distinction in Seekonk certainly do not widely separate the two word classes the way their parents do. Assuming that 14-year-old Daniel Peterson (§5.3.2.2) used to produce just as wide a distinction as his half-brother, 3-year-old Casey O'Connor (§5.3.2.4), when Daniel was Casey's age, it follows that his distinction must have narrowed under the influence of peers, some of whom may be merged.

The Seekonk example is complicated, because it involves more than individual change. But in general, there is an inherent methodological problem in trying to argue that distinct speakers' vowel systems, once established, do not change on a phonetic level. For an older speaker who clearly remains distinct, despite exposure to the merger, it is always possible that he or she used to be even more distinct, phonetically. It is almost never feasible to compare people who have moved with 'equivalent' speakers who never left their original dialect area, the only procedure that could definitively demonstrate or disprove the phonetic stability of the distinction over the lifetime.

However, when it comes to the opposite case, of merged speakers living in distinct

[51] Again, the senior citizens of the geographic study provided an extreme example of mutual non-influence: the 76-year-old man from Millville MA (MAIN) and 78-year-old woman from Uxbridge MA (ENE), who had been married for 55 years but maintained the systems of their childhood, without apparent accommodation.

areas, acoustic measurement of their vowels can reveal whether or not any separation has occurred. Even a small statisticallly-significant difference between /o/ and /oh/, for example, must indicate the effect of exposure to a dialect that distinguishes those classes.

The example of Mike Patrick (§5.6.2.1), the 48-year-old Warwick father who had grown up in Maine until starting college in Rhode Island, shows that long-term exposure to a distinct system in one's years of higher education, and later in one's workplace and community – though in this case, not one's spouse – can result in a small but regular separation forming between previously-merged word classes.

The distinction displayed by Mike Patrick (Figure 5.18) was not noticed in the course of the interview or initial impressionistic review, and is still only barely audible when you know it is there. This is mainly because it does not resemble the distinctions of even those fairly closely approximated speakers who actually grew up in the MAIN territory, such as April Koslowski (Figure 5.7) or indeed Mike's own son Juan (Figure 5.20).

For those young, approximated-but-distinct speakers, tokens of /o/ and /oh/ form two discrete groups, which partially overlap or at least abut each other closely. But for Mike Patrick, while there are regular small differences between individual /o/∼/oh/ pairs, the whole complex of tokens still forms one acoustic group.[52] Differences that are attributable to phonetic environment – for example, *tock* and *talk* are lower than *Don* and *Dawn* – are as large, or even larger, than the differences between the minimal pairs from each word class – *tock* is lower than *talk,* and *Don* lower than *Dawn,* but these differences are smaller.

The type of superimposed 'micro-distinction' produced by Mike Patrick is likely to have been acquired in a largely subconscious way. Although there was one minimal pair that he identified as "different", the ones he called "the same" showed similar acoustic differences. And although the issue is one that would require more careful investigation

[52]Impressionistically, there is also no audible *rounding* difference between /o/ and /oh/, of the kind that usually accompanies the native MAIN distinction. All Mike Patrick's tokens possessed something of the back, variably-rounded, variably-ingliding quality typical of a native ENE vowel system.

with a greater number of carefully-chosen word pairs – see Nycz (forthcoming) – there appears to be no effect of word frequency. The words *nod* and *gnawed* must be heard and used quite a bit less often than *Don* and *Dawn,* for example, yet a comparably-sized acoustic separation has occurred for both pairs.[53]

As noted in §5.7.1.3, there are 22 other parents in the family study who live on the opposite side of the historical dialect boundary from where they grew up. Not all of them also worked in that same 'foreign' dialect area, but those that did could be inspected acoustically to see if they had acquired a 'micro-distinction', either between /o/ and /oh/, among South Attleboro and Seekonk parents who had grown up in the ENE territory, or between /ah/ and /o/, among Attleboro parents who had grown up in the MAIN territory.

While it is noteworthy that small phonetic adjustments in the direction of a distinction can 'automatically' develop in adults, it is still not thought that they would play a large role in the evolution of dialects. For example, the Patrick children have a much better and more effective model of the distinction in their peers than in their marginally-distinct father Mike, and it is unlikely that the older sons' success in learning the distinction is due to their father providing an early model.

Another question is how stable the long-term accommodation shown by Mike Patrick would be, if he were placed again in a merged environment. In other words, has his vowel system shifted in a semi-permanent way, or is his native merged system still more fundamental, and thus likely to re-emerge in its totality given a merged environment?

A reasonable assumption, if Mike Patrick is not exceptional in slightly shifting away from total merger, is that speakers who originally possessed the distinction are even more likely to shift *towards* merger, if placed long-term in a merged environment. Their resulting

[53]Of course, as noted in §5.6.2.1, there is variability among the pair differences, and F1 differs more for the covert pairs while F2 differs more for the overt pairs. An investigation of Mike Patrick's low back vowels in spontaneous speech would provide a needed supplement to this data. However, without the tokens being paired, the identification of this type of tiny distinction would be much more difficult.

production pattern – a distinction that is imperceptibly smaller than it would otherwise have been – is not likely to be detected. Still, it would be very unexpected if adults did not match young children in showing a tendency to lose distinctions at least as easily as they can gain them (while remembering that children can do each of these things better than adults can).

5.7.2 Change on the dialect level

From the geographic study (Chapter 4), it was learned that the location of the dialect boundary separating ENE and MAIN low vowel systems did not change very much over the course of the twentieth century. In most places, senior citizens in their eighties and young adults in their twenties had the same phonological pattern, and a similar one phonetically.

For younger subjects, however, the geographic study began to reveal signs of change. In particular, a number of younger speakers were seen to be merging /ah/ and /oh/ in the ENE area, resulting in the three-way merger.[54] On the other side of the line, the /o/∼/oh/ merger was observed in the formerly-split communities of South Bellingham and Assonet, as well as in Barrington RI.[55]

However, these changes among young adults were hardly sufficient preparation for the degree of dialect change seen in the children of the family study. First, it became clear that around 1990, those children in South Attleboro MA who had initially acquired the low back distinction from their parents started to lose it as they entered school. The upshot of this sudden change is that today, native South Attleborians who are eighteen and younger have a three-way-merged (3-M) system.

Ten years later, around the year 2000, the same process occurred in Seekonk MA, as children from distinct family backgrounds began to merge the low back vowels as they developed their first peer groups. Again, the change happened quickly, but did not spread

[54]The children of Attleboro families showed that this 'low central' merger is still going on today.

[55]There were also the two young speakers – in Blackstone and Seekonk – who failed to adopt their communities' MAIN pattern, retaining the ENE system of their parents.

to older children (even older siblings), so that today – or in 2005, when the fieldwork was conducted – we may confidently predict that a native Seekonk speaker with distinct parents will also be distinct, if he or she is older than about 12, and merged if he or she is between 5 and 10. Children younger than that are expected to match their parents at first, but to acquire the merger along with their first group of peers.

In Cumberland RI, across the state line from South Attleboro and north of the Pawtucket-Providence urban area, the same change is visible, but it is less regular. The low back merger has definitely been in progress for several years (an 11-year-old is merged), but is not complete (a 5-year-old is distinct).

In Warwick RI, to the south of Providence, the low back merger is incipient at most. Two of the eight children with distinct parents had unclear patterns, but not ones that could be labeled merged. It is not possible to say for sure that the merger will spread to Warwick, but based on its location further from the historical dialect boundary, a delay with respect to the other communities studied would be understandable.

The dialect-level pattern, in that case, would resemble a slow spread of the merger from places like South Attleboro – which already shared a municipality with a merged area – to Seekonk and Cumberland, which bordered merged areas, and eventually to Warwick, which is not adjacent to any ENE community. The large unknown in the geographic picture is the status of Providence; is it resisting the merger, or participating as well in the changes seen in its suburbs?

Remember (see note 31) that one 8-year-old child living in Pawtucket (with two parents from Pawtucket) and attending school in Central Falls, displayed a clear low back merger. And the fortunate inclusion, in one of the Warwick family interviews, of a cousin who had come from a different part of central Rhode Island, is further evidence for the existence of the merger among young people in the state.

The farther from the edge of the historically-merged area the merger is now being found, the less sense it makes to attribute the change to direct contact with the merged area across the line. An account invoking contagious diffusion might work well enough for South Attleboro – although it does not explain why the merger should occur now, after decades of stability – but it is less able to explain the appearance of the merger in Coventry RI, where the Mahoneys' cousin Robin lived until recently.[56]

Noting further that the school survey results for a fourth grade class in Jersey City NJ (§3.6.4.3) were fairly indicative of the low back merger, and that one young woman encountered during the geographic study – a student at Wheaton College, in Norton MA – was fully merged despite having grown up in Manhattan, with New York City parents, it seems possible that the low back distinction is receding or endangered almost everywhere in the Mid-Atlantic dialect area.[57]

5.7.3 Change on the community level

While there are certainly many unanswered questions regarding how individuals reorganize the phonology and/or phonetics of their low vowels during their lifetimes, and also a great degree of ignorance regarding how changes spread through dialect areas and sometimes from one dialect area to another, a third and equally interesting question applies on the level of the speech community itself.

In Seekonk, which is the clearest example of community change uncovered in this work, children entered school and maintained their 'inherited' low back distinction for most of a century. Then, over the course of just a few years around the year 2000, a change occurred, so that all Seekonk children now merge their back vowels upon entering school, if they

[56] If the merger had spread gradually into Rhode Island, there would be no problem, because the line would have been shifting and diffusion progressing ahead of it. But this would require the merger to have spread to central Rhode Island in the same time – ten years – that it took to spread from South Attleboro to Seekonk.

[57] The 11th graders from Queens who completed the school survey also showed some progress of the low back merger, compared to Brooklyn students who maintained the distinction more strongly; see §3.6.3.6.

were not already merged beforehand.[58] The following is a hypothesis for how this change occurred, one that supposes that a demographic shift in the community led to the merger.[59]

The proposal imagines three stages. In the first stage, the number of merged parents in the community is small, and therefore the proportion of children entering the peer group who have inherited the low back merger from their parents is also small – less than a certain threshold, which we will call X (because the numerical value is unknown and perhaps indeterminate). In this environment, the natively-merged children will begin to acquire the distinction from their peers, while the relatively large number of natively-distinct children will be mainly unaffected by the minority merged group.

This first stage, which we imagine took place until some years ago in Seekonk, is what is found today in Warwick. In a more extreme version, it is also the situation of the Canadian children who had moved to England in Chambers (1992). There, the merged Canadian children would have found themselves almost completely surrounded by speakers with the distinction, and therefore they could acquire it, assuming they were young enough.[60]

The second stage of the shift occurs when a greater number of merged parents have moved to the community, and therefore the proportion of natively-merged children entering the peer group is greater than the above threshold X, but not as high as another threshold, which will be called Y. In this scenario, children who enter school with the merger will encounter enough merged peers to be able to retain it. On the other hand, the distinction

[58] This oversimplifies the matter by ignoring that phonetic approximation occurred in Seekonk before sudden total merger. The relationship between the two processes is not currently clear.

[59] Alternative accounts, whereby the change spreads through *contagious diffusion* or *hierarchical diffusion,* were discussed in §4.6. These mechanisms were largely dismissed on two types of grounds. First, it did not seem possible that young children, the leaders of merger, could be reached by such contact-driven processes, since they have few contacts beyond their home communities. Second, it seemed that even if they could participate in such diffusion, there would then be no explanation for why the mergers occurred when they did. For example, South Attleboro has always been located right next to Attleboro; why did the low back merger suddenly spread to South Attleboro in 1990, rather than in 1960 or 1930, or not until 2020?

[60] In Chambers' study, the oldest child who showed substantial progress in learning the distinct was 11 when he moved – not that young by the standards of the family study. The youngest child who did not show progress was 10 years old when he moved.

is still prevalent enough – probably still a majority – that natively-distinct children will maintain the distinction as they grow older, though perhaps approximating somewhat.

This second stage corresponds to the 'agree to disagree' behavior observed in Seekonk children over the age of 10, where the children of merged parents – actually, of only one merged parent – were probably or definitely merged themselves, whilethe children of two distinct parents were probably or definitely distinct.[61]

The third stage of the demographic shift is when the proportion of merged parents in the community exceeds the second unknown threshold, Y. At this point, although children of distinct parents may not be in a numerical minority, they come into contact with enough natively-merged children in their peer group that they lose the distinction they inherited from their parents, upon entering school. And needless to say, those children who brought the merger from their early family background will retain it as well.

Assuming this schema is valid, South Attleboro would have reached the third stage around 1990, and Seekonk would have done so around 2000. Since then, all children in those communities have acquired the low back merger, either directly from their parents, or from the consensus of their peers. We can also suppose that this is what happened in Tamaqua PA around 1920, when the children of merged foreign coal miners linguistically overwhelmed the distinction preserved among the children of native American parents.

Of course, in South Attleboro and Seekonk, recently, there has been no demographic 'catastrophe' of the type that affected the anthracite coal-mining areas of northeastern Pennsylvania.[62] There, foreign immigration triggered the merger, but in the southeastern New England geographic study area, the children of foreign immigrants – lesser in number,

[61]The pattern observed in Cumberland was somewhat different. There, only some of the children of distinct parents adopted the merger, presumably learning it from peers. Although all of these children attended the same school, it is tempting to imagine there being several peer groups within that school, each adopting a different low vowel pattern. In Seekonk, by contrast, the three elementary schools agreed in adopting the merger contemporaneously. Before this point in time, phonetic approximation occurred, but not merger.

[62]Nor has there been amount of in-migration – 400% population growth over 25 years – that accompanied the merger in Roswell GA (Anderson 2005).

to be sure – have mostly learned the local vowel systems accurately.[63]

The demographic shift affecting places like Seekonk is not an overwhelming amount of foreign immigration. It is rather thought to be native English-speaking migration, whether of parents-to-be or young children themselves, from the ENE area closer to Boston, into the MAIN area. As it increases in magnitude, this migration causes the target communities to pass through the three stages outlined above, eventually merging /o/ and /oh/. It is therefore a type of *relocation diffusion*.[64]

This relocation is not just hypothetical. Many subjects in the family and geographic studies pointed out that their communities had changed in recent years with the construction of new neighborhoods and housing subdivisions. And the families who occupied this new housing were often described as having moved there from closer to Boston, as real-estate prices rose in the suburbs closer to the city.

Although none of the families interviewed were of this type, where both parents had moved from Greater Boston, about 10% of the young adults in the geographic study were.[65] Most of these subjects' parents had moved further away from Boston (e.g. to Foxborough or Taunton), but still remained within the ENE dialect area. Only in cases where parents or families moved across the historical boundary, into the MAIN territory (e.g. to Blackstone or Seekonk), could the migration trigger community change in the low vowels.

If this 'migration hypothesis' is correct, it has a chance of explaining why the merger occurred when it did, in the communities where it has recently happened. Again, South

[63]The most common language background of foreign parents in the study area was Portuguese. The fact that standard European Portuguese possesses a contrast between /a/ and /ɔ/ might be thought to facilitate learning of the MAIN pattern. However, most of the Portuguese immigrants to New England are actually from the Azores Islands, where Silva (2005: 3) reports the most local version of the low vowel system to be /æ/ $\neq$ /ɑ$\sim$ɔ/ $\neq$ /o/, which seems more compatible with the low back merger in English.

[64]But as noted in §4.6, migration from ENE to MAIN could not cause the /ah/$\sim$/o/ merger observed sporadically and increasingly in the ENE territory. Migration in the reverse direction could, but outside of Attleboro, it was rarely attested. However, Census data (see §5.8.6.2) shows that it is not insignificant.

[65]While a few of the senior citizens had one parent who came from Greater Boston, none had both parents who had moved from there.

Attleboro, on the edge of the MAIN territory, has always been adjacent to (and shared a high school with) Attleboro, an ENE community. But migration from Greater Boston is *not* something that has been constant over the decades, although its roots certainly go back very far – indeed, many communities in the northern part of the study area were originally settled as offshoots of Boston-area settlements.

When the senior citizens of the geographic study were growing up, Boston was a rather far-off place. That people from Greater Boston are now settling as far out from the city as South Attleboro is not only the result of real-estate necessity; it also reflects that distances of up to 50 miles are not as daunting as they once were. The study area is evolving from being a set of relatively self-sufficient communities into a network of far-flung suburbs (or exurbs), where people's homes, their workplaces, and their leisure activities are no longer typically confined to one community.

5.8 Testing the migration hypothesis

As noted, none of the Seekonk children interviewed had both parents who grew up in merged areas closer to Greater Boston; the 14 families were divided between five with one merged parent and nine with two distinct parents. Fortunately, the much larger number of responses to the school survey in Seekonk enables a wider comparison, indicating demographic trends over a period of eight years. First, we look at the parental backgrounds of native Seekonk students; then, in-migration of students themselves will be examined.

If there is a noticeable increase in the proportion of children from merged backgrounds between 12th grade, 8th grade, and 4th grade students, whether by their own migration or that of their parents, it would provide support for the hypothesis that increasing migration caused merger through its effect on the peer group, in this case converting it from stage two (agree to disagree) to stage three (merger for all).

5.8.1 Parents' migration into Seekonk

Of a total of 119 Seekonk 12th graders, 62 were considered Seekonk natives; they were either known to have attended kindergarten in Seekonk (in 1993), or likely did so, but omitted the information. Of these 62 natives, only three had both parents who had grown up in a merged area, which was Norton in the case of one parent, and Attleboro for the remainder.[66] There were nine more natives who had one distinct parent and one parent from a merged area: Attleboro (3), Dedham MA, New Bedford, Plainville, Cape Cod, Pittsburgh, and California. Of these, only Dedham is significantly closer to Greater Boston, where the hypothesis supposes that much of the migration is coming from.

So for the native Seekonk 12th graders, we can say that 5% (3/62) probably had two merged parents, and another 15% (9/62) had one merged parent. However, only one of the 124 parents (0.8%) was from the Greater Boston area. These percentages are small, but not insignificant. At this point, the Seekonk student speech community would probably find itself at stage one, where the overall amount of merger entering the peer group is low enough that even the children of merged parents can acquire the distinction.

Judging by the survey results for the twelve students in question, this is the case. Although their mean score of 3.8 items marked "different", out of 7 /o/∼/oh pairs, is much lower than the mean of 6.1 from the 40 natives with two distinct parents, some among the 12 did show good acquisition of the distinction. Four gave mainly-merged responses (0-2 items "different"), four gave intermediate responses (4 "different", 3 "same"), and four gave largely distinct responses (5-7 "different"). This last group included the student whose father was from Dedham, who gave a fully-distinct response (all 7 "different").

The 8th grade sample was much smaller; only 12 students, out of 24, met the native Seekonk criteria. Three of them had one merged parent.[67] While this 25% proportion is

[66] There is a chance that "Attleboro" meant S. Attleboro. Parents from there would not have been merged.

[67] One of these may have had two merged parents, as her mother was from North Attleborough, one of the only communities where adults' systems are not easily predictable.

a slight increase, the small sample size makes it statistically insignificant. None of these merged parents were from outside the study area. The survey results from the three students with a merged parent were 1, 4, and 4, averaging to 3.0, very much in line with the average of the students from distinct families, which was 3.2. This does not support the view according to which the students at this stage 'agreed to disagree', with merged-background students remaining merged and distinct-background speakers remaining distinct.

The youngest participants in the school survey in Seekonk were in 4th and 5th grades. Among this group of 80 students, there were 25 Seekonk natives.[68] Only one of these natives had both parents from a merged area: mother and father were from Canton MA, near Boston, an example of the migration most in question. There were also three students with one merged parent from within the study area, and four more with a probably merged parent (from Arizona, Vermont, Stoughton MA / Texas, and Holyoke MA / Boston).

But it is clear that a healthy majority of the native 4th and 5th graders still have two parents with the low back distinction. For these younger students, it is 60% (15 of 25), while for the 12th graders it was 65% (40 of 62). The percentage with two merged parents has actually gone down marginally, to 4%, while the percentage with one merged parent has gone up, to 28% (although some of these cases only involve a *possibly* merged parent).

Looking at the school study responses from the 4th and 5th graders, we see that those with two distinct parents averaged 2.7 items marked distinct (out of 7), while the students with merged parentage averaged 2.1. According to the scheme, we would say that this represents the beginnings of phase three, where students from whatever parental background are mostly merged, with little difference between the groups.

[68]The fact that half the 12th and 8th graders were native to Seekonk, while only just over 30% of the 4th and 5th graders were, is due to a large number of 4th grade surveys with missing information, resulting in an unknown origin for those students. If those surveys are ignored, the proportion of native students is approximately 50%, like the other grades. This flat trend may nevertheless signal an effective decrease in the proportion of native Seekonkers, because one would expect a higher number of natives in younger grades, reflecting fewer potential years of in-migration.

A certain amount of demographic shift has been observed, but not even of a magnitude great enough to say it is a real effect, given the small sample size for the younger students. The proportion of 12th grade students with any type of merged parentage is 19% (12 of 62), and that for the 4th and 5th grade is (generously) 32% (8 of 25); this increase is not statistically significant. There is also no real evidence here of an increase in the particular kind of immigration envisioned to be crucial to the 'migration hypothesis', namely migration from the Greater Boston area.

5.8.2 Students' migration into Seekonk

If we look at the number of students who have migrated to Seekonk from merged areas during their own lifetimes, as opposed to the movement of (prospective) parents tracked above, we observe a gradual increase in the younger years, although the levels are low.

Of the 118 total 12th grade students with known origins – of whom 62 were native to Seekonk, and were discussed above – only three (2.5%) indicated that they had moved from a merged area.[69] Of the 24 8th graders, just one (4%) was a merged in-migrant.[70]

For the 4th and 5th graders, the total number of students with known origins was 52, and three of them (6%) had come from a merged area.[71] This represents another slight increase, but certainly not a statistically-significant one.

However, the slight observed increase probably underestimates the real demographic trend. One would expect a 12th grade class to have a higher proportion of inmovers from any given area, compared to a 4th grade class, simply because the students are older and

[69] One had moved from North Attleboro after the 4th grade, one from Maine after 9th grade (though she had previously lived in several places in eastern Massachusetts), and one from Norton after 1st grade, leaving again for Rehoboth after 4th grade and returning during 10th grade. They scored 0, 2, and 2 on the school survey; that is, none has showed much learning of the distinction predominant among their current peers.

[70] This student moved after elementary school from western Pennsylvania, and scored a 1 on the survey.

[71] Two had moved from within the study area: one from Norton after 3rd grade, one from Wrentham after 4th grade. The other student had moved from East Bridgewater, somewhat closer to Boston, after 3rd grade. All three of these students gave a fully-merged response on the survey.

have had more years in which to move. So the change from 2.5% merged in-migrants (12th grade) to 6% merged in-migrants (4th & 5th grade) probably actually understates the degree to which this type of migration is increasing. However, the raw numbers regarding in-migration from merged areas are undeniably small, even after the increase. The increase in students of merged parentage was not that dramatic, either, in absolute terms.

So if the migration hypothesis is correct – though it would be premature to conclude that it is – and these types of migration ultimately trigger the merger, then peer groups must be sensitive to relatively small increases in the proportion of merged children who form them. No demographic landslide is necessary for a community to shift through the three stages proposed between distinction and merger.

5.8.3 Testing the migration hypothesis in South Attleboro

According to the hypothesis outlined in these sections, the speech community made up of the children of South Attleboro would have gone through the same stages of 1) distinction (even with merged background), 2) agree to disagree (stay as you are), and 3) merger (even with distinct background), approximately ten years before Seekonk did. If the second threshold, Y, of pre-school-aged children with a merged background was reached around the year 2000 in Seekonk, then the same thing would have happened around 1990 in South Attleboro. If this was indeed the case, we would expect to see, by now, an even higher level of merged-origin students in South Attleboro, measured both by parental origins and in-migration from merged areas.

5.8.3.1 Students' migration into South Attleboro

The simplest age cohort for evaluating these measures is the fourth-grade class at Hill-Roberts Elementary in South Attleboro, from which there was a total of 87 responses. 21 of these contained enough missing information that the student's original provenance was unclear, leaving 66 students with known origins. 46 (70%) were (South) Attleboro natives, and six (9%) had moved from merged communities, which is a higher percentage of merged in-movers than any seen in Seekonk.[72]

Coelho Middle School draws from South Attleboro and another small area of the city. There were 137 total responses from the 8th grade there, and for 111 of these the origin of the student was clear. 86 (77%) were (South) Attleboro natives, and 7 (6%) were merged in-movers. Again, since the number of in-movers should logically be higher for older children given a constant rate of in-migration, the fact that the rate is actually lower for the 8th grade suggests a real increase in the in-migration rate for the younger age group.[73]

Since South Attleboro attends the same high school as the rest of the city, I looked at all 12th grade surveys where the student had gone to at least 8th grade at Coelho. There are 85 such students, 80 with known origins. Of the 80, 63 (79%) were (South) Attleboro natives, and only four (5%) were movers from merged areas.[74]

This comparison shows that for each of the grade levels, a higher proportion of students had moved from a merged community to South Attleboro, than to Seekonk. Also, in-migration from Greater Boston seems to have affected South Attleboro more than Seekonk. And furthermore, in both communities, there is evidence, some of it indirect, of an increase over time in the amount of these kinds of in-migration.

Moreover, the highest value of merged in-migration for Seekonk (6% for the youngest grades) is roughly equal to the lowest for South Attleboro (5% for the 12th grade). This corresponds to the approximate 10-year difference observed in the progress of the merger

[72]Of these six in-movers, three had previously lived in the Boston area, again a higher proportion than in Seekonk. Two of the others came from Foxborough, within the study area, and one came from Brockton, a large city nearby. Three had moved after kindergarten, the other three during elementary school.

[73]Three of these seven in-movers had come from the Boston area, in fact from the city of Boston itself. One had come from Maine, and the other three had moved from within the study area. These children moved to South Attleboro between the 3rd and 8th grades.

[74]One had moved from Fairhaven, within the study area, during 7th grade; one came from Brockton after 3rd grade; and two moved from the Boston area, after 3rd and 5th grades.

in the two communities in family interviews. The school survey scores are also comparable for the two groups: for students with both parents distinct, 3.38 for SK4, 3.79 for ABS12.

5.8.3.2 Parental migration into South Attleboro

Looking at the levels of parental in-migration, we recall that in Seekonk it rose from around 20% of students having any merged parentage in the 12th grade, to around 30% in the 4th and 5th grades. The migration hypothesis would be supported if the levels in South Attleboro were at least this high, and probably showing a continuation of this increase. If we can extrapolate that around 10 years earlier, they would have been similar to the Seekonk levels, we can say that the participation of children from merged backgrounds probably triggered the merger as it crossed the same thresholds in each place.

Of 57 South Attleboro natives in 12th grade – who had previously attended Coelho Middle School, and with known parental origin – there were 11 (19%) who had both parents from merged areas. Only one had parents from nearby, within the study area; six had both parents from the Boston area, and another four had one parent from the Boston area, a higher level of Greater Boston parentage than was seen in Seekonk at any grade level.

Sixteen more of these students (28%) had one parent from a known merged community, of which six were within Greater Boston. The combined proportion of students with any merged parentage is therefore 47% (27 of 57), which is higher than the highest level seen in Seekonk, exactly as the migration hypothesis would predict.[75]

At Coelho Middle School, there were 61 8th graders native to South Attleboro, with known parental origins. Four (7%) had both parents from merged areas: in three cases, Greater Boston for both parents, in the other, Boston and Scotland. Twelve students (20%)

[75] In fact, the level is even higher, because these calculations omit three students who listed a parent from "Massachusetts" (meaning probably merged but not certainly), three with parents from North Attleborough (possibly merged), and eleven with one or both parents from "Attleboro" (quite likely to be distinct South Attleboro, but unsure). These unclear cases comprise 30% of the native South Attleboro 12th graders.

had one merged parent. The combined level of merged parentage is 26% (16/61).[76]

Of the 4th graders at Hill-Roberts Elementary, 45 were native to South Attleboro; all had known parental origins. Seven (16%) had both parents from merged areas, with four having both parents from Greater Boston and another with one parent from there. Another nine students (20%) had one parent from a merged area, making the combined conservative total with some merged parentage 36% (16/45).[77]

These results for parental migration, like those for the migration of students themselves, support the migration hypothesis. The 12th grade in South Attleboro has a very large proportion of merged-origin parents, but then the level tapers off. Although this is puzzling, it does not imperil the hypothesis, because once merger is established within a peer group such as South Attleboro's, it would not reverse itself simply because the level of merged-origin students fell below the threshold level which caused it to occur.

The merged-origin numbers established for Seekonk were relatively generous, while those for South Attleboro were conservative. In particular, the former included parents from Attleboro while the latter did not. This is defensible because parents that South Attleboro children described as having grown up in "Attleboro" are more likely to be from South Attleboro, and hence distinct, whereas there is less bias among "Attleboro" parents who had moved to Seekonk. If the questionable cases are removed, the Seekonk numbers are much lower, and flatter – 12% for 12th grade, 17% for 8th grade, 16% for 4th grade. These levels seem low for triggering merger, but certainly are lower than the real ones.[78]

In fact, rather than being omissible, migration from Attleboro to Seekonk may have

[76]Again, this omits some students with one or two possibly-merged parents; in the 8th grade, 20 (33%).

[77]18 more of the 4th graders (40%) had one or both parents who were possibly-merged, from "Attleboro", "Massachusetts", other underspecified places, or ones whose low vowel patterns were known to be unknown.

[78]Recalling that four or five of the 14 Seekonk families interviewed personally had one parent with the merger (29-36%), it is possible that the family study recruitment methodology over-sampled families with such backgrounds – perhaps a correlation existed between origin, socio-economic level, and general interest in participation. However, Figure 5.3 shows that all eight children over the age of 12 are from families with two distinct parents. This tends to support the idea that merged in-migration was lower in earlier years.

played a key role in reaching triggering levels of merged-origin students. In South Attleboro, in-migration of parents from Greater Boston seems to have been a major, and probably decisive, factor. However, for Seekonk, Greater Boston does not seem to be a large source of migration. Were it possible to have obtained demographic data for a sample of Seekonk first graders or kindergartners, among whom the merger has taken hold more thoroughly, the migration hypothesis could be better evaluated. Roughly speaking, though, it seems to be on the right track.

Table 5.5 summarizes the merged in-migration into South Attleboro and Seekonk.

GRADE	TOTAL	MERGED ORIGINS	NATIVES	MERGED PARENT(S)
SK12	118	3 (2.5%)	62	12 (19%)
SK8	24	1 (4.2%)	12	3 (25%)
SK4/5	52	3 (5.8%)	25	8 (32%)
ABS12	80	10 (13%)	57	27 (47%)
ABS8	111	7 (6.3%)	61	16 (26%)
ABS4	66	6 (9.1%)	45	16 (36%)

Table 5.5: Merged migration to Seekonk & S. Attleboro (known-origin school surveys)

5.8.4 Migration from distinct communities

Another useful comparison between South Attleboro and Seekonk, also drawing on the school survey demographics, is of the proportion of parents and children from *distinct* backgrounds. Both these communities, historically, have been very much tied to the city of Pawtucket, and have acted as suburbs of that city (and also East Providence, for Seekonk). Families moved across the state line as their economic situations improved.[79] However, the connection with Pawtucket seems to have been maintained more strongly, and for a longer time, in the case of Seekonk.

[79]Two anecdotal examples are the subject ABS62M (§4.4.2.1), whose parents moved to South Attleboro from Pawtucket, and the Koslowski family (§5.3.1), where the parents moved from Pawtucket to Seekonk.

And if children with merged backgrounds – through their parents' migration or their own – promote the low back merger, as the migration hypothesis states, it stands to reason that the low back *distinction* could be reinforced, and perpetuated, by children or their parents migrating from Pawtucket or other distinct communities.[80] A difference between Seekonk and South Attleboro on this score could help to explain the difference in when the two communities adopted the merger.

Using the same sub-sets of students as in the discussion above, the following breakdowns are obtained. For SK12 natives, 4 students (out of 62) have both parents from Pawtucket, 8 have two distinct parents from other Rhode Island communities, 9 have two parents from distinct Massachusetts communities (including Seekonk itself), and 19 have other combinations of two distinct parents. These categories add to 65% (40/62).

For SK8, one of the 12 natives had both parents from Pawtucket, 3 had both parents from Seekonk, and 2 had other combinations of distinct parents, a total of 50% (6/12). Of the 25 natives in SK4, none had two Pawtucket parents, two had other RI parents, three had two distinct MA parents, and ten had other combinations; the total is 60% (15/25).

We see no change in the overall majority of distinct-origin parents, nor is there an overall decline in parents from Rhode Island, which would be the locus of the strongest low back distinction, and perhaps the most likely to prop up Seekonk's own. The proportion of Rhode Island parents went from 41% (51/124) for the 12th grade, down (non-significantly) to 25% for the 8th grade (6/24), and back up to 40% for the 4th and 5th grade (20/50).

Moving to South Attleboro, in ABS12 there were 3 natives of 57 with two Pawtucket parents, one with two other Rhode Island parents, and four with other combinations of two distinct parents, totalling 14% (8/57). For ABS8, out of 61 natives, one had two Pawtucket parents, five had other Rhode Island parents, and seven had other combinations of distinct

[80]Here, I am imagining in-migrants with a phonetically more robust distinction influencing natives who are more approximated, but still distinct. Their influence on anyone who already had the merger would be more limited.

parents, a total of 21% (13/61). For ABS4, the 45 natives included one with Pawtucket parents, two with distinct Massachusetts parents (including South Attleboro), and four with other distinct parents, for a total of 16% (7/45).

We see that the South Attleboro level of distinct parentage is much lower than that of Seekonk, being only around one-fourth as high. Total Rhode Island parentage presents less of a contrast between towns, but the South Attleboro level is still only half as high as that of Seekonk: 15% for ABS12 (17/114), 22% for ABS8 (27/122), and 21% for ABS4 (19/90).

Although the lower levels of children with distinct backgrounds in South Attleboro is consistent with the fact that the merger occurred earlier there, the steady nature of these levels does not help support the migration hypothesis. While the proportion certainly seems low enough in South Attleboro to facilitate merger, there is no decrease in the proportion of distinct-background children in Seekonk during the time when the merger took hold there.

Examining the cases where students themselves moved from distinct areas reveals quite a similar pattern. In SK12, 38% (45/118) of all students with known origins had moved at some point from another distinct community. Of these 45 movers, six had come from Pawtucket, but the most common point of origin was East Providence, a Rhode Island city that is adjacent to another part of Seekonk (which has a long, slender shape). Almost half of the distinct in-movers (22/45) had come from East Providence.

In SK8, the same high percentage of students had started their schooling in a different distinct community: 38% (9/24). Of these, one had come from Pawtucket and two from East Providence. In SK4, the percentage was lower: 38% (20/52), with five coming from Pawtucket and eight from East Providence.

The trend is exactly flat, although it should be remembered that we expect something of a decline for the younger grades, who have had fewer years in which to migrate. Therefore, the steady numbers may actually reflect an increase in migration from distinct areas.

South Attleboro already showed a much lower level of parents from distinct communities than Seekonk, and it also shows a much lower level of students who themselves moved from such communities – along with their parents, of course. For ABS12, 13% of students with known origins (10/80) had such backgrounds. Six of the ten had come from Pawtucket. For ABS8, the rate was very low, only 5% (6/111), with three from Pawtucket. For ABS4, the proportion was 12% (8/66), again with around half – five – of the in-migrants coming from Pawtucket, next door. Given the expectation of lower rates for younger grades, this reflects a constant or rising low level of in-migration from distinct communities.

Table 5.6 summarizes the Seekonk and South Attleboro data for distinct in-migration.

GRADE	TOTAL	DISTINCT ORIGINS	NATIVES	DISTINCT PARENTS
SK12	118	45 (38%)	62	40 (65%)
SK8	24	9 (38%)	12	6 (50%)
SK4/5	52	20 (38%)	25	15 (60%)
ABS12	80	10 (13%)	57	8 (14%)
ABS8	111	6 (5%)	61	13 (21%)
ABS4	66	8 (12%)	45	7 (16%)

Table 5.6: Distinct migration to Seekonk & S. Attleboro (known-origin school surveys)

5.8.5 Summary of migration data derived from school survey

In the above subsections, the amount of in-migration into Seekonk and South Attleboro was evaluated on two intersecting dimensions. Migration from both merged and distinct dialect areas was evaluated; the former was imagined as triggering merger, the latter as possibly retarding it. For each type, the migration of children themselves was tabulated, along with the migration of the parents of children who have always lived in the target communities.

In general, parental migration should be more important, as native children of migrant parents form part of the peer group from the earliest age, whereas the effect of children who arrive in later years must be more limited. For merged in-migration, the summary measurement has been the proportion of children with one or both parents from a merged area, while for distinct in-migration it has been only the proportion with *both* parents from distinct areas. This is because children of mixed parentage have been observed to pattern more like the children of two merged parents than of two distinct parents (see §5.3).[81]

Unlike above, where the levels of parental migration were calculated as a proportion of *native* children (i.e. those who had always lived in the community in question), in the following summary the values will be calculated out of the total number of students with known origins (i.e. with completely filled-out survey responses). This allows an easier comparison with the values for student migration, which use the same denominator.

In Seekonk, all three grade levels had a low, rising level of migration from merged areas, and a much higher, constant level from distinct areas.

The level of merged parental in-migration (one or both parents) went from 10% (SK12) to 13% (SK8) to 15% (SK4). Merged student in-migration paralleled this at a low level: 2.5% (SK12) to 4% (SK8) to 6% (SK4).[82] If the migration hypothesis is correct, then this fairly modest increase – taken together, the two types of migration increase from 12.5% to 21% over the eight years – results in a large difference in the effect of merged children on the remainder of the peer group.

The level of distinct parental in-migration (both parents) stayed essentially flat, going from 34% (SK12) to 25% (SK8) to 29% (SK4). Distinct student in-migration was also high and flat: 38% for SK12, SK8, and SK4. The high, relatively constant proportion of distinct children entering the peer group did not prevent the merger developing during this period.

In South Attleboro, all the levels of distinct in-migration were much lower than they were in Seekonk, and falling. The levels of merged in-migration were higher, and student migration rose over time, while parental migration showed a falling-off.

[81] This conflation is debatable, however. The school survey analysis showed conclusively that each parent has an independent effect.

[82] These two measures differ in that we *expect* a decrease simply because younger children have had fewer years in which to move.

The level of merged parental in-migration went from 34% (ABS12) to 14% (ABS8) to 24% (ABS4), while merged student in-migration went from 13% (ABS12) to 6% (ABS8) to 9% (ABS4).[83] The parental level for ABS12 is unusually high, and this may be interpreted two ways. Either such a high level is exactly what triggered the merger around that time, and the later drop-off is inconsequential since the merger had already occurred, or all these levels are sufficient for merger, and the exceptionally high ABS12 level was merely overkill. The second interpretation fits better with the Seekonk data, since substantial merger did occur in SK4, which is at the same level as ABS8, and nowhere near ABS12.

Distinct parental in-migration went from 10% (ABS12) to 12% (ABS8) to 11%, a steady low level also found for student migration: 13% (ABS12), 5% (ABS8), 12% (ABS4).

Table 5.7 summarizes the data on parental and student migration from both directions, with both types calculated out of the total number of students of known origins.

		MERGED					DISTINCT				
GRADE	TOTAL	ORIGINS		PARENT(S)		O+P	ORIGINS		PARENTS		O+P
SK12	118	3	(2.5%)	12	(10%)	13%	45	(38%)	40	(34%)	72%
SK8	24	1	(4.2%)	3	(13%)	17%	9	(38%)	6	(25%)	63%
SK4/5	52	3	(5.8%)	8	(15%)	21%	20	(38%)	15	(29%)	67%
ABS12	80	10	(13%)	27	(34%)	46%	10	(13%)	8	(10%)	23%
ABS8	111	7	(6.3%)	16	(14%)	21%	6	(5.4%)	13	(12%)	17%
ABS4	66	6	(9.1%)	16	(24%)	33%	8	(12%)	7	(11%)	23%

Table 5.7: Migration to Seekonk and South Attleboro (known-origin school surveys)

The proportion of merged vs. distinct migration makes it seem reasonable that South Attleboro became a merged community. It is more surprising that Seekonk is undergoing merger 10 years later – with SK4 in the middle of the change – given its continued high levels of distinct migration and levels of merged migration that are not exactly high.[84]

[83] As in Seekonk, these numbers understate the rise, by not factoring out the expected decrease.

[84] Another way of putting it is that based on the migration data, one might have expected a *greater* separation between the times at which the merger affected the two communities.

The consideration of social factors complicates the evaluation of the migration hypothesis, which has been treated as an automatic, almost mechanical process. For example, it is entirely plausible that children from merged backgrounds might enjoy a different status – for several possible reasons – in one community than in another, and therefore be more or less likely to be emulated by locals. The data does not allow us to explore such questions.

We can say that while the data does not strongly confirm the migration hypothesis, it is at least consistent with it. Seekonk shows an increasing level of merged in-migration in parallel with the observed increase in merger among the majority distinct-origin children there. And South Attleboro shows a higher level of merged in-migration and a lower level of distinct in-migration, both in line with it having succumbed to the merger earlier.

5.8.6 Migration and journey-to-work data from the U.S. Census

5.8.6.1 Migration into historically-MAIN communities: Seekonk & South Attleboro

Data from the U.S. Census Bureau enables an independent estimate of the amount of in-migration. For both the 1990 Census (Census 1995) and the 2000 Census (Census 2003a), we can total the number of people aged 5 or older who moved in the previous five years – that is, during the periods 1985-1990 and 1995-2000 – to Seekonk and South Attleboro, from known merged areas of Eastern Massachusetts, Maine and New Hampshire.[85]

Since the data is tabulated for each minor civil division (city or town), the calculation is simpler for Seekonk. There, an estimated 393 people moved between 1995 and 2000 from the above-described merged areas. Out of a total 2000 population (age 5 and over) of 12674, this gives an in-migration rate of 3.1%.[86] If we were to exclude migration from

[85]Of course, not all of these migrants will have grown up in those places, with the merger, but a fair number will have done so, and the error would be largely balanced between the two target communities.

[86]It makes sense that this number is lower than any of those estimated from the school survey. Some students, and especially their parents, could have moved longer than five years ago. And perhaps more importantly, the entire population of a community, including older citizens, is almost certainly less mobile than are young couples, before and after having children.

Attleboro – only a mostly-merged community – the figure would drop to 2.0% (249/12674).

For the whole of Attleboro, the corresponding rate of in-migration from merged areas is much higher: 9.4% (3674 out of a 2000 Attleboro population of 39126). However, we must adjust this, because more northern parts of the city are likely to have more migration from merged areas than South Attleboro does. Referring to the school survey data can resolve this problem reasonably well.

Recall that for South Attleboro 12th graders, 4 of 80 (5%) had in-migrated from merged areas. For 12th graders from the entire city, 34 of 298 (11%) had done so. This yields an ABS12 'migration multiplier' of 0.44. For the 8th grade surveys, the discrepancy was not as wide; the South Attleboro rate was 6% (7/111) compared with a city-wide rate of 10% (39/396); the ABS8 multiplier is 0.64. And for the 4th grade, the South Attleboro rate of 9% (6/66) compared to a 16% (41/253) city-wide rate; the ABS4 multiplier is 0.56.

The change in the multipliers shows that merged in-migration into South Attleboro has recently been increasing faster than it has been for the city as a whole. This corresponds to the distribution of new subdivisions in the city, many of which are in South Attleboro. Still, averaging the multipliers gives the best estimate of the true rate of merged in-migration from 1995 to 2000. The average is 0.55, and multiplying this by the Census total for Attleboro gives a South Attleboro value of 4.7%. This is approximately twice the level for Seekonk, which is exactly in line with what the school survey data has already showed.

When the 1990 Census figures, for migration 1985-1990, are compared to the 2000 values, yielding an estimate of change over time, the result does not add support to the migration hypothesis. The rate of in-migration from merged areas into Seekonk during the earlier period was 4.8% (588/12252) if migration from Attleboro is included, and 4.0% (485/12252) if not. That is to say, the amount of merged in-migration, at least that coming from Eastern New England, significantly *decreased* over the ten-year interval, whether assessed in absolute terms or as a percentage of the population.[87]

For the whole city of Attleboro, the 1985-1990 rate of merged in-migration was 10.8% (3795/35056), which again corresponds to a decrease over time, although nowhere near as sharp a decline as the one in Seekonk. This drop-off may correspond to the one noted for parental in-migration in South Attleboro recently, according to the school survey data.

The 1990 migration files were stored electronically in a proprietary format that could not be read using the software provided. The figures had to be extracted 'manually', leaving a slight doubt whether they have been tabulated correctly here. Beyond that concern, we must remember that these Census figures refer to the entire population of a given place, and so they may not give an accurate sense of the amount of migration among the relevant sector of the population: young couples and their children.

Furthermore, assuming parental migration is the key issue, it is difficult to know how to match up age cohorts of children with the years of migration of their parents. Most parents who had moved from elsewhere were asked when they moved, but this information has not been incorporated here. A common-sense estimate is that a young couple might move to a new community and buy a home a few years after getting married, and a few years before having children. This would make most of the 1995-2000 in-migrants too young, probably, to have young schoolchildren in 2005, though not necessarily. The larger 1985-1990 group probably corresponds better to the young families interviewed.

We could prop up the migration hypothesis by suggesting that merged in-migration crested – triggering merger – and has since entered into a decline. It would be especially helpful to be able to compare migration levels going further back in time, but unfortunately there is no such Census data available earlier than 1990.

But parents could have moved long before actually becoming parents – indeed, even

[87]The 'significance' intended here is not the statistical sense, because these figures are not estimated from a sample. For most of the school survey data, the same point applies, since the 'sample' is most of the population. Because of the small number of surveys returned, SK8 and to a lesser extent SK4 are exceptions.

while they were children themselves – and still have conveyed merged input to their children in line with the migration hypothesis. So it is difficult to know how to interpret the data from only these two time periods. But certainly, a decline in merged in-migration parallelling an increase in merger does little to support the hypothesis of a causal link.

5.8.6.2 Migration into historically-ENE communities: Dartmouth and Berkley

In theory, the migration hypothesis could also be suited to explaining the /ah/∼/o/ merger observed sporadically in the New England territory, although there is less precise data on the regularity or timing of this change.[88] Movers with the MAIN system – often simply called 'distinct' – have merged /ah/ and /o/, and could influence others on this score.

Take the town of Dartmouth MA, historically ENE, but where a 16-year-old boy had the three-way merger. If we total the in-migration between 1995 and 2000 from the following MAIN-speaking regions – Rhode Island, Connecticut, western and parts of southeastern Massachusetts, New York, and New Jersey – we obtain a value of 7.1% of the over-5 population of Dartmouth (2066/29296). This value is higher than the level of ENE inmovers that are hypothesized to have triggered /o/∼/oh/ merger in South Attleboro and Seekonk, so it would logically be sufficient to trigger the /ah/∼/o/ merger in a place like Dartmouth. Note that fully half of the distinct migration to Dartmouth is from a single city, Fall River.

Dartmouth is a fairly cosmopolitan community, with both summer homes and a large campus of the University of Massachusetts, which may account for the high values of in-migration (the pattern of source communities suggested that students were being included). Another community was therefore selected which also had a young speaker (an 18-year-old woman) with the three-way merger, against the backdrop of a historically ENE pattern.

This community, Berkley MA, was one of the smallest towns in the geographic study area, and it retains a rural character. I had not expected it to have much distinct in-migration.

[88] In fact, it seems the low central merger has not occurred as regularly or suddenly as the low back merger.

But the actual value is not that low: 5.4% of the population (286/5300). Three-quarters of these movers came from Fall River, which is two towns away (as it also is from Dartmouth).

The Census data for distinct migration during the 1985-1990 period do reveal a marked increase over time for one of these communities. In Dartmouth, the earlier figure for distinct migration (from CT, parts of MA, NJ, NY, and RI) is 3.8% (989/25904), a third of it coming from Fall River. The level is just over half that for the 1995-2000 period; in other words, the rate almost doubled over ten years' time. Migration from Fall River tripled, and that from other distinct sources also increased significantly.

In Berkley, however, the figures indicate a moderate decrease in the rate of distinct in-migration over time. Between 1985 and 1990, 6.7% of Berkley's population (258/3840) moved from the distinct areas listed. Half of this migration was from a single source: Fall River. Between the 1990 and 2000 Census, the amount of in-migration from Fall River into Berkley almost doubled, while that from the other distinct states – listed above – fell. It was the overall population growth in the town, from natural increase and migration from other sources, that led to the percentage-wise decrease in distinct in-migration. The absolute number of distinct migrants actually increased slightly.

COMMUNITY	POPULATION[a]		MOVED FROM ENE[b]		MOVED FROM MAIN[c]	
	1990	2000	1985-1990	1995-2000	1985-1990	1995-2000
Attleboro	35056	39126	10.8%	9.4%	7.1%	7.0%
Seekonk	12252	12674	4.0%	2.0%	14.0%	10.9%
Berkley	3840	5300	23.3%	16.6%	6.7%	5.4%
Dartmouth	25904	29296	19.6%	14.1%	3.7%	7.0%

[a]Population 5 years old and over in Census year.
[b]Moved from ME, NH, E. Mass. (not AB, BK, DM, NA, or MAIN communities).
[c]Moved from RI, CT, NY, NJ, W. Mass., E. Mass. MAIN communities (not SK, FT).

Table 5.8: Migration from selected ENE and MAIN dialect areas into Attleboro, Seekonk, Berkley, and Dartmouth MA (1990 & 2000 Census migration data)

Overall, the data from the U.S. Census on migration between communities has led to more questions than answers. An investigation that did not simply lump all merged (or distinct) source areas together, but treated them independently, could be more revealing.

But the school survey data is thought to be quite an accurate source of demographic information in its own right, and it is a fairly exhaustive sample of the key population in question. It is not clear how to reconcile the disparities between it and the Census data, but I do not believe the latter substantially invalidates the conclusions drawn from the former.

5.8.6.3 Journey-to-work: commuting to different dialect areas

Another type of data collected by the Census, discussed above in §4.3.4, is that on "journey-to-work": commuting patterns, in other words (Census 1999, 2003b). While the argument being advanced here is that adult workers (16 and over) would experience little alteration to their own linguistic patterns by interacting with co-workers in other dialect areas, and more importantly that these changes would have little chance of percolating down to the young children who are leading the vowel mergers, it is still enlightening to observe how the same differences appear on this score as well, e.g. between South Attleboro and Seekonk.

As for migration, some approximations must be made in order to use the journey-to-work data. In this case, we can isolate South Attleboro fairly accurately, as Massachusetts Census Tract 6311. At this level of residence detail, however, the data on workplace is less precise. But it is reasonable to say that almost anyone in the study area whose commute took them out of state worked in a MAIN dialect area (Rhode Island or possibly Connecticut). Similarly, almost anyone who commuted to a different county in Massachusetts, other than their home county of Bristol County, would have worked in an ENE environment (since commuting to western Massachusetts was rare enough to be ignored).

For the four communities discussed in §5.8.6.1 and §5.8.6.2 – Seekonk, South Attleboro, Berkley, and Dartmouth – Table 5.9 shows the proportion of workers who commuted to MAIN territory (approximated as out-of-state) and to ENE territory (approximated as

Massachusetts counties other than Bristol), for both 1990 and 2000.

COMMUNITY	WORKERS[b]		WORKED IN ENE[c]		WORKED IN MAIN[d]	
	1990	2000	1990	2000	1990	2000
South Attleboro[a]	3559	4071	25.2%	27.4%	26.9%	21.3%
Seekonk	6784	6814	7.0%	10.5%	51.3%	49.0%
Berkley	2145	3106	33.2%	36.0%	3.7%	7.2%
Dartmouth	12535	14100	11.7%	12.8%	5.0%	5.7%

[a]Approximated as Census Tract 6311. [b]Workers 16 years old and older.
[c]Worked in Mass., outside of Bristol County. [d]Worked outside of Massachusetts.

Table 5.9: Proportion of workers in South Attleboro, Seekonk, Berkley, and Dartmouth MA who commuted to work in certain ENE and MAIN dialect areas (1990 & 2000 Census Journey-to-Work data)

Table 5.9 shows a small increase in each community, between 1990 and 2000, in the proportion of workers who commuted to the designated ENE areas (closer to Boston, in most cases). But this proportion was much larger for South Attleboro and Berkley than for Dartmouth and Seekonk. Even though Seekonk is adjacent to South Attleboro, only about a third as many workers traveled to other Massachusetts counties. Even more than the migration data, this shows South Attleboro's greater ties to other parts of Massachusetts, where the ENE system is dominant.

Looking at the proportion who commuted to other states (principally Rhode Island), we see a slight decrease between 1990 and 2000 in the two communities that actually abut Rhode Island: South Attleboro and Seekonk. There was a slight rise in this number in Berkley and Dartmouth, where the figures are much lower, which makes sense since those towns are further from the state line.

Between South Attleboro and Seekonk, we note the moderate number of South Attleboro workers who commuted to Rhode Island, and the very high number of Seekonk workers who did so. This echoes the migration data, where a much larger number of parents and students had moved from Rhode Island to Seekonk than to South Attleboro.

In the journey-to-work data, Seekonk clearly comes across as a suburb of the Providence urban area. Whatever forces brought the low back merger to young children in Seekonk did so against a backdrop of considerable ties to (distinct) Rhode Island.

5.8.7 Other hypotheses

While the migration hypothesis – whereby increasing numbers of children from merged backgrounds eventually cause sudden merger in a community – has partial demographic support, none of the increases observed have been very large. We can imagine that children, as they form peer groups, are very sensitive to the speech around them, and that there is a certain amount of merger that initially-distinct children can tolerate hearing. Above that threshold, they will reliably abandon their distinction. This account is almost mechanistic.

A refinement of the account, that makes it more sociolinguistically plausible, is that children not only attend to the patterns around them in their totality, but also pay attention to who produces which patterns. Incorporating social class into the account – which must be done speculatively, as such information was gathered erratically for the families, and not at all on the school survey – could improve the migration hypothesis. For example, the children of families who have moved from Greater Boston, especially those who have live in new homes in expensive subdivisions, may have greater prestige than the children of local families. A small number of such children could have a disproportionate influence on their peers, over and above the fact that the merger appears to be inherently more 'powerful' than the distinction in situations of contact.[89]

If more specific social factors, personality, and popularity play an important role, it

[89] In Payne's (1976) study in King of Prussia PA, a large proportion (45%) of the population was non-local, yet the dynamic described is of variable accommodation by the migrants, with the local Philadelphia dialect remaining intact. Although Payne does not discuss the low back vowels, about a third of her out-of-state families come from merged areas. Extrapolating from this, we can make a crude estimate that 15% of the King of Prussia population consisted of merged in-migrants, a figure comparable with the communities addressed in this chapter. However, no community-wide merger has been reported in King of Prussia, nor in other Philadelphia suburbs with a high rate of in-migration.

may be that the occurrence of sudden merger is not actually a predictable event of the type we have been assuming it is. Although the greater level of merged in-migration in South Attleboro seems a strong reason for why merger would have occurred earlier there than in Seekonk, this could be an illusion, if prestigious individuals can have major influence. Perhaps either event might not have occurred, or their order could equally well have been reversed, but happened not to be, for local reasons whose nature has hardly been probed.

However, the appearance of merger roughly simultaneously in the three elementary schools of Seekonk tends to suggest that larger-scale factors, including demographic ones, are primary. It may also be worth distinguishing between the demographic conditions necessary for merger to occur, and the events – or children – who actually trigger it in a specific circumstance (or peer group). The latter events may depend on such a constellation of circumstances as to make them largely unpredictable, even after the fact. But it would be more fair to admit that this territory simply remains unexplored.

As migration has still not been convincingly proved to be the only or principal cause of merger in these communities, a review of some alternative explanations is in order. One of these would emphasize the fact that the merger did not come out of nowhere in Seekonk (nor, presumably, in South Attleboro). Teenagers like Amber and April Koslowski and Daniel Peterson showed a phonetic approximation of the low back vowels that preceded their younger siblings' total merger. Instead of a model that takes each age cohort's peer group(s) as determining the nature of those individuals' future vowel systems, perhaps a model where older children in the community influence younger ones is more reasonable.

One problem with this possibility is that near-mergers – distinctions phonetically closer than the closest distinct speakers seen here – are known to be potentially stable over generations, so the question remains why the younger children would have lost the distinction here. In addition, focus on the older, approximated group of children reminds us that we have no clear understanding of why the approximation occurred, either. It could be a regular sound change from below the level of conscious awareness, it could be a conscious reaction against the lower-class, urban, 'Rhode Island' significance of an extreme distinction, or it could be a compromise due to contact with a small number of merged speakers.

An appealing account of any change that shows up first in one community, then later in a contiguous one, is that it has spread from one place to the other. However, the fact that the leaders of merger are children around the age of five presents great difficulty for any diffusion account. Children that young have few contacts in other communities (other than relatives), and if the contact was mediated by their parents or other adults, one would expect it to show up in the mediators too, at least to some degree.

This realization, more than anything else, motivates seeing these changes as primarily autochthonous, as things that develop in neighboring places because of common causes, not because of spread. While migration from the same dialect area seems the most promising of such causes, internal change would also fit the description.

Inside the study area, South Attleboro and Seekonk, as well as South Bellingham and Assonet, have all already undergone the merger, but it looks as though Rhode Island towns such as Barrington and Cumberland have begun the process, and that Pawtucket and Warwick may not be that far behind. In most of the geographic study area, young children were not interviewed at all, and seeing how quickly merger can occur, it is quite possible that it is actually widespread in many of the historically-MAIN communities studied, within that youngest age bracket.

But as already noted in the conclusion of §4.6, a lot depends on what might be going on outside the study area, for the interpretation of what is definitely happening in it. If there were evidence of the low back merger of /o/ and /oh/ among children in communities farther south and west, where in-migration from merged areas is less common – for example, southern Rhode Island (ENE migration into Washington County RI was only 1%, from

1995 to 2000), or urban New Jersey (ENE migration to Hudson County NJ was c. 0.3%)[90] – then any version of the migration hypothesis becomes less tenable.

The same logic would apply if the low central merger of /ah/ and /o/ were found to be occurring in parts of ENE where the in-migration of MAIN speakers – who already merge the two classes – is very low. One might think of places like 'downeast' eastern Maine (distinct migration into Washington County ME totaled 2.0% between 1995 and 2000), or northern New Hampshire (distinct in-migration into Coos County NH was 1.6%).

If the changes found in the study area were also occurring in places like these, the migration hypothesis would clearly not be a promising way to account for them. But appeals to language-internal change are unsatisfying, especially if the mergers are sudden as opposed to being the end-product of decades of gradual approximation.

Other external factors could be considered, however. These could include the influence of the mass media, although it is generally regarded to play a very minor role, if any, in linguistic changes of this type (CITE). Although watching television is a passive activity, I was reminded that more interactive media-related merged exposure does at least reach young children, in the home of a Warwick family.

While I spoke to one of the children in this family, another was playing an educational computer game. In the game, a song played, with its lyrics appearing on the screen, and the child's task was to identify all the words that rhymed. The software apparently had been programmed by people with the low back merger, since tokens of /o/ and /oh/ were intended to be selected as rhyming vowels. It seems plausible that participating in such tasks – and presumably many parallel examples in the culture of young children – could at least accelerate other tendencies toward merger that derive from real personal contacts.

[90] Hudson County contains Jersey City, where the school study found evidence of merger; see §3.6.4.3. Of course, merged speakers from other parts of the United States would have moved there too, as well as many foreign immigrants.

5.9 Summary

In §1.6, a framework was first introduced, of three overlapping theoretical 'levels' on which to understand merger, in southeastern New England in particular. The dialect level was already explored in the geographic study (Chapter 4), and the individual level was investigated in the school survey (Chapter 3). The family study, the results of which are presented in this chapter, primarily aimed to understand how merger operates at the community level. The ultimate question was what causes a speech community to merge two vowel classes that it previously distinguished. Related to this was the issue of why such community merger occurs when it does, often suddenly.

Sudden merger was observed to a limited extent in the geographic study and to a startling degree in the family study. 49 families with 106 children were interviewed, in Attleboro, South Attleboro, and Seekonk MA, and in Cumberland, Pawtucket, and Warwick RI. The study design is described in §5.1.

The children of Attleboro (§5.2) were already known to have the low back merger, and some of them were seen to now be merging /ah/ with /o = oh/. Because all adults from South Attleboro are distinct, the low back merger found among all children there was an unexpected development, one that appears to have occurred suddenly around 1990.

Children of distinct parents in Seekonk (§5.3) were divided by age between those over the age of 10, who preserved an /ah = o/ $\neq$ /oh/ system, and younger speakers, who had all lost this distinction (around the year 2000). Two Seekonk families were analyzed in detail. They showed that the merger could divide families linguistically, with parents and older siblings maintaining the distinction while younger siblings of school age were merged. But a three-year old, too young for peer group exposure, still produced his parents' distinction.

Cumberland, another community where adults are distinct, presented a somewhat similar picture (§5.5). The same trend from distinct to merged was observed within families, but it was not possible to draw a chronological line between the two groups of children, as it was in South Attleboro and Seekonk.

The city of Warwick (§5.6) was chosen to see if children growing up slightly deeper inside the MAIN territory were resisting the low back merger better. On the whole, they were, but signs of incipient merger were present, even there. An especially interesting family had both parents from merged areas, but their children were variably acquiring the distinction. Acoustic analysis revealed that their father had learned something of it, too.

On the individual level (§5.7.1), the following picture emerges. Children initially acquire their parents' low vowel systems, but are very susceptible to change when they form their first peer groups. This change usually happens very quickly, especially in the direction of merger, but as children age their systems become more fixed. Teenagers and adults, it seems, are not capable of truly changing their vowel inventories, but some phonetic changes can definitely occur, even in the direction of the distinction.[91]

On the dialect level (§5.7.2), we noted only that the low back merger appears to be spreading regularly from the border of the Rhode Island dialect area – where the MAIN system was predominant – to communities farther inside it. However, the speed of the apparent spread suggests that contagious diffusion may not be the best explanation. There is also no good evidence as of yet that the merger is not actually developing everywhere, near and far from the historical boundary.

On the community level (§5.7.3), a proposal was introduced for how a merger might take hold in a previously-distinct place. An elaboration of Herold's account, this 'migration hypothesis' suggests that the proportion of a community's children who are from merged backgrounds – those having merged parents, or having moved from a merged area – is key to the linguistic evolution of that community from distinction to merger. As that proportion rises, local distinct children go from imparting their distinction to the migrants,

[91] Indeed, it is only in the direction of the distinction that such changes are likely to be detected.

to just maintaining it, to suddenly losing it, when the amount of merger they are exposed to becomes too great.

Under the migration hypothesis, the spread of merger is not principally from place to adjacent place. Nor are the changes passed upward, and perhaps not downward either, through the age cohorts of a community; I am proposing that children learn first from their parents, then from their peers of similar age, and that demographic change can take the place of whatever usually causes incrementation (Labov 2007).[92] Because such mechanisms seem reasonable, rejecting them is a somewhat radical proposal, but it is supported by the evidence gathered in the family study.

The hypothesis was motivated by anecdotal evidence that migration was occurring across the historical dialect boundary. Few of the families interviewed were examples of this, but in §5.8, demographic data from the large-scale school survey was used to evaluate the backgrounds of children in the two communities where sudden merger was clearest.

The data on parental and student origins revealed a sharp difference between South Attleboro and Seekonk. The overall higher proportion of merged backgrounds and lower proportion of distinct backgrounds in South Attleboro would have been sufficient to explain the difference between the commuities, had Seekonk not undergone merger ten years later.

To explain why Seekonk children merged when they did, we would want to see an increasing rate of merged in-migration between older and younger cohorts. And such an

[92]In both space and apparent time, what looks like contagious diffusion is not necessarily contagious diffusion. As a spatial example, if one mapped the passage of a constitutional amendment like women's suffrage or Prohibition as it spread across the United States, one would see regional patterns, and cases of one state passing the amendment shortly before a neighboring state. But because each social movement had a long history within each state before passage, it would be ludicrous to interpret the evolving map as showing diffusion from one state to another. As a temporal example constructed as an allegory of the merger situation, imagine a city with a rising population of Mexican immigrant families. If we look at the native American children of different ages, we might well observe several stages in apparent time: the oldest group knows no Spanish, somewhat younger kids know a few words, and perhaps the youngest group can converse in Spanish, since so many of their classmates speak it. To explain this increase, it would not be logical to say that the American children are copying but increasing the Spanish-speaking abilities of their older siblings, etc., even though the resulting *pattern* is appropriate to such a mechanism. It is clear that the learning is coming from outside, from each cohort's degree of exposure to Spanish-speaking children.

increase was in fact observed, though the total proportion with merged backgrounds was still quite low (13% for 12th graders, 21% for 4th and 5th graders). South Attleboro's high rate did not get any higher (46% for 12th graders, 33% for 4th graders), which may cast doubt on it having been similar to Seekonk's only ten years previously.

In §5.8.6, U.S. Census data confirmed the higher rate of Eastern New England migration into South Attleboro as compared to Seekonk. However, it also showed a decrease for both communities in ENE in-migration between the 1985-1990 and 1995-2000 periods, especially for Seekonk. But the difficulty of correlating the time of parents' migration with the age of their children perhaps saves this data from being fatal to the migration hypothesis, along with the fact that the Census data includes all migrants, not just the relevant ones, namely parents and young children.[93]

Because the migration hypothesis could not be considered proved, other possibilities were considered (§5.8.7). None of the alternatives seemed as promising, except a refinement of the hypothesis to incorporate socially relevant factors. However, complicating the 'model' might lead to a recognition that merger in a community is not a fully predictable event. It was also noted that a fuller understanding of the geographic extent of the recent mergers could strike a blow against any migration hypothesis, if merger were occurring in areas far from the dialect boundary, where migration levels from across it are very low.

In the family study, the actual findings with respect to patterns of distinction and merger – particularly the curious interplay of stability and lability – may, at least so far, be more convincing and interesting in their own right than the hypotheses introduced to explain them. Unfortunately, it seems that further progress might only come from studying more children than here, in more places than here, in greater depth than here. But the family study as it was conducted has taught us much regarding how children's vowel systems

[93]The Census data also showed that there may be enough migration in the reverse direction, from MAIN areas into adjacent parts of ENE, to be responsible for the merger of /ah/ and /o = oh/ noted there.

develop and redevelop, and provided more than a hint of an explanation for where, when, and why communities change.

Chapter 6

Conclusions and Extensions

The conclusions of Chapters 1 through 5 are given in some detail at the end of each chapter. Here I will try to highlight the most important or surprising findings to come out of these studies, and briefly discuss their broader implications, including directions for future research. Some statements are worded more strongly than in the main text.

Chapter 1 reviewed the literature on vowel merger, raising some more general questions:

- When does a merger, or other change, spread across a dialect boundary, and when does it not do so, its extent instead matching that boundary, becoming part of it? Herzog invokes the concept of structural incompatibility between different linguistic changes, while Garde suggests that even linguistically unrelated mergers can be incompatible if too much homonymy is created by both of them applying.

- It seems as though dialect areas evolve in parallel, as the same innovations develop within older settlement regions. In the best-known cases, such as the Northern Cities Shift, it seems unlikely that contact between communities spreads these changes. But if not, why do children increment them in the same direction throughout the dialect area? I have been satisfied to raise this question, rather than attempt to answer it.

Chapter 1 looked at the history of the low vowels in England and New England, coming to one two-part conclusion. The first point seems clear; the second is only speculative:

- When settled, beginning in the 17th century, all parts of New England originally had the same phonological low vowel pattern. The /ah/ of *father* and *palmed,* the /o/ of *bother* and *pond,* and the /oh/ of *daughter* and *pawned* all had distinct vowels.

- Two main regions within New England differed with respect to the phonetics of these vowels, especially /o/. In eastern New England – including eastern Massachusetts and the former Plymouth Colony – /o/ was closer to /oh/, and after c. 250 years, merged with it. In western New England – including Rhode Island – /o/ was closer to /ah/, and they also eventually merged around 1900. Within each region, these mergers developed in parallel: change was triggered internally, not by diffusion.

Chapter 3 performed regression analysis on survey data collected from a large number of schoolchildren, comparing the size of different influences on a child's low vowel system. Some place-specific conclusions were reached; the following were more general:

- Children's judgments of how word pairs (should) sound are sensitively governed by both recent and distant exposure to merged and distinct patterns.

- Peers have the largest effect, but parents have a lasting effect as well, one that is still visible in how 17-year-olds filled out the questionnaire.

- Mothers influence their daughters slightly more than their sons, and fathers, whose effect is less overall, influence their daughters much less than their sons.

- The effect of early distinct peers is also persistent, though most children who move to merged areas show acquisition of the merger.

- Factors favoring merger are not additive; they interact to reduce each other's effects.

- Children younger than high-school age respond more accurately to minimal pairs (same or different) than to near-minimal pairs (rhyme or don't rhyme).

- Is it true that younger children generally learn second dialects better than older children, but exceptions exist on both sides. There are no absolute rules regarding the acquisition or non-acquisition of mergers in various situations of exposure.

- The minimal pairs *cot*∼*caught* and *tot*∼*taught* were the ones most often marked distinct in distinct dialect areas *and* the most often marked merged in merged areas.

- With a large sample, consistent, intricate patterns can emerge from crude, noisy data.

Chapter 4 reported the results from interviews with senior citizens and young adults in a 40-community study area straddling the Massachusetts-Rhode Island border. The results showed that:

- Almost all senior citizens clearly had one of two systems: /ah/ $\neq$ /o $=$ oh/ (ENE) or /ah $=$ o/ $\neq$ /oh/ (MAIN). A few showed the older three-way distinction (3-D).

- The study targeted lifelong residents of a community, but others who were encountered showed evidence of having retaining their childhood systems for many decades.

- A sharp geographic boundary existed between the ENE and MAIN groups of seniors. The boundary generally matched what is known of settlement patterns (even though settlement occurred when no ENE or MAIN system likely existed yet).

- The clearest exception to the match can be explained as the influence of a growing industrial city (Woonsocket RI) on its hinterland (Blackstone, Millville, and South Bellingham MA). This influence would have come in the early 19th century. Since the phonological patterns were probably still 3-D at this point, the boundary could shift without it requiring reversal of a merger.

- Since the twentieth century, the boundary, consisting of two *complementary* mergers facing each other, could not shift without the reversal of one of them. It could only disintegrate, by all three word classes merging.

- This was partially observed among the young adults. Most young adults were also clearly either ENE or MAIN. Some, especially the youngest (teenagers), were unclear or transitional, and some clearly showed a new pattern where all three word classes were merged (3-M).

Chapter 5 explored the transition from MAIN to 3-M as it affected children, mainly in South Attleboro and Seekonk MA:

- Evidence for sudden merger was observed in both places.

- In South Attleboro, the merger occurred ten years earlier than in Seekonk.

- Merger occurred across each community at the same time, although Seekonk has three elementary schools in geographically rather distant parts of the town.

- Phonetic approximation preceded the merger in apparent time, but there were clearly two stages: gradual approximation, followed by sudden expansion.

- Two families had older children who were distinct, like their parents, and a younger child who was totally merged. This demonstrates its acquisition from peers, as well as its non-contagion from younger to older children.

- In one of these families the youngest child, a three-year-old boy, had a clear distinction, like his parents (and his 14-year-old brother; his 8-year old sister was merged).

- In other families, children as young as 4 and 5 had a clear merger, unlike their parents.

- Taken together, it appears that children speak like their parents until they first develop a peer group, at which point they can learn a new merger very quickly. (In Warwick RI, it was seen that children can also learn a distinction from their peers, but that the process takes considerably longer.)

- After this point – age 5 or 6 – the underlying phonological low vowel system is unlikely to change, although small phonetic adjustments can be made through accommodation. These small adjustments will never be detected if they are in the direction from distinction towards merger. But the reverse type of adjustment was observed, from an adult who had grown up merged in Maine, and has been exposed to the distinction in Rhode Island for 30 years. His word classes were minimally, almost imperceptibly distinct. Neither of us noticed the differences by ear, as they were smaller than the allophonic variation within the overlapping word classes. He has not acquired a full phonological distinction, though how such a small phonetic one should be modeled is unclear.

- Many speakers exhibited a difference, though never a dramatic one, between their productions in spontaneous speech and in reading and judging minimal pairs. Their speech was almost always closer to the pattern of their current peers, while their more self-conscious behavior reverted towards the patterns of their parents or earlier peers.

- To explain the changes in South Attleboro and Seekonk, and particularly the difference in their timing, the migration hypothesis was proposed. Drawing on Herold's suggestion that contact with merged speakers can cause others to abandon their distinction, I hypothesized that increasing numbers of merged speakers from across the dialect boundary (including ones from the Boston area) were responsible for the change, if more of them arrived in South Attleboro before they did in Seekonk. More precisely, it is the young children of merged parents, forming peer groups with distinct local children, who should be held accountable. Analysis of demographic data from the school survey and the U.S. Census supported the hypothesis, though not overwhelmingly. But if it is correct, the proportion of merged-background children required to trigger a merger is only 20% or so.

Throughout the dissertation, it has sometimes been implied that the vowel mergers studied here behave like those same mergers in other places, or like mergers in general, or like phonological changes in general, or even like linguistic changes in general. Clearly, this would be going too far. But this suggests a set of avenues of future research, to see if something like the transition from parents to peers usually has a similarly abrupt effect, yet with a similar observable persistence of earlier patterns.

More specifically, in the New England case it became clear that a proper interpretation of the changes observed in the boundary zone would require data from areas far from this border. For if the /o/∼/oh/distinction is breaking down quite generally, even in the Mid-Atlantic states, then a local explanation, such as the migration hypothesis, may be a red herring. In this regard, it would be worth doing a historical study of the /ah/∼/o/ merger, which may have swept the country in similar fashion – regionally resisted, but ultimately triumphant – a century ago.

The historical part of this work, as well as the facts of more contemporary changes like the Northern Cities Shift, stresses the power of internally-caused dialect evolution. But I have not encountered, besides Trudgill (2004), nor been able to suggest, theoretical mechanisms that would allow us to understand this primary type of language change. With a tip of the hat to the Calvinists of early New England, I would say that predestination is hardly too strong a word to employ when we see dialects evolving in parallel without a fully plausible external explanation.

Along these same deterministic lines, I would call attention to the relative absence of evidence here – other than in the school study – for individual agency, or even liberty, in linguistic matters. Explanations of language change that give great weight to children's misunderstandings or errors cannot be easily reconciled with the evidence of parallel innovation, ranging from the geographically (relatively) far-flung low back merger in mid 19th-century Martha's Vineyard, to the temporally coordinated one in early 21st-century Seekonk.

Appendices

Appendix A

Geographic Study Reading Cards

A.1 Longer cards

(1)

After the fourth operation on his heart, Don started walking farther and jogging more. He's a lot calmer now.

Donna named her daughter Dawn, to honor her father's aunt, whose death she was mourning.

Don started walking farther

named her daughter **Dawn**

(2)

Even short people can't sleep well on a a narrow cot. At four o'clock in the morning, they toss and turn, and probably fall off.

The shortstop caught the ball, and tagged the fast runner before he could dodge.

a narrow **cot**

caught the ball

(3)

For a sore throat, doctors ask you to say 'Ah'. Before a shot, they always promise "This won't hurt."

Shawn saw a small dog barking and clapping its paws. He said "Aw, how cute!"

doctors ask you to say '**Ah**'

"**Aw**, how cute!"

(4)

If you're dot-com shopping, watch out for con artists trying to charge your credit card forty dollars when it should cost four.

It bothers me when people tear up a lawn and put sod there. People like that don't even know what grass seed is for.

it should cost **four**

what grass seed is **for**

(5)

If you're naughty, Santa Claus will only put coal in your stocking, not what you want – a hockey puck.

To start a bonfire, use a few pieces of knotty pine wood. It burns hotter.

if you're **naughty**

knotty pine wood

(6)

John drove his car to the mall. He bought a doll for his little girl Molly. Then he bought her some strawberry lip balm at Shaw's.

In order to end the war, the army dropped an atomic bomb on Hiroshima and another one on Nagasaki, Japan.

strawberry lip **balm**

an atomic **bomb**

(7)

Ma was born half a mile down the road, but Pa's whole family comes from abroad. They were cod fishermen.

When you're reading out loud, a comma means that you should pause, a period means you should stop, and so forth.

Pa's whole family

you should **pause**

(8)

Rotten apple cores, broccoli stalks, artichoke hearts, corn on the cob: raw food can clog your garbage disposal.

In grammar school they taught us that the Egyptian god Rah fought the serpent of darkness and rowed his boat across the sky.

raw food

Rah fought

(9)

The most common kinds of beer are lager and ale. Coors Light is a popular lager. Old Milwaukee is not.

It's a hard job to work in the forest as a logger. In the old days, it was even harder. They sawed the logs in half by hand.

a popular **lager**

to work in the forest as a **logger**

(10)

To look more formal, Tom wore a dark shirt and closed his collar, even though it was August and the weather was hot.

A lot of modern telephones give you the name of the caller. They also show you how long each call has gone on.

closed his **collar**

the name of the **caller**

A.2 Shorter cards

(1)

Naughty boys and bad girls don't get gifts, just lumps of black coal from Santa Claus in their stockings.

Knotty pine wood burns hotter in a bonfire than bark or logs. If that's all gone, throw a dry corn stalk in.

naughty boys

knotty pine wood

(2)

Dawn's aunt was in the hospital. Her bed was harder than a rock, so they put her on a short, narrow cot.

Don's father Carlo might put me to sleep if he talks on and on about that four-foot-long swordfish he caught.

narrow **cot**

fish he **caught**

(3)

Llamas are much taller than dogs, but have smaller ears and paws. The same size collar will fit both animals.

Ma and Pa got into riding go-karts. Ma's driving is way worse than Pa's. She goes fast around sharp corners.

ears and **paws**

worse than **Pa's**

(4)

It costs forty dollars for a night at the circus in Boston. The ooh's and ah's of the audience are as loud as the applause.

The Wizard of Oz is a popular movie. Dorothy's dog Toto was honored for his performance with an Oscar.

ooh's and **ah's**

The Wizard of ***Oz***

Appendix B

Family Study Reading Cards

(1)

You can't sleep well on a small cot, like if you're in the army, or the hospital. It's hard not to fall off.

On a fast train from Providence to Boston, the cops caught the robbers drinking coffee in the dining car.

cot

caught

(2)

My father's name is Don. He is tall, with dark brown hair (*or* He likes to eat pasta with sauce). It's his day off, so he's gone jogging.

My aunt's name is Dawn. She bought me candy, but not the kind I want. That really bothers me.

Don

Dawn

(3)

Paul's shoelaces have knots in them. He should throw out the knotty ones and get a brand new pair.

Santa Claus knows if boys and girls have been naughty or nice. Watch out! Santa is coming to town.

knotty

naughty

(4)

Ms. Clark was my first grade teacher. She taught us to tell time on a clock. The small hand is for the hours, and the large hand is for the minutes.

A two and a half year old tot does not belong in the boy scout lodge.

taught

tot

(5 – Attleboro & Cumberland)

John works in an auto body shop. He fixes cars and vans. He owns a Mazda and a Saab.

Otto works at a movie theater. He sells soda and popcorn. He has to look sharp or lose his job.

Otto

auto

(5 – Seekonk & Warwick)

In *The Wizard of Oz,* there is a lion who can talk. But the dog, Toto, does not talk. Toto waves his paw to say goodbye.

In *Peter Pan,* a crocodile swallows a clock. Now he is called Tick-Tock.

talk

Tock

(6 – Seekonk & Warwick)

If you thought it was awesome, you would nod your head. If it was awful, you would not.

Ma and Pa sawed the logs with saws. Our dog Spot gnawed the raw meat with her sharp teeth and claws.

nod

gnawed

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