Chapter 6

The merger of /o/ and /oh/

6.1 Introduction

This chapter discusses the status of /o/ and /oh/ for all of the speakers included in the corpus for this dissertation. These two vowels are of utmost importance for the dialectological status of Erie; the spread of their merger to Erie is the clearest diagnostic for no longer including the city in the Northern dialect region. Furthermore, the merger of /o/ and /oh/ in Erie clearly aligns it with the area of the Midland directly to the south and centered around Pittsburgh, where the two vowels are also solidly merged. In this chapter, the apparent-time evidence from both the interviews I conducted and the archival sources I examined is analyzed to determine when and how the merger spread through Erie and beyond into Chautauqua County, NY. The analysis draws upon both acoustic data and experimental data (in the form of minimial pair tests), in an attempt to characterize each speaker in the corpus as merged, unmerged, or transitional.

This chapter is organized as follows: first, Section 6.2 provides an overview of the two vowel phonemes under consideration, /o/ and /oh/. Next, Section 6.3 describes the status of /o/ and /oh/ in the two regions neighboring Erie. Then, Section 6.4 discusses

the question of how to determine whether a given speaker has the merger of /o/ and /oh/ or not. The information about the status of /o/ and /oh/ in Erie available from previously published sources is reviewed in Section 6.5. Then, Sections 6.6, 6.7, and 6.8 present the results from my fieldwork and archival research. Section 6.9 takes a closer examination at the data from Ripley, a town in Chautauqua County, NY, which acquired the merger in the middle of the 20th century. Finally, Section 6.10 reviews all of the available evidence for the chronology of the spread of the merger.

6.2 Overview of /o/ and /oh/

The short-*o* vowel is represented here by the symbol /o/, following the notation in the ANAE, and it corresponds to the LOT vowel class in Wells (1982).[1] It is descended primarily from short **o** in Middle English, and occurs in nearly all segmental environments. Some examples of words with /o/ include *lock*, *pot*, *god*, and *stop*.

In most dialects of North American English, /o/ has been unrounded and lowered to [ɑ]. In many of these dialects, /o/ has moved towards the front, and is unrounded. In these dialects, the best phonetic representation would be [a]. This is especially the case in the North where the fronting of /o/ as the second stage of the Northern Cities Shift has caused /o/ to move close to the position formerly occupied by /æ/. In other dialects, /o/ has maintained its roundedness, merging with /oh/ in the low back position. This is the case for the Western Pennsylvania dialect centered around Pittsburgh.

The symbol /oh/ is used to represent the long open-*o* class, and corresponds to Wells' THOUGHT lexical set. It is derived primarily from the monophthongization of the Middle English diphthong **au**, which itself was derived from a variety of sources (such as Old

[1] All of the speakers in my dissertation corpus have the merger of /o/ and /ah/, as is evidenced by the near-minimal pair of *father* and *bother*. For speakers who maintain a distinction between /o/ and /ah/, the /o/ vowel corresponds to LOT, and the /ah/ vowel corresponds to Wells' PALM.

English /aw/, OE /a/ + /x/, as in *fought*, vocalization of OE coda /g/, as in *draw*, and Middle French loan words, as in *applaud*). Another large source for /oh/ words was the lengthening of /o/ to /oh/ before voiceless fricateves, as in *lost*, and the velar nasal, as in *strong*. The distribution of /oh/ is severely restricted, and it occurs before only a small number of consonants, mainly before /t/, /d/, /k/, /z/, /n/, /l/, and word-finally. Some examples of words with /oh/ include *thought*, *hawk*, *caught*, and *law*.[2]

In dialects of North American English where /o/ and /oh/ have not merged, /oh/ has changed in three different directions: 1) In the Mid-Atlantic region and New York City it has raised substantially and developed a central offglide, 2) In many areas of the South, it has developed a back upglide, and 3) In the North, it has lowered and fronted as Stage 3 of the Northern Cities Shift. In dialects where /o/ and /oh/ have merged, /oh/ can become unrounded and rather front, especially in the West.

6.3 /o/ and /oh/ in the Midland and the North

In this section, the distributions of /o/ and /oh/ for two typical speakers from the dialect regions neighboring Erie will be examined. First, a speaker from Buffalo will display a clear distinction between the two vowel classes along with the Northern fronting of /o/. Next, a speaker from Pittsburgh will demonstrate the low-back realization of the phoneme resulting from the merger of /o/ and /oh/ in Western Pennsylvania.

Figure 6.1 displays all of the individual tokens of /o/ and /oh/ (including both word list and interview data) produced by Walter K., an 82-year-old Sun Valley resident from Buffalo. Walter K.'s distributions of /o/ and /oh/ show an almost perfect separation between the two classes. Only a single token of /oh/ (the token of *talk* labeled in Figure 6.1) overlaps with the distribution of /o/, and no tokens of /o/ overlap with the /oh/ distribution.

[2]See Labov et al. (2006:58) for a more complete description of the historical sources of /o/ and /oh/, as well as words exemplifying all possible segmental environments for the two vowels.

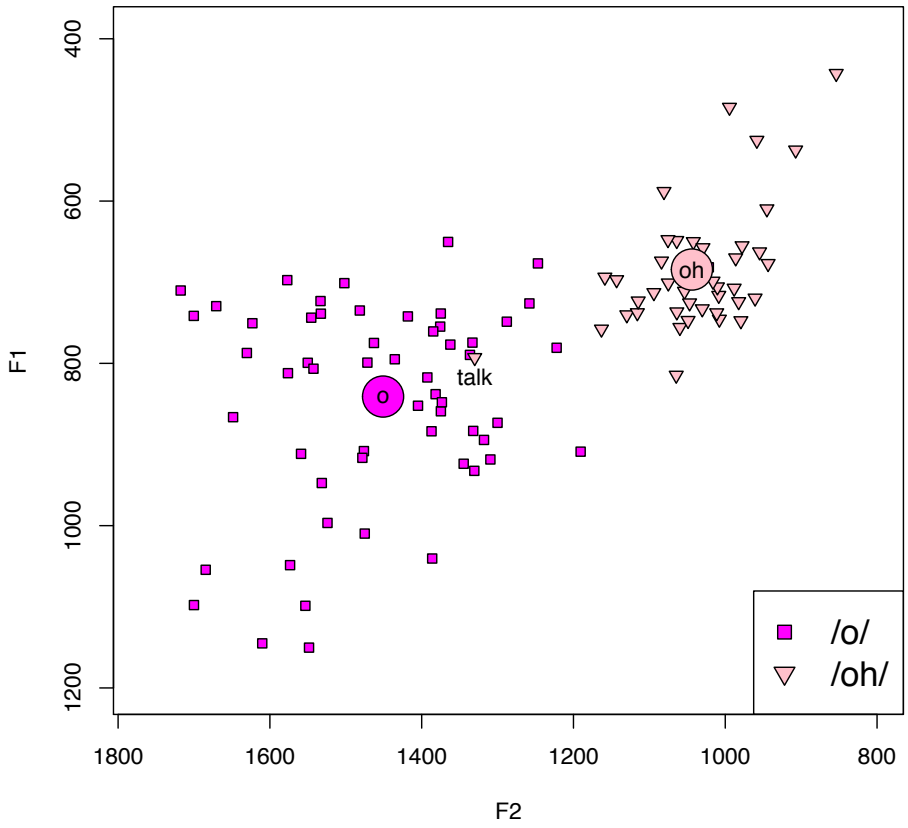

Figure 6.1: /o/ and /oh/ from Walter K., born 1927 in Buffalo,
Mean(/o/) = (841, 1451), N=56; Mean(/oh/) = (684, 1044), N=24; Dist(/o/, /oh/) = 436

Walterk K.'s /o/ is fronted (although not as extremely as it is for many younger speakers from the North) with a mean F2 value of 1451 Hz. The Euclidean distance between the two vowel means is quite large at 436 Hz.

The acoustic evidence for Walter K. demonstrates clearly that he maintains a distinction between /o/ and /oh/, and presents a typical distribution for a Northern speaker. Experimental evidence from minimal pair tests confirms that Walter K. maintains the distinction:

he produced the minimal pairs *cot* / *caught* and *Don* / *dawn* as clearly distinct, and also judged them to be different perceptually.

The caption for Walter K.'s plot of /o/ and /oh/ in Figure 6.1 illustrates a few notational conventions that I will use when displaying vowel plots. First, the notation Mean(V) will be followed by a tuple containing the F1 and F2 mean values for the vowel V, along with the number of tokens that were used to calculate the mean values.[3] Secondly, the notation Dist(V1, V2) will be used to represent the two-dimensional Euclidean distance between the F1 and F2 means for the two vowels V1 and V2, as calculated in Equation 6.1.

As an example of a Midland speaker from Western Pennsylvania, Figure 6.2 displays a plot of /o/ and /oh/ for Gwen S., a speaker from the ANAE (TS # 355)[4]. Gwen S. was born in 1929 in Pittsburgh, and provides a clear example of the solid merger of /o/ and /oh/ in that region. Figure 6.2 shows almost complete overlap between the tokens of /o/ and /oh/: the F1 and F2 ranges for both vowels are very similar, and both vowel classes have tokens distributed throughout their entire ranges. Gwen S.'s /o/ has remained a low back vowel, with a mean F2 value of 1149 Hz. Additionally, most of her tokens of /o/ are also clearly rounded perceptually. The Euclidean distance between her means of /o/ and /oh/ is 66 Hz, also indicating that she has a solid merger. Furthermore, the experimental evidence corroborates this acoustic evidence: all ANAE minimal pair tests involving /o/ and /oh/ show Gwen S. to be merged in both production and perception.

Walter K. and Gwen S. occupy two ends of a continuum representing potential realizations of /o/ and /oh/ in the North and the Midland. Additionally, since they are from

[3] All mean values for individual vowel classes reported in this section were calculated using the exclusions described in Section 3.8. Thus, these tokens are not counted in the N values associated with each mean value. However, all tokens, even the ones not contributing to the mean values, are displayed in the vowel plots. The only tokens not displayed in the plots are extreme outliers caused by measurement errors. These are omitted from the visual display so that the distributions of the correct measurements can be observed more clearly. However, they are not excluded from the calculation of the mean values.

[4] As described in Section 3.3.2, my analyses of the ANAE speakers are not based on the publicly released Plotnik files containing the annotations used for the ANAE, but rather my own re-analysis using the methodology of forced alignment and automatic vowel analysis

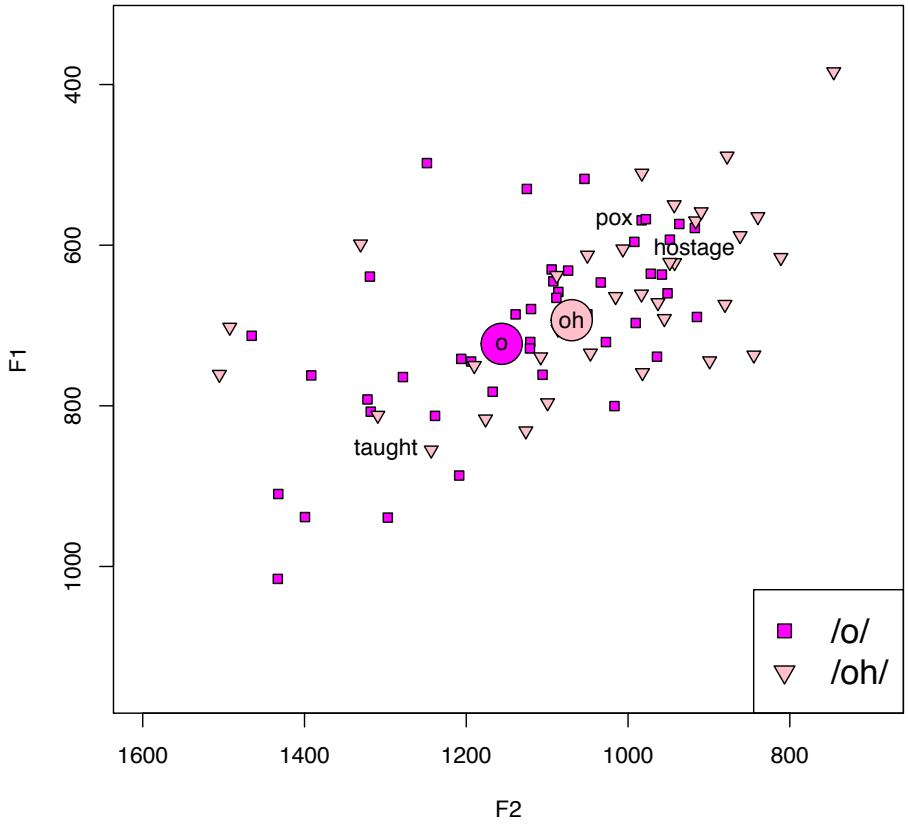

Figure 6.2: /o/ and /oh/ from Gwen S., born 1929 in Pittsburgh,
Mean(/o/) = (723, 1149), N=45; Mean(/oh/) = (689, 1092), N=10; Dist(/o/, /oh/) = 66

Buffalo and Pittsburgh, they also represent two ends of the geographic continuum that the data for this dissertation was drawn from. The evidence for the status of /o/ and /oh/ is not always as clear as it is in the cases of Walter K. and Gwen S., especially if the analysis involves speakers who did not provide experimental evidence in the form of minimal pair tests (for example, speakers who were drawn from archival sources). In cases where such experimental evidence is lacking, however, it is still useful to be able to distinguish merged from unmerged and transitional speakers based on the acoustic evidence alone. The following section will review the techniques that have been used to characterize a speaker's status with respect to the low-back merger (especially speakers whose distributions are not as clear-cut as Walter K. and Gwen S.) and describe my reasons for choosing the ones that I use for the analyses in this chapter.

6.4 Determining whether a speaker has the merger of /o/ and /oh/

As the previous section demonstrated, the status of some speakers with respect to the merger of /o/ and /oh/ is clear; for other speakers, however, the evidence can be less conclusive. On the other hand, in the case of merged speakers, the acoustic evidence often does not show a complete overlap between the distributions for the merged vowels, due to different allophonic constraints in the words that belong to each class. In the case of unmerged speakers, the distributions for the two classes are often not completely discrete. For such speakers, it is often difficult to determine from the acoustic evidence alone whether they maintain a complete distinction, or whether they are transitional; in these cases, experimental methods provide a more reliable means of categorizing speakers. However, in the data for this dissertation, speakers are drawn from both my own interviews and archival recordings, where experimental evidence is necessarily lacking. Therefore, it will be useful

to use a metric that is applicable to all speakers in the corpus.

The experimental method that provides the most reliable characterization of a speaker's phonemic status is the commutation test. In this test, the speaker is recorded uttering several tokens of each item in a minimal pair (these tokens can come either from spontaneous speech or in an elicitation context). Then, the tokens are played back in random order and the speaker is asked to label each of the utterances. Speakers who maintain a phonemic distinction between the two words in the pair generally attain 100% accuracy on this task whereas speakers with a merger perform at chance level.[5] The commutation test methodology, however, was impractical given the logistical constraints of the fieldwork setting for this dissertation, and was not used.

A simpler experimental task that also generally provides reliable results about the status of a speaker's phonemic contrast between two vowels is the minimal pair test. In this test, the speaker is asked to pronounce the two words in a minimal pair in direct succession. Then, he tells the analyst whether they sound the same or different to him, and pronounces the pair a second time. This elicitation technique thus quickly obtains two sources of information about the two words in the minimal pair: the speaker's own *perception* about whether they are the same or different and two acoustic records of the speaker's *production* of each item in the minimal pair. In general, the results obtained from the perception and production parts of the test are identical for each minimal pair, and the speaker's status is easy to determine. The main cause of a discrepancy between the two is when a speaker is from a transitional area; in these cases, the two items are often pronounced only slightly differently. These tokens are provided with the intermediate label of "close". Also, the judgments of a speaker in a transition area may not match the production data. In general, though, the results of the minimal pair tests are reliable and consistent, and they will be

[5] In cases of a near-merger, the interpretation of the results can be more complicated. This is the case with the distinction between *ferry* and *furry* in Philadelphia (Labov et al. 1991).

given primary importance for determining the phonemic status of /o/ and /oh/ for a given speaker, when available.[6] However, this source of information does not exist for speakers drawn fromarchival recordings. For those speakers, a metric based on the acoustic evidence alone is required.

A statistical method that has frequently been used to determine whether a speaker maintains a distinction between two vowel classes on the basis of formant measurements is the unpaired *t*-test. Herold (1990) applied this methodology in an attempt to determine whether a speaker's F1 and F2 means for /o/ and /oh/ were significantly different or not. However, she ran into the difficulty that a *t*-test comparing the means of /o/ and /oh/ for several speakers' interview data produced statistically significant differences, even though the distributions for the two vowels overlapped substantially. Furthermore, these speakers were clearly judged as merged based on perceptual tests (Herold 1990:73). She argued that this apparent paradox was due to an imbalance in the types of consonants that can follow each of the vowels, and concluded that this uneven allophonic distribution thus makes the unpaired *t*-test unsuitable for comparing mean values of /o/ and /oh/.

Johnson (2007:284–289) introduced the paired *t*-test as a technique in overcoming this imbalance. In this test, items from minimal pairs (or near-minimal pairs containing similar segmental environments) are directly compared when the *t*-statistic is computed for the means of the two classes. Thus, any potential differences due to an imbalance in the segmental environments between the two classes is factored out. This method thus produces more reliable results than a simple unpaired *t*-test of tokens from spontaneous speech. However, it requires a large number of minimal pairs to be recorded. In Johnson's study, this was not a problem, since the low back vowels were the only target for analysis. For the

[6]The case of Bill Peters from Duncannon, PA is a notable exception to the accuracy of the minimal pair test in determinining the phonemic status of two vowels. He produced all minimal pairs involving /o/ and /oh/ identically and also judged them to be the same perceptually. However, his spontaneous speech showed a large and consistent difference between tokens from the two classes (Labov et al. 1972:235–236).

present study, however, the interview procedure required time for several other elicitation tasks; thus, it was not possible to include enough minimal pairs to produce statistically reliable results from a paired *t*-test.

Finally, various distance metrics between the formant values for the two vowel classes can be examined. The Euclidean distance between the F1 and F2 mean values is the most straightforward and most commonly used method. Equation 6.1 provides the formula for calculating the Euclidean distance between two vowel means in F1 and F2 space, where V1 and V2 are the means of the two vowels under comparison.

$$Dist(\mathrm{V1}, \mathrm{V2}) = \sqrt{(\mathrm{F1_{V1}} - \mathrm{F1_{V2}})^2 + (\mathrm{F2_{V1}} - \mathrm{F2_{V2}})^2} \tag{6.1}$$

Speakers with the merger of /o/ and /oh/ will usually have a lower value for the Euclidean distance than unmerged speakers. Transitional speakers often have intermediate values.

This method of comparing the means for two vowels can also be influenced, as is the unpaired *t*-test, by an unbalanced distribution of the segmental environments for the tokens from two vowel classes. However, it does provide a useful way of comparing speakers whose acoustic data comes from different sources and was obtained through different methods (as is the case for this dissertation's corpus). In the case of the "Arthur the Rat" recordings from the DARE corpus, it is an ideal means for comparing the DARE speakers with each other. Since these speakers all uttered the same words, the Euclidean distances can be calculated over sets of tokens with the same environmental contexts.

The analyses in this section will combine the results of minimal pair tests, when available, with the Euclidean distance metric in determing the phonemic status of /o/ and /oh/ for a given speaker. The Euclidean distance rarely approaches 0, even for a completely merged speaker, due to the different historically-derived allophonic distributions of the two classes.[7] The results from the ANAE show that the average Euclidean distance for speakers

[7]The mean F2 value of /o/ is usually greater than the mean F2 value of /oh/ for both merged and un-

from three regions with the merger (West, Canada, and Western Pennsylvania) is less than 100 Hz, and it is less than 200 Hz for speakers from Eastern New England. On the other hand, the average Euclidean distance for speakers from the Inland North is around 300 Hz.

In addition to the minimal pair tests and the Euclidean distance metric, vowel plots showing the locations of all tokens of /o/ and /oh/ will be analyzed for several speakers. Speakers who have a clear distinction between the two classes usually have very little overlap between the clouds of tokens for /o/ and /oh/. On the other hand, speakers with the merger have a substantial overlap between the two classes. Speakers who are transitional may have a smaller number of tokens overlapping, in addition to having many indeterminate tokens in the intermediate area between the two classes.[8]

6.5 Previous sources of information about the merger

Before describing the results from my own research pertaining to the status of /o/ and /oh/ in Erie, I will review the prior sources of information that are available. There are three previously published sources that provide evidence for the status of /o/ and /oh/ in Erie:

- the field surveys for LAMSAS (as published in Wetmore (1959) and Kurath and McDavid (1961)), which included two informants from rural areas of Erie County
- the telephone survey of the state of Pennsylvania conducted by Herold (1990), which included one speaker from the city of Erie
- the interviews for ANAE, which included two speakers from the city of Erie

merged speakers. Likewise, the mean F1 value of /o/ is usually greater than the mean F1 value of /oh/ for both groups of speakers.

[8]This discussion assumes that the merger is proceeding by approximation, not transfer or expansion (Labov 1994:321–323). The vowel plots shown for the transitional archival speakers in Section 6.7 tend to support this view.

Informant #	Township	County	Year of Birth	Type	Sex	Occupation
NY64a	Westfield	Chautauqua	1868	I	M	village clerk
NY64b	Westfield	Chautauqua	1869	II	F	florist
NY64c	Westfield	Chautauqua	1884	III	F	librarian
PA55a	Springfield	Mercer	1855	I	M	farmer
PA55b	Findley	Mercer	1900	II	M	farmer
PA56a	Canal	Venango	1857	II	M	teacher
PA56b	Richland	Venango	1896	II	M	farmer
PA65a	Sugar Grove	Warren	1866	I	M	farmer
PA65b	Triumph	Warren	1889	II	M	farmer
PA66a	East Fallowfield	Crawford	1859	I	M	farmer
PA66b	Conneaut	Crawford	1890	II	M	farmer
PA67a	Venango	Erie	1864	I	M	farmer
PA67b	Amity	Erie	1903	II	M	farmer

Table 6.1: Demographic information for the 13 LAMSAS informants shown in Figure 6.3

Section 2.3 presented the evidence from Kurath and McDavid (1961) and Wetmore (1959) that demonstrates that the two LAMSAS informants from Erie County maintained a consistent distinction between /o/ and /oh/. This conclusion is based on over 20 lexical items from the LAMSAS survey.[9] In order to provide a better context for interpreting the evidence from these two LAMSAS speakers, the status of /o/ and /oh/ for the other LAMSAS speakers from the neighboring regions will be investigated.

Table 6.1 presents the demographic information for the LAMSAS speakers from Erie County and the neighboring regions. The "Type" column displays a subjective classification of each speaker's social characterists according to the following three-way scheme: "folk speakers" are Type I, "common speakers" are Type II, and "cultivated speakers" are Type III (Kretzschmar et al. 1993:25).

[9]These two speakers behave consistently for the 7 relevant lexical items mapped in Kurath and McDavid (1961). Wetmore (1959) had access to the original, unpublished field notes for LAMSAS, and was able to examine several additional lexical items. Based on this, he concluded that both speakers from Erie County had the distinction, although he doesn't provide information about the specific transcriptions used for these

The status of /o/ and /oh/ for these 13 LAMSAS speakers is displayed in Figure 6.3. In most cases, the decision about whether to classify a LAMSAS speaker as merged or not was based on the classifications provided by (Wetmore 1959:113).[10] The only speakers that were not included in Wetmore's study are the three from Chautauqua County, NY. Their status was determined by examining the same maps from PEAS that were analyzed in Table 2.9 for the two speakers from Erie County.

Figure 6.3 suggests that the merger of /o/ and /oh/ was in the process of spreading through Crawford County in the last few decades of the 19th century, but had not yet reached Erie or Warren Counties at this time. The fact that the younger of the two LAMSAS informants from Erie County was born in 1903 indicates a time around the first decade of the 20th century as the *terminus post quem* for the merger of /o/ and /oh/ in Erie.[11]

The earliest study to document the merger of /o/ and /oh/ in Erie County is Herold (1990). She conducted a telephone survey in 1987–1988 of all of the counties in Pennsylvania that were reported as distinct based on the interpretation of the LAMSAS data in Wetmore (1959) in order to track the progress of the merger in the state. She interviewed one speaker from Erie County: a 63-year-old female from the city of Erie. Through a series of elicitations and minimal pair tests she concluded that this speaker had the merger of /o/ and /oh/. This evidence thus suggests a time around 1925 as the *terminus ante quem* for the merger of /o/ and /oh/ in the city of Erie. Combining the chronology from LAMSAS and Herold (1990) suggests a window of about a generation in the second two decades of the 20th century for the completion of the merger in Erie County.

---

speakers in the additional lexical items he examined.

[10] Additionally, the LAMSAS field notes describe speaker PA66a as having the merger and speaker PA66b as maintaining the distinction (Kretzschmar et al. 1993:262).

[11] This line of reasoning assumes that the merger spreads uniformly throughout all towns in a county. This abstraction is clearly an over-simplification—a more detailed analysis that takes into account the specific locations of the LAMSAS speakers in Erie County will be presented in Section 6.10.

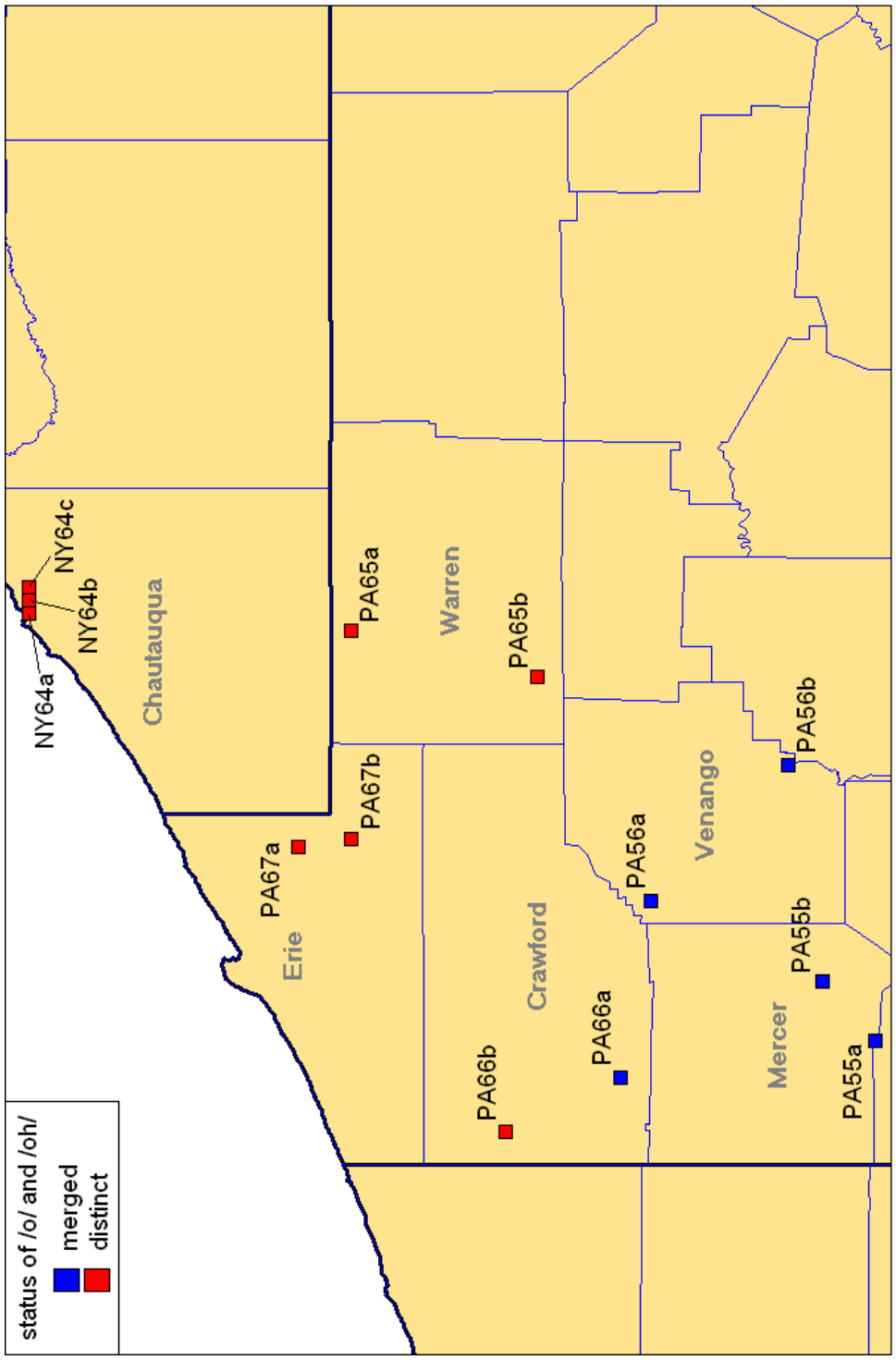

Figure 6.3: The status of /o/ and /oh/ for 13 LAMSAS speakers from the region around Erie

The results from Herold's survey also provide similar information about Warren County. She interviewed a 59-year-old male from the city of Warren who she judged to have the merger. Given that the youngest LAMSAS speaker from Warren County was born in 1889, this would again suggest that the merger spread to Warren County in the first few decades of the 20th century.

Subsequently, two female Erieites were interviewed in 1995 for the ANAE survey. At the time, they were 31 and 39 years old, and both had a solid merger of /o/ and /oh/ in perception and production. This finding is not surprising, since these speakers were born several decades after the merged Erieite interviewed by Herold (1990).

The following section will supplement these previous studies with apparent time evidence from my own fieldwork conducted in the region around Erie as well as archival recordings of speakers from the area.

6.6 The city of Erie: an apparent time study

If the *terminus post quem* for the merger of /o/ and /oh/ in Erie suggested by the LAMSAS data is correct, then it might still be possible to find some elderly Erieites who were born before the merger took place in Erie. In order to test this hypothesis, I conducted an apparent time study at a retirement center in Erie, which I will call Sun Valley. In total, I conducted interviews with 12 senior citezens at the center, 9 of whom are life-long residents of the city of Erie (see Section 3.3.1 for more details about these speakers).

Despite the fact that I was able to interview several elderly Sun Valley residents, including four who were born before 1920, none of them showed any trace of a distinction between /o/ and /oh/. It is clear from both minimal pair tests and the acoustic measurements taken from interviews and word lists that all of the native Erieites interviewed at Sun Valley have a complete merger between /o/ and /oh/. None of them had a difference in

production of perception for any of the minimal pairs, and the vowel plots show almost total overlap between the two classes.

For example, consider the vowel plot shown in Figure 6.4 for Dan R. He was born in 1912, and is the oldest speaker I interviewed at Sun Valley. His means for /o/ and /oh/ are only separated by 10 Hz in the F1 dimension and 78 Hz in F2. The two vowel clouds show considerable overlap throughout their entire ranges. To complement this acoustic evidence, the minimal pair data from Dan R. also point to a complete merger. He produced the pairs *cot* / *caught* and *Don* / *dawn* identically and judged them both to be the same.

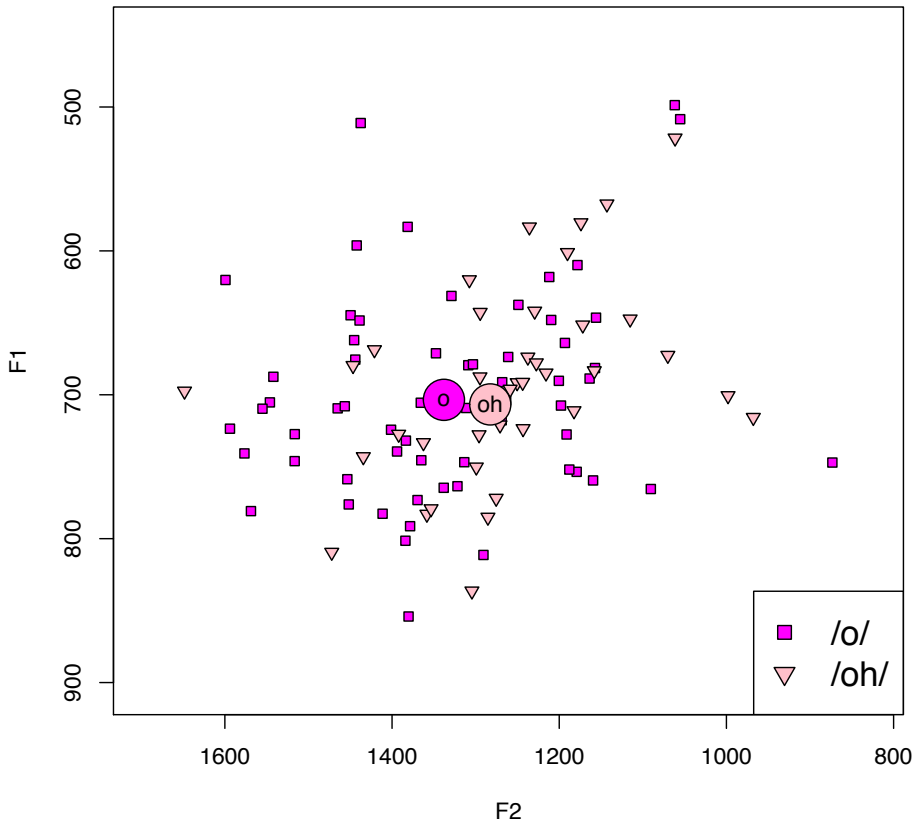

Figure 6.4: /o/ and /oh/ from Dan R., born 1912 in Erie,
Mean(/o/) = (704, 1338), N=55; Mean(/oh/) = (707,1283), N=31; Dist(/o/, /oh/) = 55

Table 6.2 displays the mean F1 and F2 values for /o/ and /oh/, as well as the Euclidean distances between the two vowels, for all of the Sun Valley residents from Erie. All of the Euclidean distances between /o/ and /oh/ for these nine speakers are around 200 Hz or below, much lower than the value of 436 for Walter K., the unmerged Sun Valley resident from Buffalo shown in Figure 6.1. Furthermore, the vowel plots for all speakers are similar to Dan R.'s in Figure 6.4, and show that the clouds for the two classes overlap substantially. Finally, the minimal pair results for these nine Sun Valley speakers agree with the acoustic evidence and confirm that all these speakers have a solid merger of /o/ and /oh/: all nine speakers had the pairs *cot* / *caught* and *Don* / *dawn* merged in both production and perception.

Name	Year of Birth	Mean(/o/)	Mean(/oh/)	Dist(/o/, /oh/)
Dan R.	1912	(717, 1361), N=56	(707, 1283), N=31	78
Robert E.	1916	(693, 1463), N=34	(674, 1261), N=17	203
Flora R.	1919	(834, 1386), N=71	(811, 1300), N=30	89
Mary D.	1919	(856, 1402), N=36	(793, 1255), N=23	160
Charles B.	1925	(790, 1222), N=36	(820, 1168), N=11	62
Eloise B.	1925	(778, 1331), N=48	(758, 1155), N=27	177
Dottie A.	1926	(771, 1284), N=58	(758, 1120), N=22	165
Sally W.	1928	(733, 1285), N=31	(713, 1157), N=18	130
Dana W.	1941	(814, 1287), N=67	(745, 1166), N=38	139

Table 6.2: /o/ and /oh/ or 9 Sun Valley residents from Erie

The clear evidence for the merger of /o/ and /oh/ among several Sun Valley residents aged 80 and above indicates a time around 1915 as the *terminus ante quem* for the merger of these two vowels in Erie (pushing this date back by about 10 years from what was suggested by Herold's telephone survey). This evidence, along with the LAMSAS data discussed in Section 6.5, would seem to indicate a short window in the second decade of the 20th century for the merger's occurrence.

In order to shed more light on this chronology, I attempted to find older recordings of

Erieites born before the Sun Valley residents. The results from these archival materials will be presented in the following section.

6.7 Archival evidence

This section presents evidence for the chronology of the merger of /o/ and /oh/ in Erie drawn from the archival sources described in Section 3.3.2. Most of these speakers were born over 100 years ago, and thus push the time depth of the acoustic evidence back a few decades earlier than the apparent time evidence from the elderly Sun Valley residents. Additionally, they are all approximately contemporaneous with the LAMSAS speakers described in Section 6.5. Thus, it will be possible to complement the impressionistic data provided by LAMSAS from that time period with acoustic data.

6.7.1 SWV corpus

The two speakers selected for analysis from the SWV corpus (see Section 3.3.2), Richard O. and Benjamin S., were chosen because they are the two oldest speakers in the corpus. Richard O. was born in 1906, and Benjamin S. in 1907. They both lived their entire lives in North East, PA.

Figures 6.5 and 6.6 show plots of the vowels /o/ and /oh/ for Richard O. and Benjamin S., respectively.[12] Richard O. has only a small amount of overlap between the two classes. This distribution suggests that he maintained a distinction between /o/ and /oh/. However, the distributions for two phonemes are quite close: the Euclidean distance between /o/ and /oh/ for Richard O. is only 201 Hz, compared to 436 Hz for the clearly unmerged Walter K. from Buffalo. This is the type of distribution that exists for many of the Midland ANAE

[12] As mentioned in Section 3.3.2, the vowel formant measurements for these two speakers are the only ones that were extracted manually for this dissertation, due to the poor sound quality of the archival recordings.

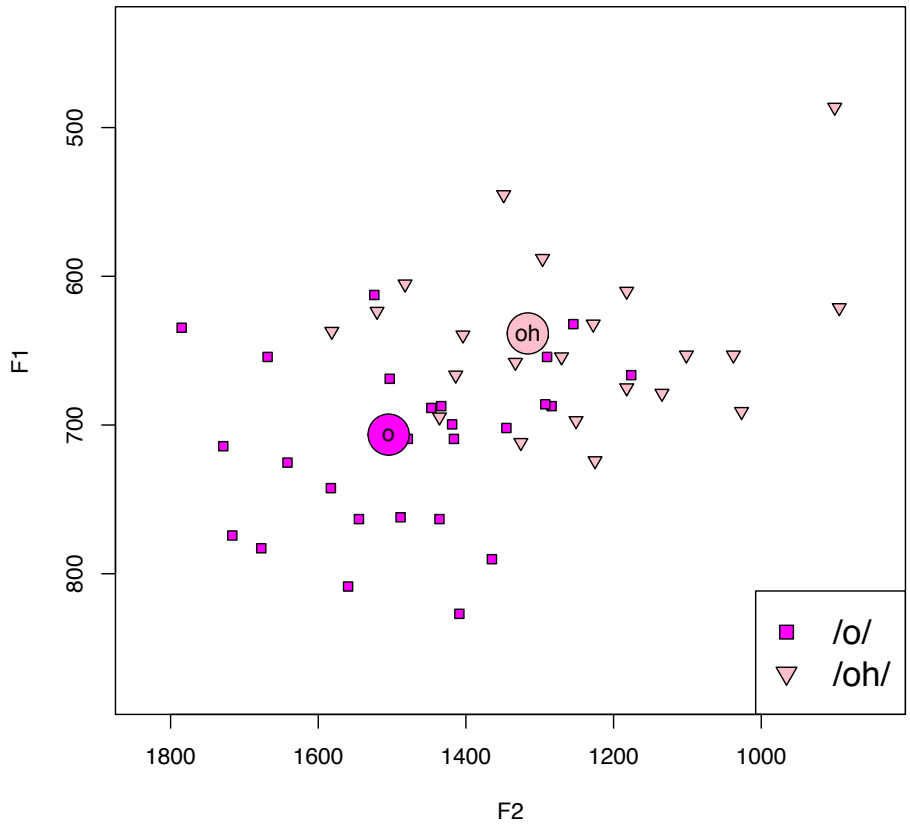

Figure 6.5: /o/ and /oh/ from Richard O., born 1906 in North East, from the SWV corpus, Mean(/o/) = (706, 1505), N=19; Mean(/o/ = (638, 1316), N=10; Dist(/o/, /oh/) = 201

speakers who are labeled as "transitional" with regard to the /o/ ∼ /oh/ merger (Labov et al. 2006:270).

Benjamin S. shows a much greater degree of overlap between the two classes, with several tokens from each class falling clearly within the cloud of the other class. Furthermore, the Euclidean distance between the means of the two classes is only 68 Hz. All of this evidence suggests that the merger of /o/ and /oh/ is quite advanced for Benjamin S., and

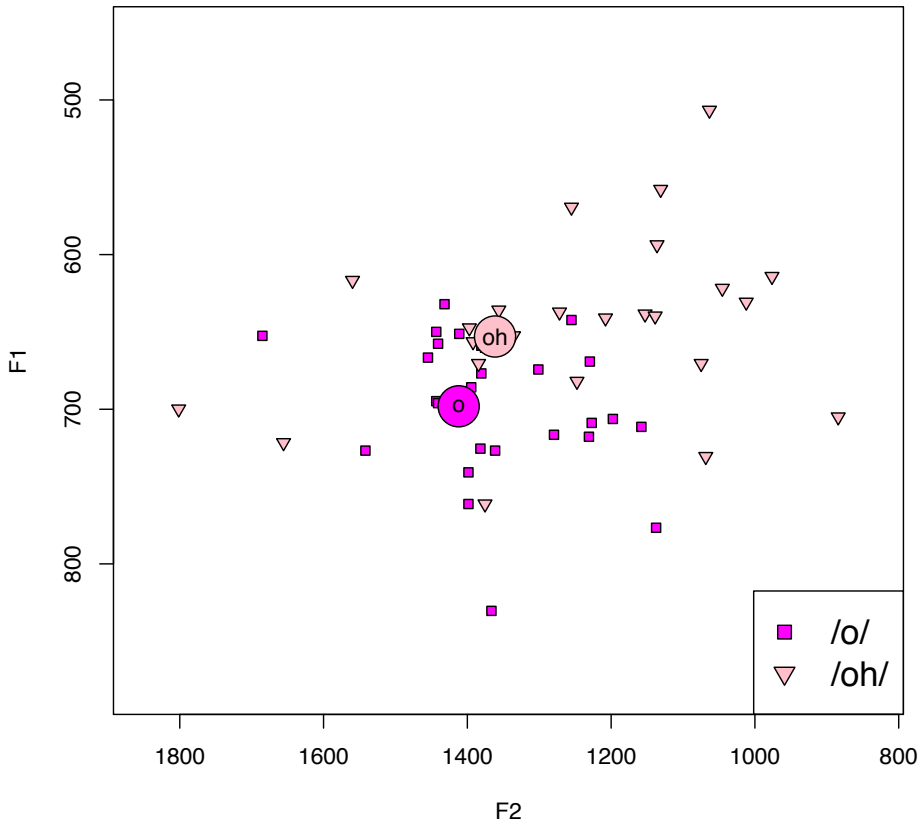

Figure 6.6: /o/ and /oh/ from Benjamin S., born 1907 in North East, from the SWV corpus,
Mean(/o/) = (698, 1412), N=15; Mean(/oh/) = (653, 1361), N=12; Dist(/o/, /oh/) = 68

has probably already reached completion for him.

Thus, the evidence from Richard O. and Benjamin S. suggests that the merger was already in transition in North East in the first decade of the 20th century. However, this would seem to contradict the LAMSAS evidence showing a distinction for the speaker from Erie County born in 1903. The following two sections will attempt to address this apparent contradiction by providing more evidence from the same time period from other

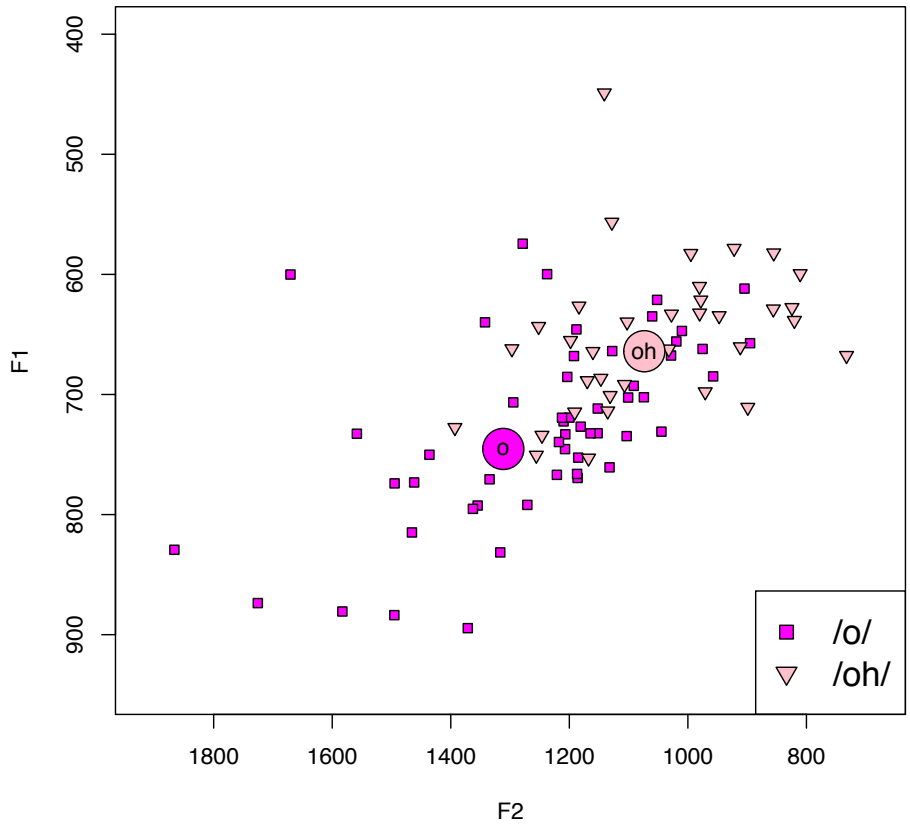

Figure 6.7: /o/ and /oh/ from H. O. Hirt, born 1887 in Erie,
Mean(/o/) = (745, 1311), N=36; Mean(/oh/) = (664, 1074), N=21; Dist(/o/, /oh/) = 250

areas of Erie County.

6.7.2 H. O. Hirt

H.O. Hirt is the oldest recorded speaker in the corpus from the city of Erie itself (see Section 3.3.2 for his demographic details). He was born in 1887, and thus pushes the time depth for our knowledge of the city of Erie back about 20 years from Dan R., the oldest Sun Valley

resident. Figure 6.7 shows a plot of all tokens with /o/ and /oh/ from the interview with Hirt.

As the figure shows, there is a large amount of overlap between /o/ and /oh/, especially in the boundary area between the two distributions. However, the 250 Hz distance between the means is somewhat larger than would be expected for a completely merged speaker. As was the case for Richard O. from the SWV corpus, the distributions of /o/ and /oh/ for H.O. Hirt seem to indicate that the distinction was tenuous for him, and that he is transitional with respect to the merger. Thus, the merger was already in progress in Erie when Hirt was acquiring language in the early 1890's. Again, this seems to contradict the LAMSAS evidence, but is consistent with the evidence presented in Section 6.6 for the 9 elderly Erieites interviewed in 2007 at the retirement community and in Section 6.7.1 for the two elderly participants in the SWV corpus.

6.7.3 DARE

Another archival source that provides an early source of acoustic data for speakers in the region around Erie is DARE. While the DARE survey was primarily focused on elicitation of lexical items through a written questionnaire, interviews were recorded with 1,843 subjects, about 2/3 of the total number of DARE subjects (Cassidy and Hall 1985:xiv). These interviews are usually about 30 minutes in length, and cover topics such as regional history, agricultural practices, and local traditions. In addition to the conversational interview, most subjects were also recorded reading the story "Arthur the Rat". This story contains 593 words, and has a relatively balanced distribution of all English vowels in a variety of segmental environments. It thus provides an efficient means for comparing speakers from the DARE corpus.

Table 6.3 lists all of the words included in the "Arthur the Rat" passage that were used for calculating the means for /o/ and /oh/, including the number of occurrences for words

/o/	/oh/
on (6x)	*long* (3x)
not (3x)	*caught* (2x)
foggy	*loft* (2x)
got	*off* (2x)
odd	*coughed*
rotted	*haunted*
upon	*log*
	longer
	undaunted
N(/o/) = 14	N(/oh/) = 14

Table 6.3: Words with the vowels /o/ and /oh/ contained in DARE's "Arthur the Rat" reading passage

that appear more than once in the passage. The word *on* is listed as belonging to the /o/ class for this study, despite the fact that its pronunciation varies between /o/ and /oh/ in North America. For the region under consideration, the ANAE shows near-categorical use of /o/ in *on* for Northern speakers (Labov et al. 2006:189). Also, the five unmerged speakers in my corpus from Chautauqua County and Buffalo who had *on* and *Don* in their list of minimal pairs all produced *on* with /o/; i.e., *on* and *Don* rhymed for all of them. Since there is no evidence to expect *on* to be pronounced with /oh/ for any of the speakers in this region, it is assumed that it contains the vowel /o/ for the DARE speakers.

Additionally, the "Arthur the Rat" reading passage contains several words with /o/ and /oh/ that were excluded from the calculations of the mean values of /o/ and /oh/, since they match the exclusion criteria listed in Section 3.8. For /o/, these words are *watched* and *washing*; for /oh/, they are *all* (4x), *always*, *crawled*, *walk*, and *walls*. Although these tokens were excluded from the calculation of the mean values, they are still displayed in the vowel plots.

The individual token counts for /o/ and /oh/ for each speaker analyzed below often

vary slightly from the 14 that would be expected based on the list in Table 6.3. These differences are caused either by the exclusion of suspected mis-measurements according to the procedure described in Section 3.8 or by individual deviations from the "Arthur the Rat" text in the DARE recordings.[13]

Unfortunately, no speakers from the city of Erie itself were interviewed for DARE. However, several speakers from the boundary areas around Erie were interviewed and recorded. In total, 14 of these speakers who read "Arthur the Rat" were analyzed for this dissertation. Since these recordings were made from a reading passage, a transcription already exists as potential input to the forced alignment system (the version that was given by the DARE fieldworkers to the subjects to read is printed in Appendix E). However, due to disfluencies, mis-readings, and background noise, the written text of the story does not provide a perfect transcription of each individual speaker's rendition of "Arthur the Rat." Therefore, in order to achieve optimal forced alignment, each speaker's transcription was amended beforehand to reflect any deviations from the original transcription. These improved transcriptions were then used for forced alignment and automatic vowel analysis of the "Arthur the Rat" reading passages. In addition, two DARE speakers from the town of Ripley, NY were selected for more detailed analysis, because apparent time evidence from my interviews demonstrates that the merger spread to that town during the course of the 20th century (see Section 6.9 for a detailed discussion of the town of Ripley). Excerpts from their interviews were transcribed and analyzed using forced alignment and automatic vowel analysis.

The 14 DARE speakers that were analyzed for this dissertation come from the following 7 locations: North East and Union City (Erie Co., PA); Meadville (Crawford Co., PA); Warren (Warren Co., PA); Fredonia, Ripley, and Jamestown (Chautauqua Co., NY). Figure

[13]For the sake of a standardized analysis, the word *log* is included in the /oh/ category for all speakers, despite the fact that its phonemic status is variable among unmerged North American speakers.

Name	Year of Birth	Mean(/o/)	Mean(/oh/)	Dist(/o/, /oh/)
Gladys T.	1899	(840, 1378), N=12	(737, 1163), N=13	238
Bill C.	1950	(727, 1339), N=11	(696, 1093), N=12	248

Table 6.4: /o/ and /oh/ from two DARE speakers from Meadville, PA

6.8 summarizes the data from these speakers by displaying the Euclidean distances between /o/ and /oh/ for each speaker. The specific values for each speaker in this map are presented below in Tables 6.4 - 6.10, where a town-by-town analysis is conducted.

First, consider the two speakers from Meadville, PA, located in Crawford County. The LAMSAS evidence presented in Figure 6.3 showed that the northern boundary for the merger of /o/ and /oh/ crossed through the middle of Crawford County. The acoustic evidence from the oldest DARE speaker in Crawford County, Gladys T., suggests that she was transitional with regard to the merger (she was born nine years later than the younger, unmerged LAMSAS informant from Crawford County, PA66b). The younger DARE speaker from Crawford County appears to be merged from his vowel plot: a large number of tokens from the two classes overlap (although the Euclidean distance between his means of /o/ and /oh/ is somewhat larger than would be expected from a completely merged speaker).

Next, the values for the DARE speaker from Union City are shown in Table 6.5. Her distributions of /o/ and /oh/ are quite clearly separated, and do not show signs of being transitional. Union City is located near Venango and Amity, the locations in Erie County of the two unmerged speakers from LAMSAS. Maggie S.'s data supports the conclusion that the merger had not yet spread to this part of Erie County at the turn of the 20th century.

However, Maggie S.'s results can be compared with Sharon N., the only speaker in Union City that I interviewed. Her acoustic data and minimal pair tests show that she has a solid merger of /o/ and /oh/, but she was born in 1931. This indicates that the merger

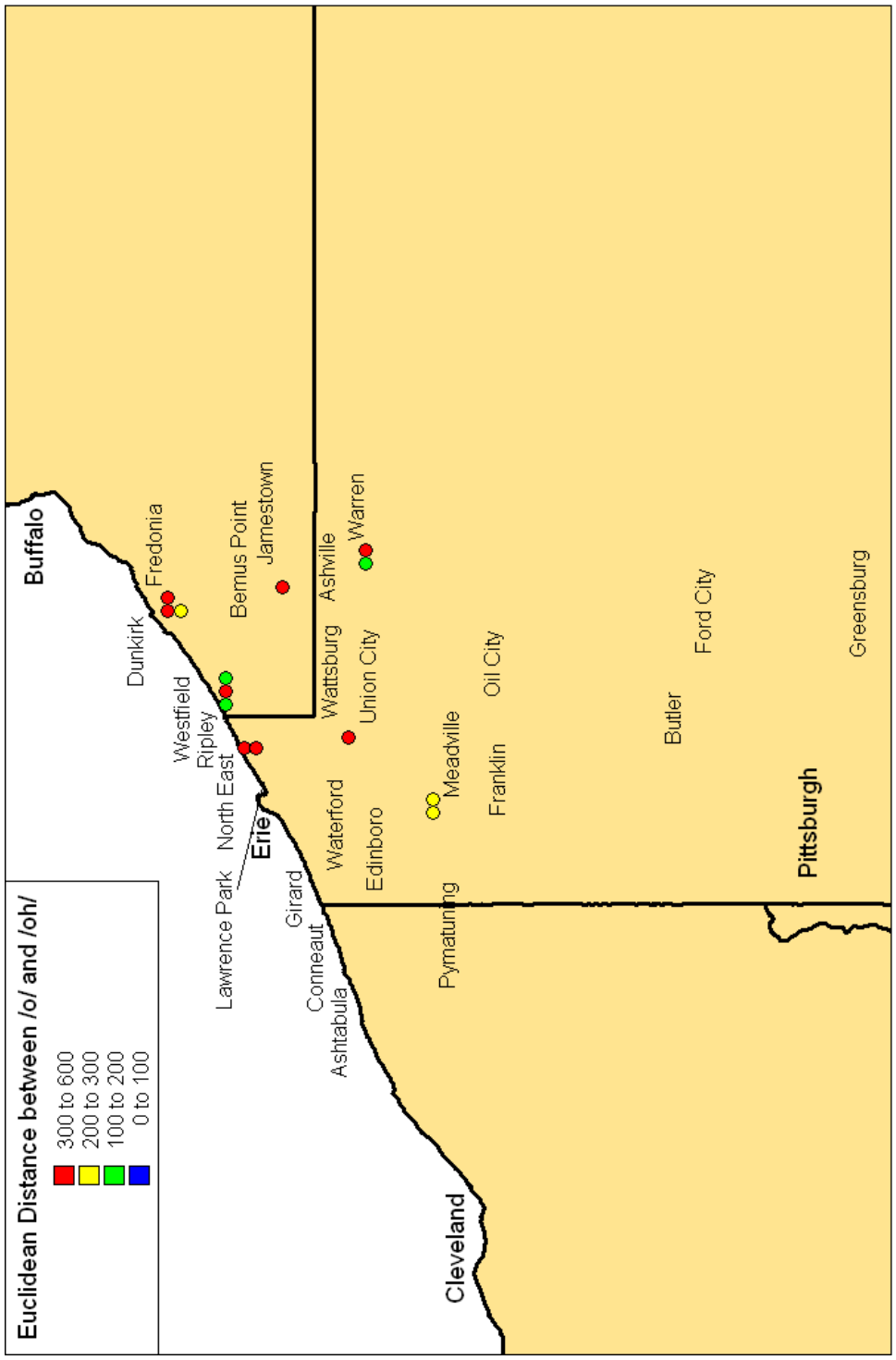

Figure 6.8: Euclidean distances between /o/ and /oh/ for 14 DARE speakers

Name	Year of Birth	Mean(/o/)	Mean(/oh/)	Dist(/o/, /oh/)
Maggie S.	1900	(724, 1524), N=12	(672, 1067), N=14	460

Table 6.5: /o/ and /oh/ from a DARE speaker from Union City, PA, born 1900

Name	Year of Birth	Mean(/o/)	Mean(/oh/)	Dist(/o/, /oh/)
Sarah N.	1897	(682, 1549), N=13	(574, 1130), N=8	433
Nancy S.	1908	(765, 1502), N=14	(687, 1203), N=13	309

Table 6.6: /o/ and /oh/ from two DARE speakers from North East, PA

spread to Union City in the first few decades of the 20th century.

Next, consider the two DARE speakers from North East, PA, Sarah N. and Nancy S. Their productions of /o/ and /oh/ are summarized in Table 6.6, and vowel plots showing the individual tokens are presented in Figures 6.9 and 6.10.

The Euclidean distances between /o/ and /oh/ for these two speakers from North East are both greater than 300 Hz, and there is little overlap between the two distributions for each speaker.[14] These two speakers from North East thus appear to still maintain a distinction between /o/ and /oh/. This evidence contrasts directly with transitional and merged vowel plots presented in Figures 6.5 and 6.6 for Richard O. and Benjamin S., the two speakers from the SWV corpus. These two speakers were born in 1906 and 1907, respectively, one year earlier than Nancy S. However, the two SWV speakers provide evidence that the merger was already spreading to North East in the first decade of the 20th century, while Nancy S. demonstrates that it had not yet spread to all speakers in North East yet at that time. There was thus a period of inter-speaker variation in the phonemic status of /o/ and

[14]The token of *caught* displayed in the lower-left corner at (1130, 1777) in Nancy S.'s plot in Figure 6.10 is clearly a measurement error. This is an unfortunate case where the Mahalanobis distance metric for formant prediction chose the wrong pair of poles and bandwidths. However, this error was not egregious enough to be excluded by the exclusion criteria described in Section 3.8. Since the methodological goal of this dissertation is to conduct the vowel analyses with no manual intervention in order to enable reproducibility, tokens like these were not removed.

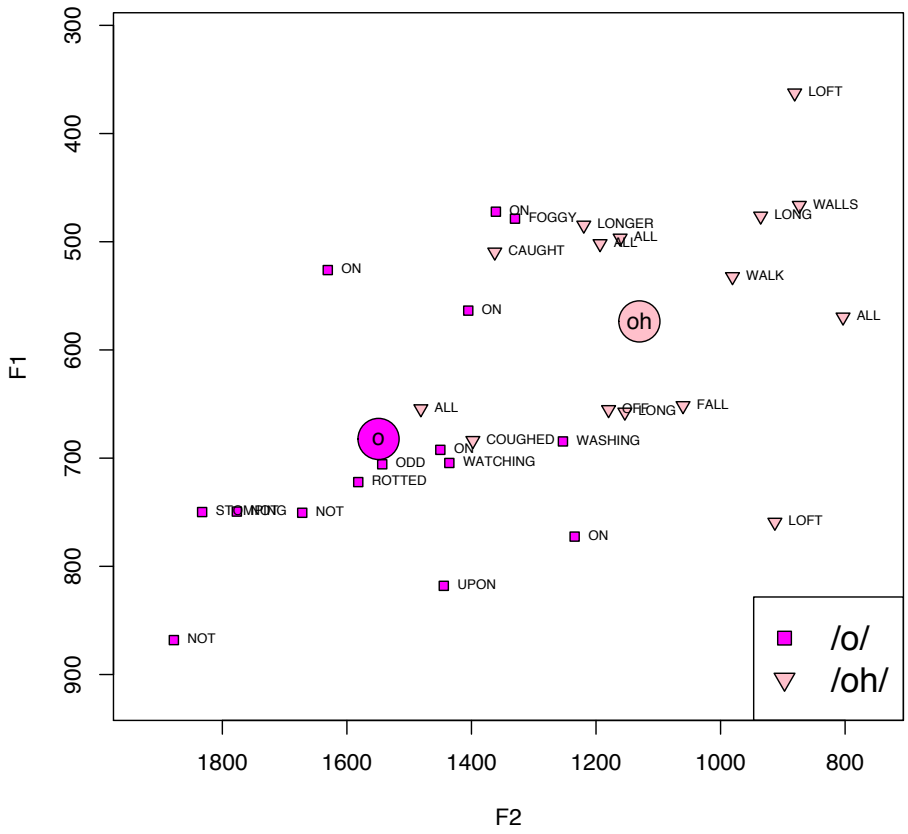

Figure 6.9: /o/ and /oh/ from Sarah N., born 1897 in North East, from the DARE corpus, Mean(/o/) = (682, 1549), N=13; Mean(/oh/) = (765, 1502), N=8; Dist(/o/, /oh/) = 433

/oh/ in North East at this time. The fact that the two speakers from this town who appear to be acquiring the merger, Richard O. and Benjamin S., are both male, whereas the two speakers who maintain a distinction, Sarah N. and Nancy S., are both female, suggests that males may have been in the lead in acquiring the merger in North East. A similar pattern in which the males appear to be leading the advance of the merger in Ripley will be presented in Section 6.9.

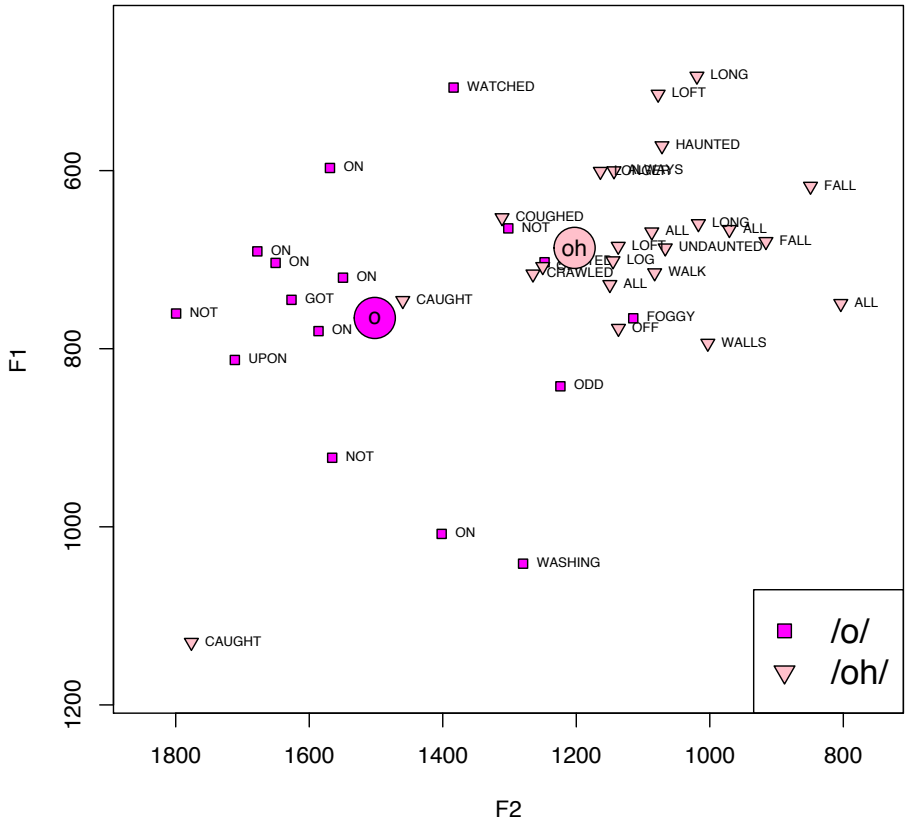

Figure 6.10: /o/ and /oh/ from Nancy S., born 1908 in North East, from the DARE corpus, Mean(/o/) = (765, 1502), N=12; Mean(/oh/) = (687, 1203), N=13; Dist(/o/, /oh/) = 309

Name	Year of Birth	Mean(/o/)	Mean(/oh/)	Dist(/o/, /oh/)
Agatha S.	1907	(757, 1490), N=14	(739, 1292), N=12	199
Steven G.	1915	(734, 1532), N=13	(690, 1128), N=13	406

Table 6.7: /o/ and /oh/ from two DARE speakers from Warren, PA

Name	Year of Birth	Mean(/o/)	Mean(/oh/)	Dist(/o/, /oh/)
Ted L.	1904	(781, 1477), N=14	(642, 1157), N=11	349

Table 6.8: /o/ and /oh/ from a DARE speaker from Jamestown, NY, born 1904

Table 6.7 displays the values for the two DARE speakers from Warren County. The distributions of /o/ and /oh/ for the older speaker, Agatha S., show some overlap, and the Euclidean distance between the mean values is just under 200 Hz. This suggests that she is transitional with regard to the merger. The other speaker, however, maintains a clear distinction. This inter-speaker variation in the city of Warren is consistent with the conclusion reached in Section 6.5 (based on evidence from two LAMSAS speakers and one speaker from Herold's telephone survey) that the merger spread to Warren County in the first few decades of the 20th century.

The results for the single DARE speaker from Jamestown, NY are displayed in Table 6.8. His acoustic evidence shows that he maintained a distinction between /o/ and /oh/, as would be expected based on the current status of the vowels in Jamestown (see Section 6.8).

The results for the three DARE speakers from Fredonia, NY are displayed in Table 6.9. The two female speakers, Leslie B. and Anne B., maintain a clear distinction with no overlap between the two distributions, and a large distance of over 500 Hz between the mean values for /o/ and /oh/. The situation is different, however, for Wallace L., who was born a few years earlier. The 200 Hz distance between his mean values for /o/ and /oh/

Name	Year of Birth	Mean(/o/)	Mean(/oh/)	Dist(/o/, /oh/)
Wallace L.	1892	(627, 1250), N=13	(590, 1053), N=11	200
Leslie B.	1897	(849, 1519), N=13	(675, 984), N=13	568
Anne B.	1898	(917, 1619), N=13	(725, 1124), N=12	531

Table 6.9: /o/ and /oh/ from three DARE speakers from Fredonia, NY

is smaller than would be expected for a speaker with a clear distinction between the two vowels. To examine his status in more detail, a vowel plot for his individual tokens of /o/ and /oh/ is displayed in Figure 6.11.

There is actually little overlap between the two distributions for Wallace L. The measurement of *not* at (545, 772) is clearly a measurement error, and the position of *foggy* suggests that this lexical item actually contains the phoneme /oh/ for him. It thus appears that he still maintains a distinction between /o/ and /oh/. However, the mean values are much closer than they are for the other two speakers from Ripley; specifically, his mean F2 value for /o/, 1250 Hz, indicates that he has much less fronting of this vowel than most other speakers from the region. Based on the one interview I conducted in Fredonia (with a woman born in 1921), it does not appear that Wallace L'.s pattern indicates a community-wide transition to the merger in Fredonia. However, data from younger speakers from the town is necessary to confirm this.

Finally, Table 6.10 displays the results for the three speakers from Ripley, NY. One speaker, Jill C., maintains a clear distinction betwen /o/ and /oh/. Her plot for these two vowels is displayed in Figure 6.12. It shows only a slight amount of overlap at the boundary between the two distributions. Furthermore, the distance between the two mean values is quite high, at 434 Hz.

The other two speakers from Ripley, however, do not appear to have a complete distinction between /o/ and /oh/. Clarence T.'s vowel plot in Figure 6.13 does show that the

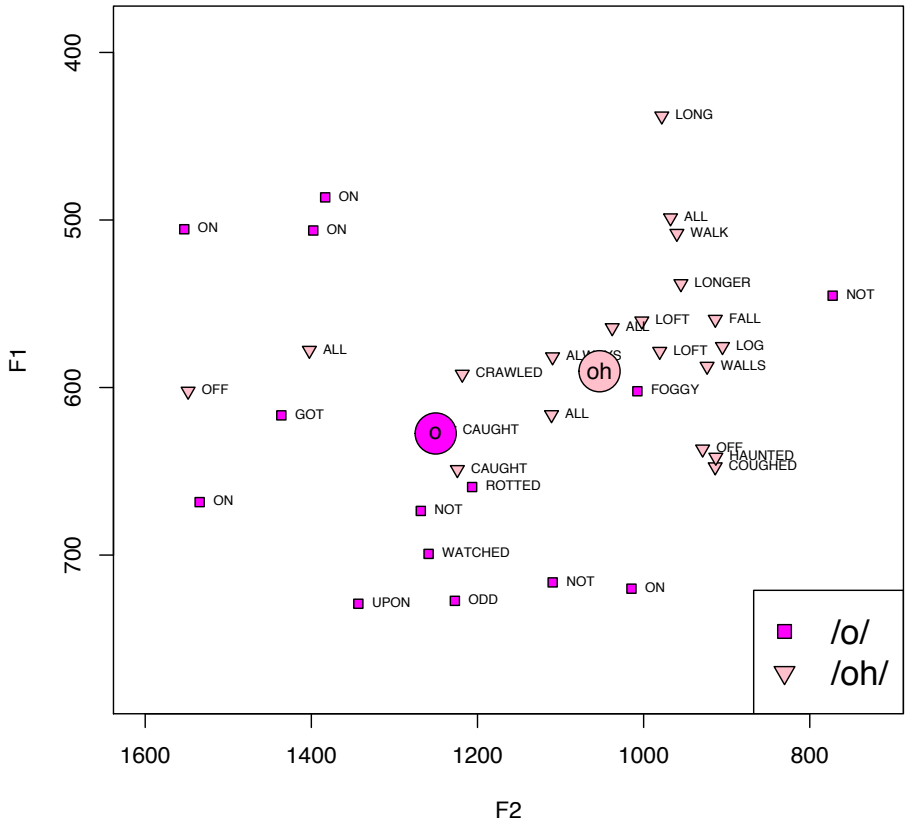

Figure 6.11: /o/ and /oh/ from Wallace L., born 1892 in Fredonia, from the DARE corpus, Mean(/o/) = (627, 1250), N=13; Mean(/oh/) = (590, 1053), N=11; Dist(/o/, /oh/) = 200

Name	Year of Birth	Mean(/o/)	Mean(/oh/)	Dist(/o/, /oh/)
Clarence T.	1886	(714, 1417), N=19	(700, 1253), N=14	165
Jill C.	1889	(733, 1542), N=12	(659, 1114), N=13	434
Jonas H.	1898	(746, 1390), N=46	(674, 1249), N=16	158

Table 6.10: /o/ and /oh/ from three DARE speakers from Ripley, NY

two distributions are mostly separated, and that several of the overlapping tokens are at the edges of the distributions. However, there is a token of *got* that is clearly within the /oh/ distribution,[15] and two tokens of *small* that are clearly within the /o/ distribution. This vowel plot indicates that the distinction between /o/ and /oh/ is not as great for Clarence T. as it originally was in Ripley, based on the evidence from Jill C.

The other DARE speaker from Ripley, Jonas H., indicates even more clearly that /o/ and /oh/ were in transition for him. A large number of tokens from each class overlap with each other, and only the F2 extremes of each distribution remain homogenous. Jonas H. and Clarence T. thus provide an early sign of the transitional nature of Ripley which laid the groundwork for the merger to spread completely through the town in the 20th century (see Section 6.9).

[15]The very low F2 value in his pronunciation of *Holland* can be explained by the fact that the /o/ vowel is followed by an /l/. Simiarly, the token of *washing* in the /oh/ distribution can be explained by the preceding /w/ (additionally, it is possible that *washing* has the phoneme /oh/ for Clarence T).

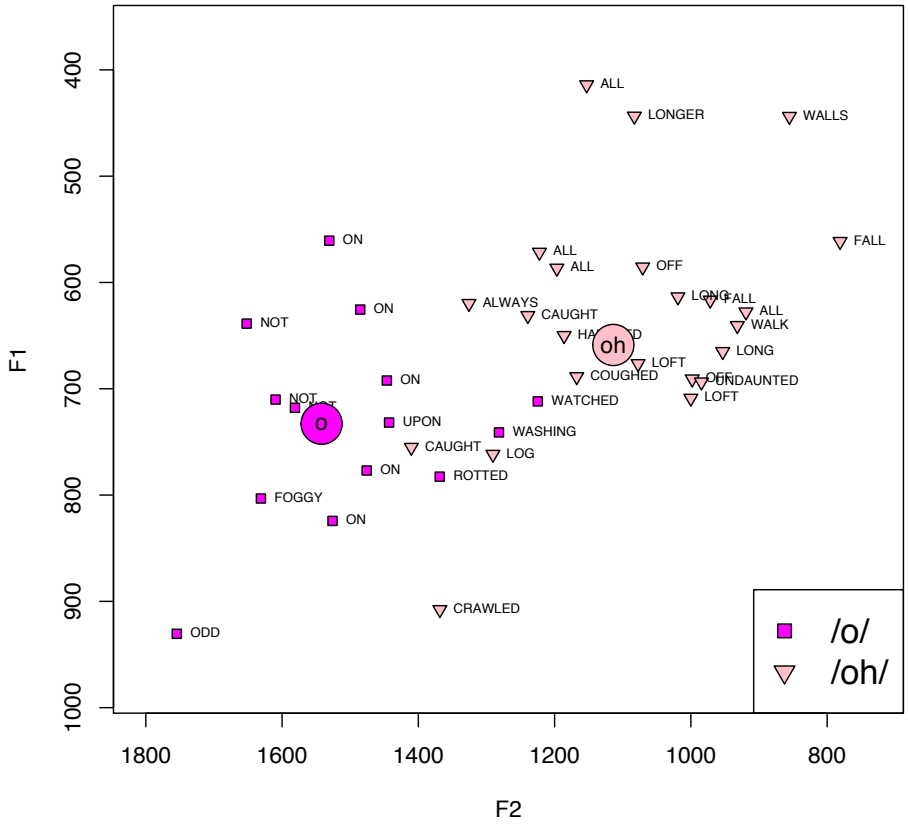

Figure 6.12: /o/ and /oh/ from Jill C., born 1889 in Ripley, from the DARE corpus, Mean(/o/) = (733, 1542), N=12; Mean(/oh/) = (659, 1114), N=13; Dist(/o/, /oh/) = 434

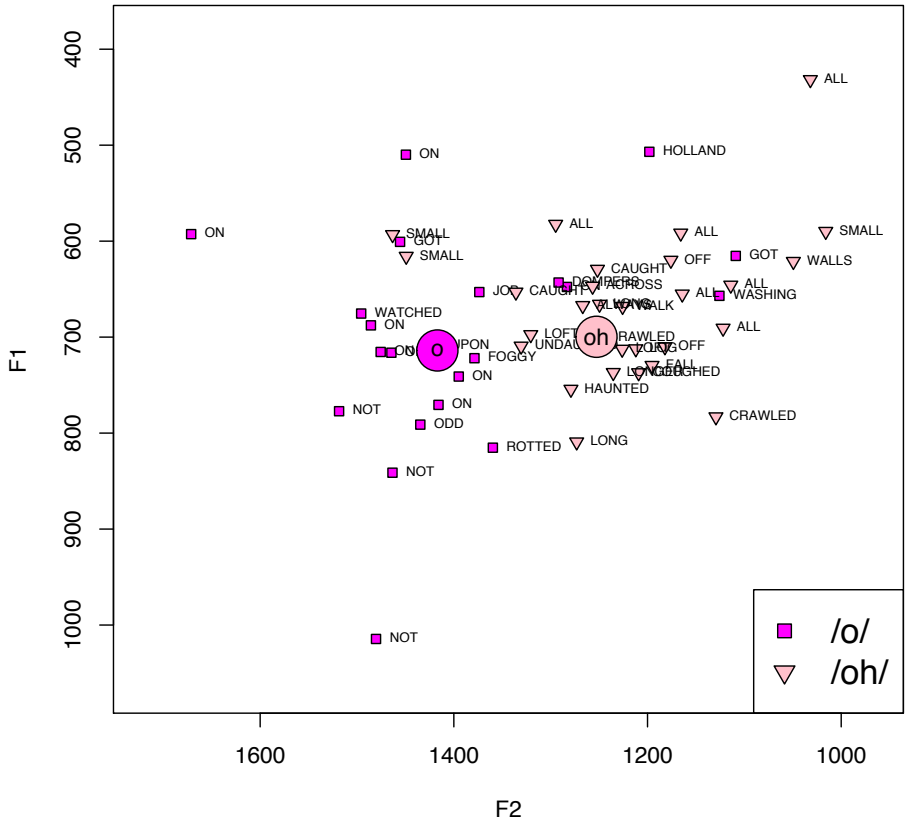

Figure 6.13: /o/ and /oh/ from Clarence T., born 1886 in Ripley, from the DARE corpus, Mean(/o/) = (714, 1417), N=19; Mean(/oh/) = (700, 1253), N=14; Dist(/o/, /oh/) = 165

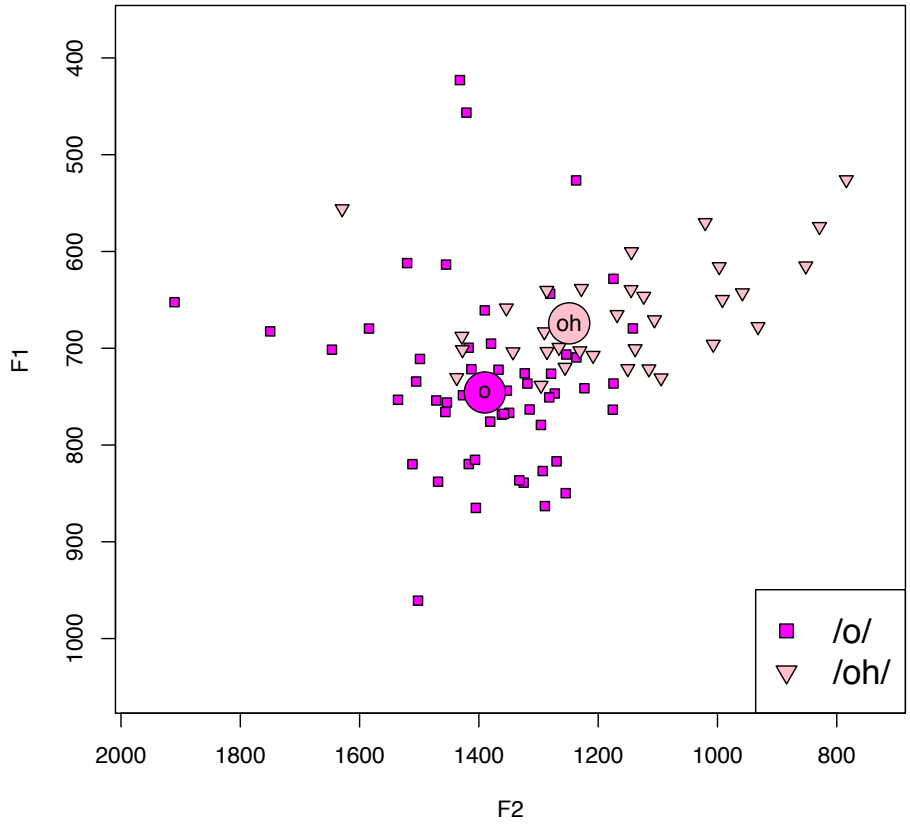

Figure 6.14: /o/ and /oh/ from Jonas H., born 1898 in Ripley, from the DARE corpus, Mean(/o/) = (746, 1390), N=46; Mean(/oh/) = (674, 1249), N=16; Dist(/o/, /oh/) = 158

6.8 The Current Geographic Extent of the Merger around Erie

Figures 6.15 and 6.16 show the geographic extent of the merger of /o/ and /oh/ for 72 speakers from Erie and the surrounding areas.[16] These two maps display the production data for the pairs *cot* / *caught* and *Don* / *dawn*: the blue points show speakers who pronounced the two words in a pair identically (based on my perception of their pronunciation), the red points show speakers who pronounced them as clearly distinct, and the green points show speakers who pronounced them similarly, but not identically.

The two maps show a clear boundary between the entire area of western Pennsylvania stretching from Erie to Pittsburgh, on the one hand, and Chautauqua County, NY, on the other. There is no variation in western Pennsylvania: all speakers are categorically merged. The converse is true for most towns in Chautauqua Co., NY: all speakers maintain a clear distinction between /o/ and /oh/, except for speakers in the town of Ripley, NY. In Ripley, a clear apparent-time distribution of the merger is visible in Figures 6.15 and 6.16. The 19 speakers from Ripley are ordered on the maps by their ages (as are speakers in all towns): the speaker represented by the point in the upper-left corner is the oldest speaker in Ripley, and the speaker in the lower-right corner is the youngest (speakers are arranged in decreasing age order by row). The only speakers from Ripley who pronounced the minimal pairs as either close or distinct are middle-aged and older. No trace of the distinction was found in any of the younger speakers from Ripley. Section 6.9 will analyze the data from the Ripley speakers in more detail, in an attempt to interpret this apparent time distribution.

[16] These 72 speakers include the ANAE speakers who were re-analyzed for this dissertation. Their minimal pairs data was obtained from the database file that is released with the ANAE.

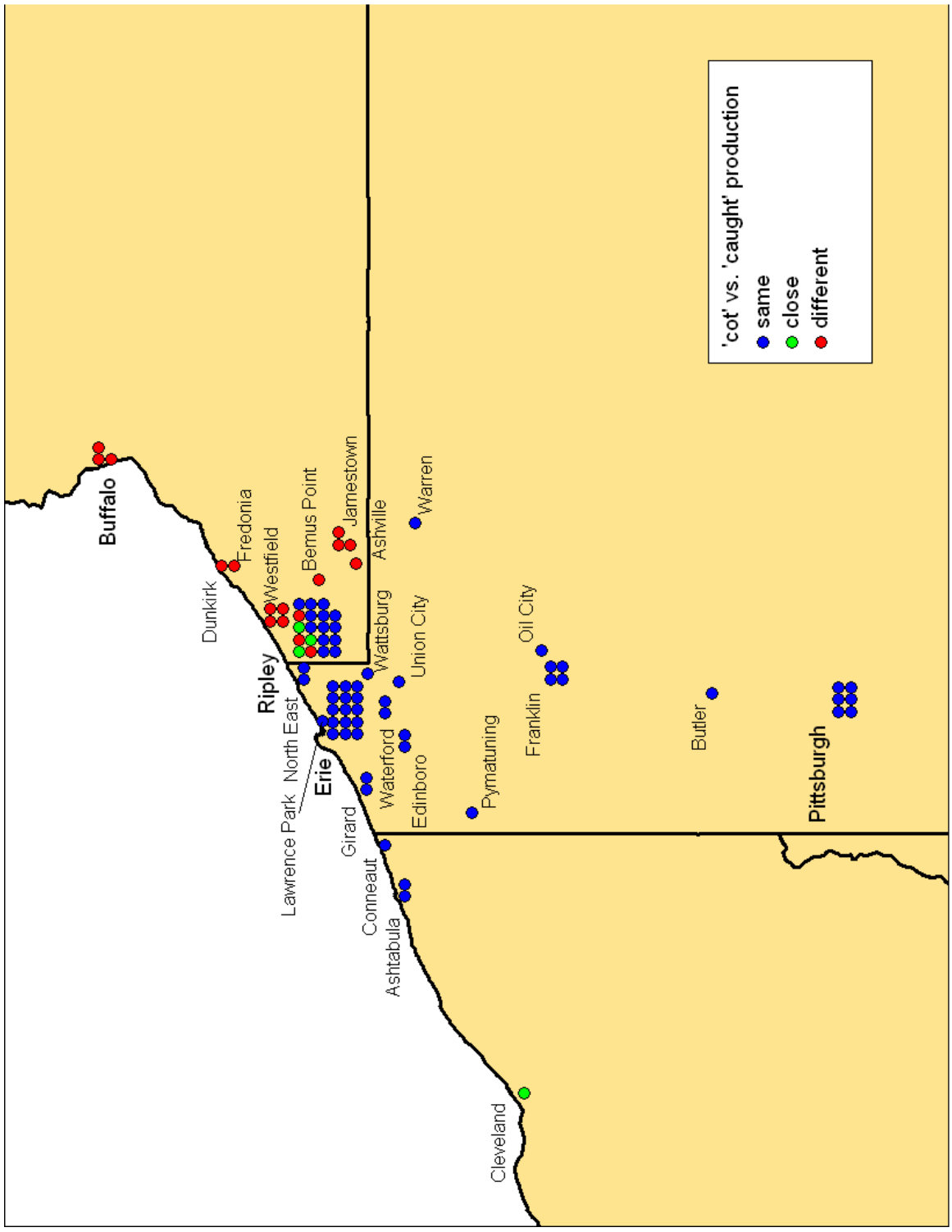

Figure 6.15: Geographic extent of the merger of *cot* and *caught* around Erie, minimal pair production data

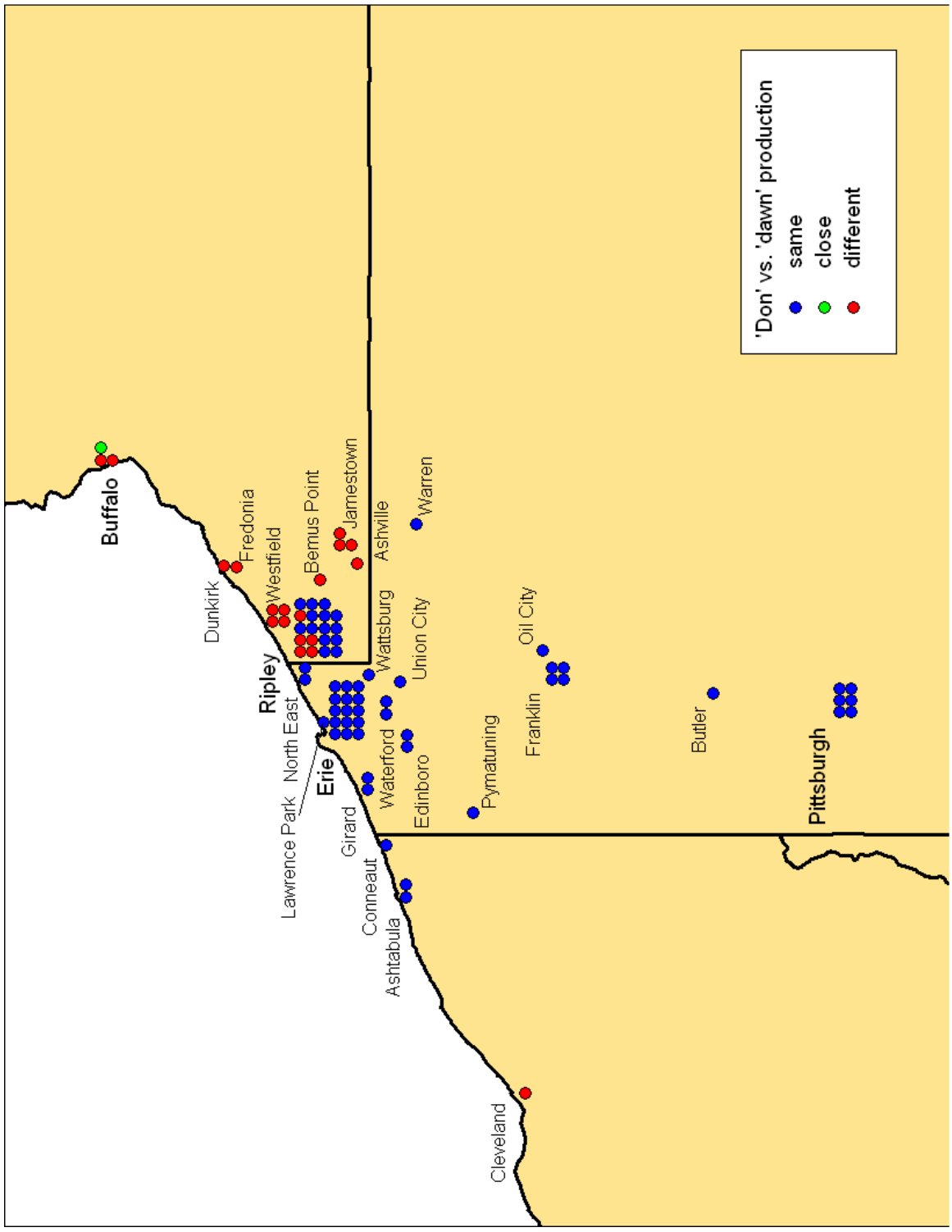

Figure 6.16: Geographic extent of the merger of *Don* and *Dawn* around Erie, minimal pair production data

Figures 6.17 and 6.18 display the perception data for the pairs *cot* / *caught* and *Don* / *dawn*. The general pattern is the same as what was observed for the production data: the merger is present in all towns in western Pennsylvania, and has spread to the younger population of Ripley, NY. Other towns in Chautauqua Co., NY still maintain the distinction.

There are a few cases where there is a mismatch between the speaker's perception of the merger and my evaluation of their production data. In nearly all of these cases, the merger is more advanced in production than in perception. For the *cot* / *caught* pair, there are six speakers for whom the merger is more advanced in production than in perception, and only one speaker for whom the reverse is true.[17] Similarly, there are three speakers for whom the merger of *Don* and *dawn* is more advanced in production, and none for whom the reverse is true. This result goes in the opposite direction to previous findings, where the tendency was for the merger to occur earlier in perception than in production (DiPaolo (1988), Herold (1990:97), Labov (1994:319), Labov et al. (2006:63)[18]). However, the number of speakers involved in the present study is too small to make any reliable generalizations. Furthermore, the perceptual judgments for at least some of the speakers likely represent the influence of orthography. Two of the speakers for whom the merger is more advanced in production than in perception come from areas of western Pennsylvania where the merger almost certainly occurred before the speakers were born. These speakers are a 53-year-old woman from Waterford and a 62-year-old man from Franklin. Since it is very unlikely that either of these two speakers have anything but a total merger of /o/ and /oh/, their perceptual judgments could simply reflect an intrusion of the orthographic difference into their ability to perceive the vowel sounds properly.

[17] "More advanced in production" is defined here to mean a production rating of "same" or "close" if the perception rating was "different", or a production rating of "same" if the perception rating was "close".

[18] It should be mentioned, however, that the there was also a large minority of ANAE speakers who showed the opposite pattern, namely the merger occurring earlier in production than in perception.

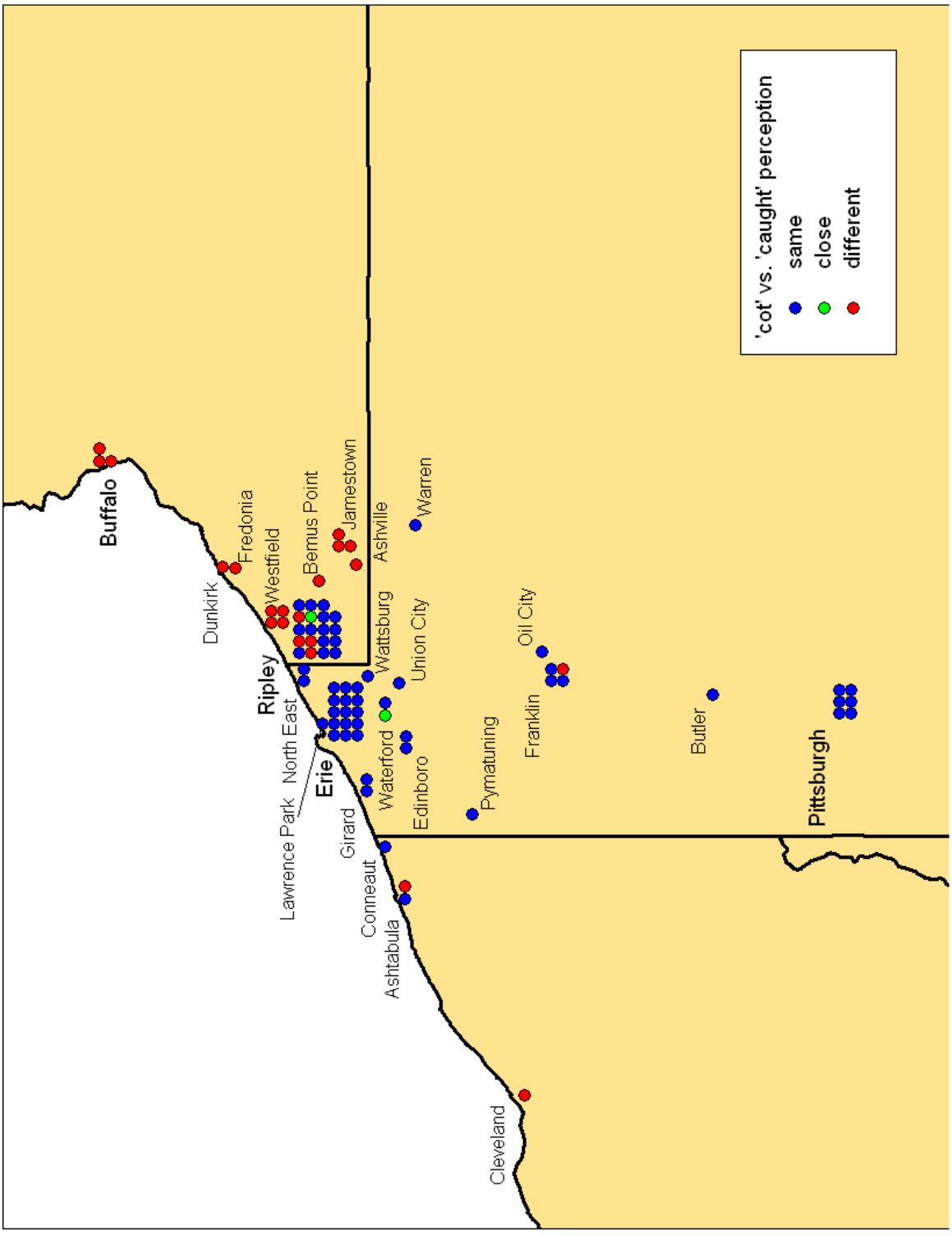

Figure 6.17: Geographic extent of the merger of *Don* and *Dawn* around Erie, minimal pair perception data

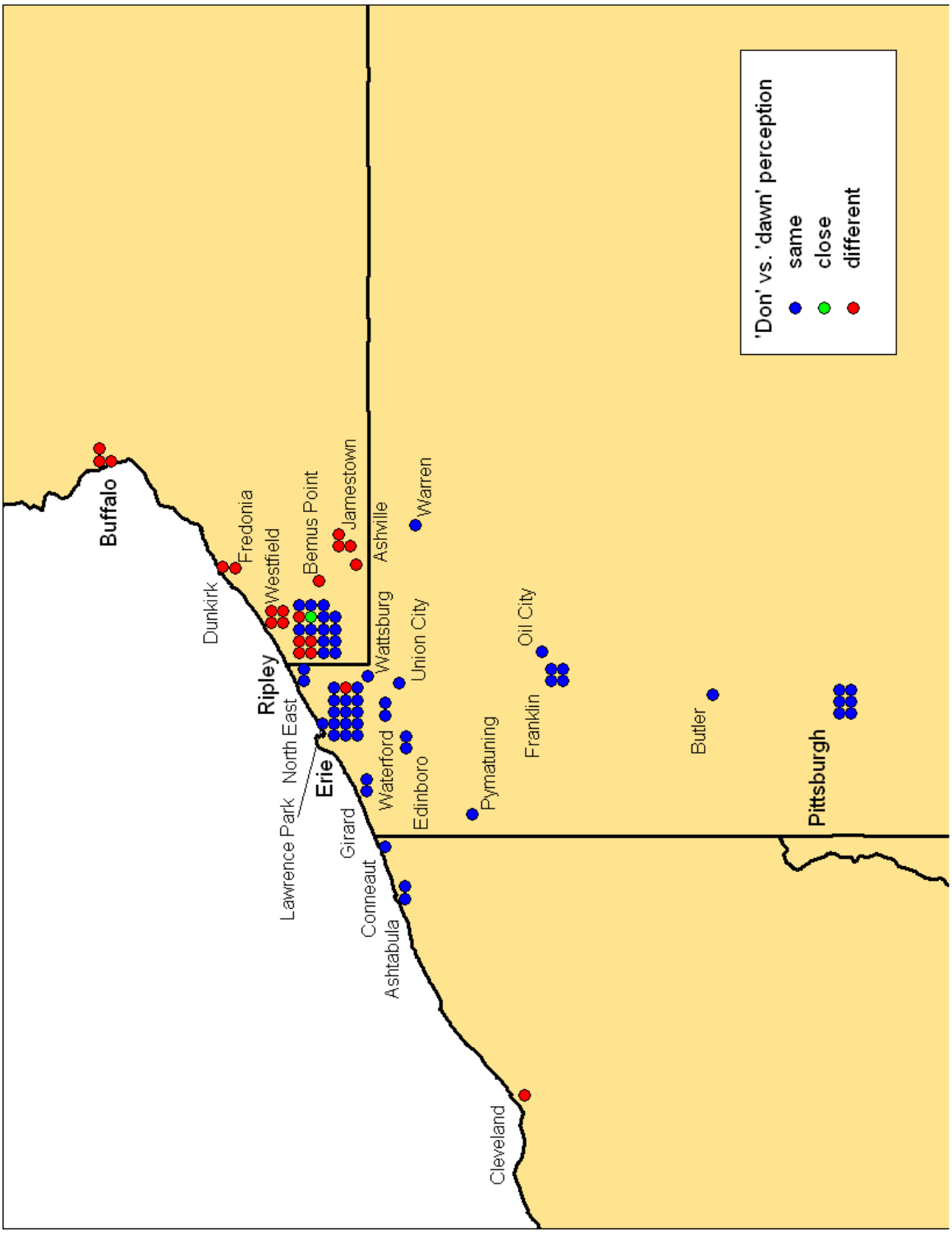

Figure 6.18: Geographic extent of the merger of *Don* and *Dawn* around Erie, minimal pair perception data

Finally, Figures 6.19 through 6.22 present the production and perception results for minimal pair tests for the pairs *collar* / *caller* and *stock* / *stalk*. These two pairs test whether the speaker maintains the /o/ $\sim$ /oh/ distinction before /l/ and /k/, respectively. The number of speakers in my corpus who did minimal pair tests for these pairs is smaller than the number who did tests for *cot* / *caught* and *Don* / *dawn*, since *collar* / *caller* and *stock* / *stalk* were not added to the list until mid-way through my field work.

However, even with this smaller set of responses the same general geographic pattern for the merger of /o/ and /oh/ is observable. Nearly all speakers in Western Pennsylvania are merged in both production and perception for the two pairs. The only speakers in Pennsylvania whose production tokens were not given the rating "same" are two speakers who produced the pair *collar* / *caller* as slightly distinct and the pair *stock* / *stalk* as different.[19]

[19]The speaker from North East pronounced *stalk* (presumably unnaturally) with an /l/, and the speaker from Erie produced *stock* and *stalk* differently during his first reading, but produced them identically when he repeated them.

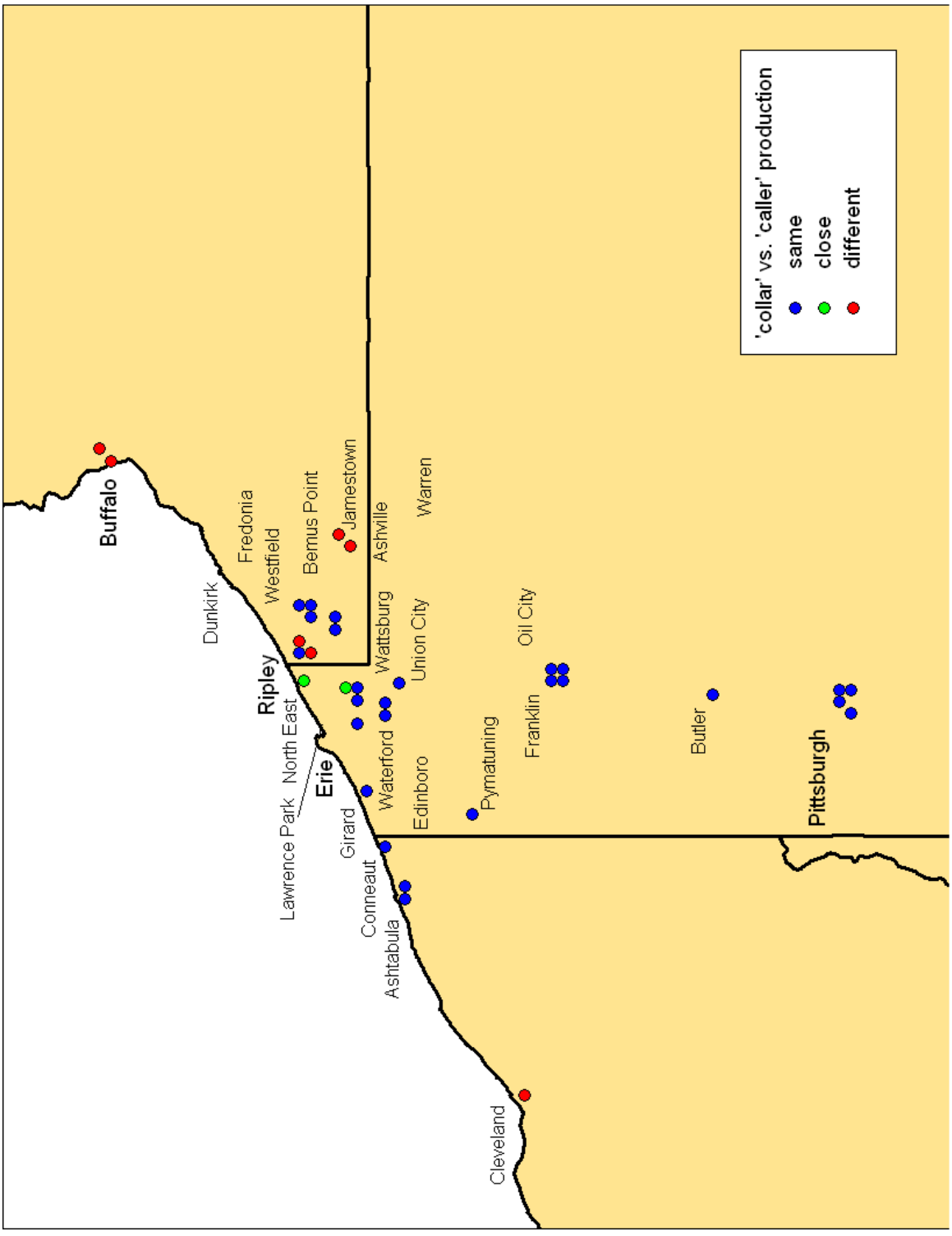

Figure 6.19: Geographic extent of the merger of *collar* and *caller* around Erie, minimal pair production data

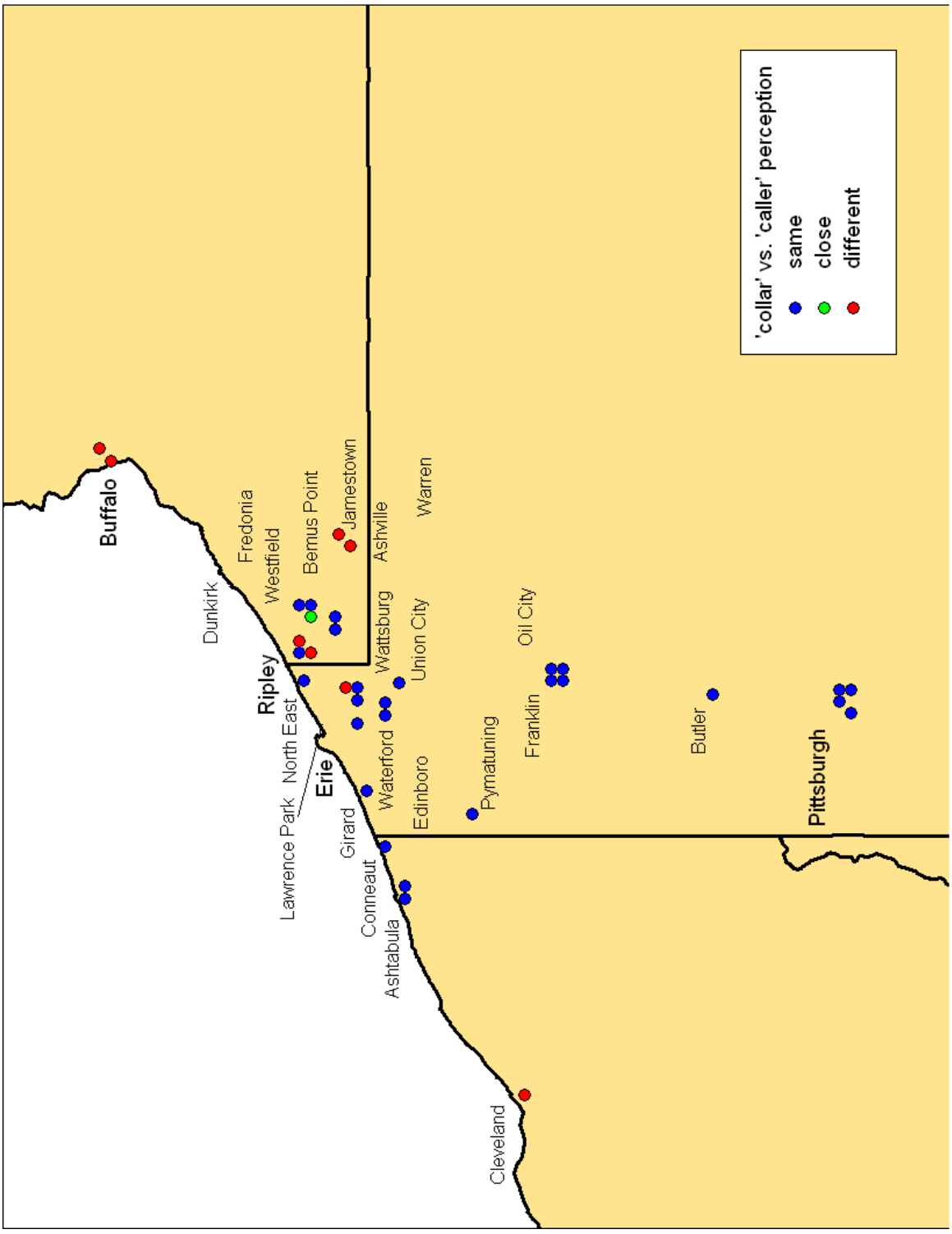

Figure 6.20: Geographic extent of the merger of *collar* and *caller* around Erie, minimal pair perception data

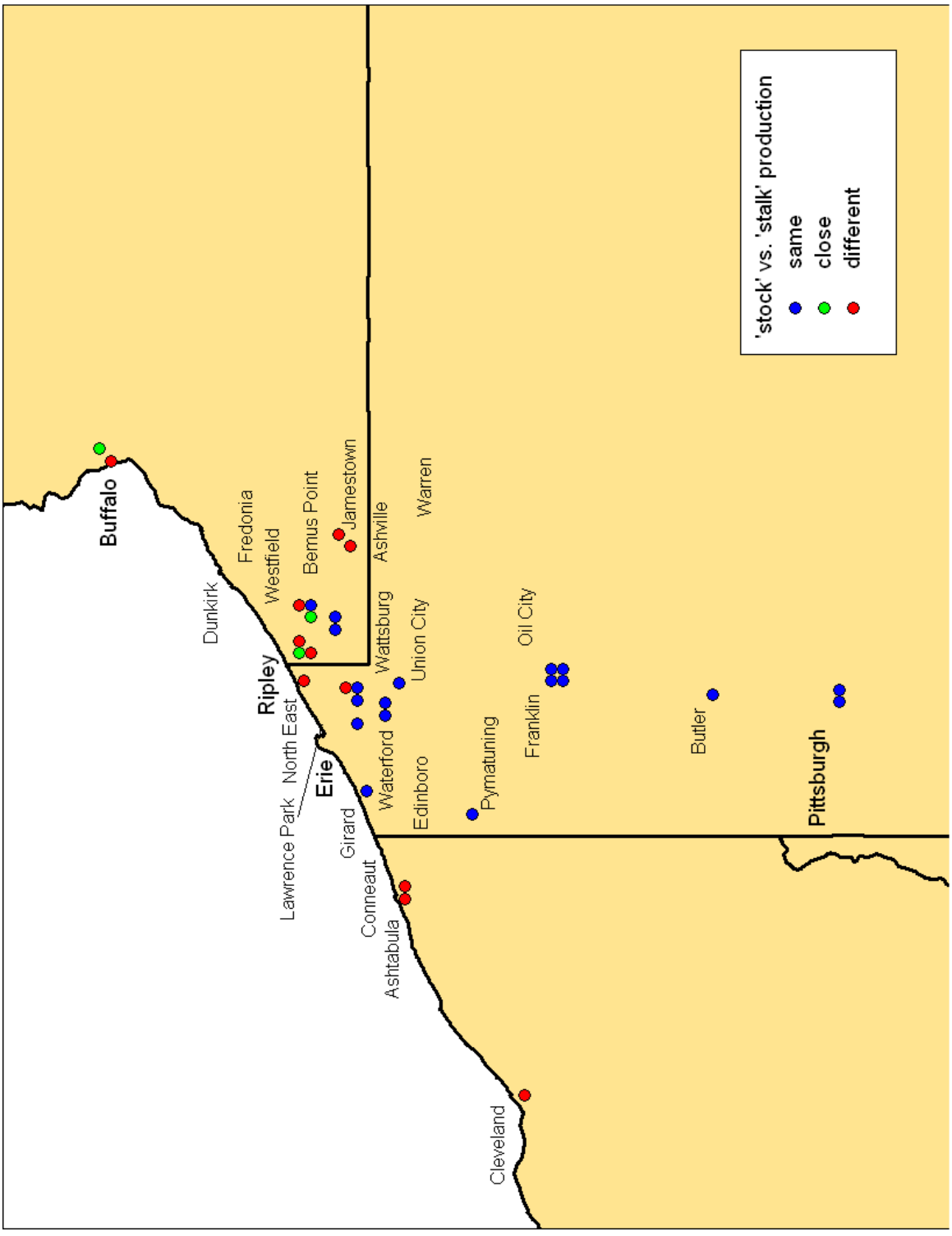

Figure 6.21: Geographic extent of the merger of *stock* and *stalk* around Erie, minimal pair production data

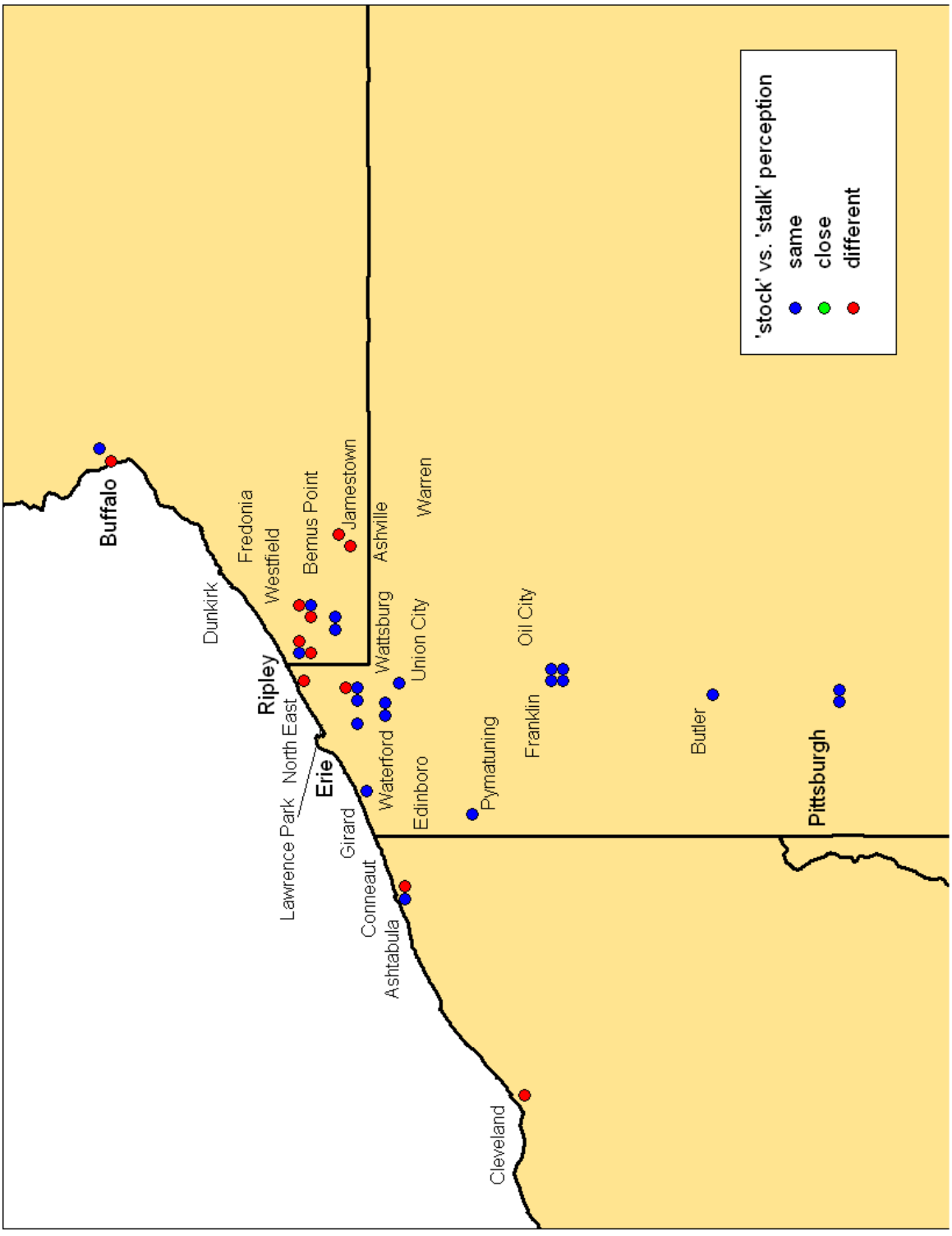

Figure 6.22: Geographic extent of the merger of *stock* and *stalk* around Erie, minimal pair perception data

Another intriguing result that is apparent in Figures 6.15 through 6.22 is that the merger of /o/ and /oh/ has spread to the towns of Conneaut and Ashtabula in northeastern Ohio.[20] Unfortunately, there are no prior studies of these towns to compare this evidence to, but it can be assumed that they were originally unmerged and Northern (as were Erie and Cleveland on either side of them). The mergerd speaker from Conneaut is a 52-year-old woman, and the two merged speakers from Ashtabula are women who were born in the 1930's. Thus, it appears that the merger spread to these two towns quite some time ago. Further research in the region between Ashtabula and Cleveland is necessary to determine the exact location of the current boundary for the merger of *cot* and *caught* in northeastern Ohio.

Finally, Figure 6.23 displays the Euclidean distance between /o/ and /oh/ for all speakers in the corpus. This map shows the same geographic pattern as the maps for the minimal pairs. The only speakers in Pennsylvania who have a distance of greater than 300 Hz are archival speakers from DARE (two from North East, one from Union City, and one from Warren). The town of Ripley displays considerable variation: some speakers maintain a clear distinction with a distances of greater than 300 Hz between /o/ and /oh/, while others appear to have merged the two classes. A more detailed analysis of these speakers from Ripley will be conducted in the next section.

6.9 A case study of the merger in progress: the town of Ripley

As the previous section showed, Ripley is the only town where inter-speaker variation was observed in the results of the minimal pairs tests for /o/ and /oh/. Additionally, Figures

[20]The only one of the four minimal pairs that was produced differently was *stock* / *stalk*. Again, the two speakers who produced a difference were apparently confused by the orthography of *stalk* and unnaturally inserted an /l/ into their pronunciations.

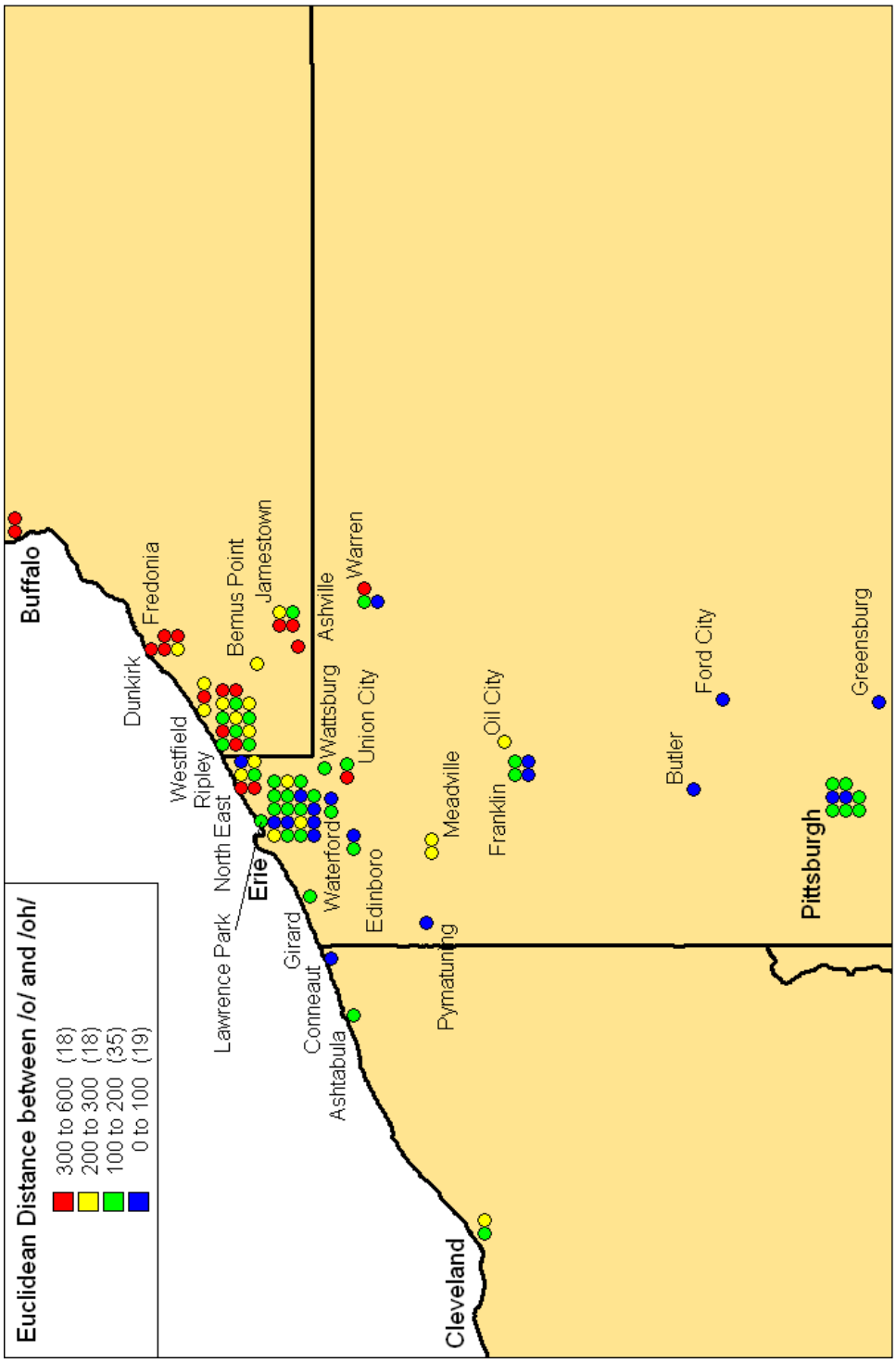

Figure 6.23: Euclidean distance between the mean values of /o/ and /oh/

6.15 and 6.16 clearly show an apparent time distribution in which the merger has become more prevalent in Ripley over time. This section will take a more in-depth look at the results for the individual speakers from Ripley in an attempt to understand how the merger spread to that town.

First of all, the evidence from the young speakers I interviewed in Ripley clearly shows that the merger has progressed to completion for both male and female speakers in Ripley. I conducted abbreviated interviews with five female students and two male students at the high school in Ripley, and their minimal pair tests for /o/ and /oh/ demonstrated a complete merger in production and perception. Furthermore, I conducted full interviews with three other adolescents from Ripley. Both the minimal pair tests and the acoustic data from these interviews demonstrate that these three speakers also have a complete merger of /o/ and /oh/. As an example, Figure 6.24 shows a plot of /o/ and /oh/ for Ryan N., a 15-year-old high school student. This plot shows that Ryan N. has an almost complete overlap between the two distributions, and a rather back /o/ with a mean F2 value of 1266 Hz.

While the adolescents I interviewed in Ripley were categorically merged, there is a large amount of inter-speaker variation among the adults in the town. Based on the minimal pair tests for /o/ and /oh/, the adults I interviewed fall into three categories, defined as follows:

- **Merged speakers**: both the production and perception values for the minimal pairs *cot* / *caught* and *Don* / *dawn* are "same"

- **Unmerged speakers**: both the production and perception values for the minimal pairs *cot* / *caught* and *Don* / *dawn* are "different"

- **Transitional speakers**: the production and perception values for the minimal pairs *cot* / *caught* and *Don* / *dawn* do not unambigiously characterize the speaker as merged or unmerged (there is either a mismatch in production and perception for one of the

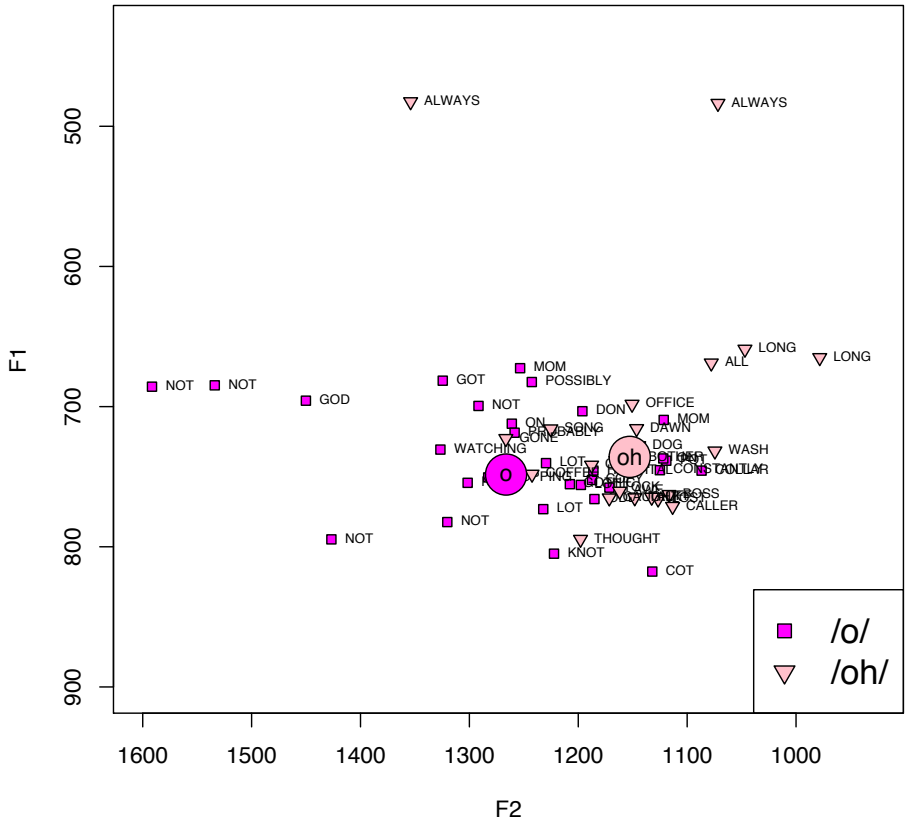

Figure 6.24: /o/ and /oh/ from Ryan N., born 1994 in Ripley
Mean(/o/) = (748, 1266), N=30; Mean(/oh/) = (736, 1153), N=16; Dist(/o/, /oh/) = 114

Name	Born	Occupation
Tracy N.	1972	waitress
Pam O.	1958	winery owner

Table 6.11: Demographic information for two adult speakers in Ripley who have the merger of /o/ and /oh/

Name	Born	Occupation
Sheila T.	1950	waitress
Rachel A.	1951	daycare provider
John M.	1953	town supervisor
Daphne R.	1958	grape farmer
Jane L.	1960	waitress
Rachel C.	1963	town clerk

Table 6.12: Demographic information for six unmerged adult speakers in Ripley

minimal pairs, or the two pairs produced different results)

Tables 6.11 through 6.13 display the demographic information for the speakers from Ripley that fall into each of these three categories.

The lists of speakers in Tables 6.11 – 6.13 suggest that the merger was in progress in Ripley at least 60 years ago. The ages of the speakers in each group suggest that the merger advanced more quickly among men, although the number of speakers is too small to say this with certainty. The data from the three DARE speakers from Ripley would fit well

Name	Born	Occupation
Stan R.	1948	grape farmer
Larry K.	1952	town supervisor
Rebecca R.	1980	baker

Table 6.13: Demographic information for three transitional adult speakers in Ripley

with this observation. The two male DARE speakers from Ripley (born in 1886 and 1898) appeared to already be in transition to the merger, while the female speaker (born in 1889) maintained a clear distinction. Thus, there appears to have been a period of nearly 100 years during which the merger was slowly spreading throughout the town of Ripley.

6.10 Explaining the chronology of the merger

The original starting point for the chronology of the merger was LAMSAS speaker PA67b from Amity township in Erie County. He was born in 1903, and maintained a clear distinction between /o/ and /oh/, according to Kurath and McDavid (1961) and Wetmore (1959). This suggested that the merger did not reach Erie until around the second decade of the 20th century, at the earliest. However, the apparent time date from the elderly speakers from Sun Valley demonstrated that a complete merger had spread through the city of Erie by the 1920's. Additionally, three archival speakers (the two from the SWV corpus and H.O. Hirt) suggest that the merger was in transition in the city of Erie and the neighboring town of North East by the turn of the 20th century.

The apparent contradiction between the LAMSAS data and the other evidence can be explained by considering the specific location in Erie County of the two unmerged LAMSAS speakers. Neither of them were from the city of Erie itself; rather they were born and raised in small farming communities in the southeastern part of Erie County. On the other hand, the speakers who provide evidence for an earlier date for the merger are much more connected to the city than the LAMSAS speakers: H.O. Hirt and the Sun Valley residents are all from the city of Erie itself, and the two SWV speakers are from North East. North East is only slightly closer to Erie than Amity in terms of distance, but is much more closely connected with Erie, since it is a larger community and a major highway passes between Erie and North East.

So, if all of the temporal and geographic evidence is taken at face value, then it indicates that the merger first occurred in the city of Erie, and then spread gradually to the nearby townships in Erie County. The spread of the merger proceeded in accordance with the Cascade Model of Labov (2003), first to the more populous ones, then, finally, to the smaller, more isolated ones. H.O. Hirt's data indicates that the merger probably took place in Erie already before the turn of the 20th century. The two SWV speakers indicate that it had spread to North East by around 1910. Finally LAMSAS speaker PA67b indicates that the merger had not yet reached Amity township by 1910.

This Cascade Model pattern of the merger spreading to the larger cities in a county first and from there to the smaller towns appears to be applicable to the other counties of northwestern Pennsylvania as well, although the data for Warren and Crawford Counties is not as clear. Table 6.7 showed that a female speaker born in 1907 in the city of Warren was transitional, and Figure 6.3 showed that the two LAMSAS speakers from rural areas of Warren County were unmerged. These two speakers, however, were born one and two generations earlier than the DARE speaker from the city of Warren. Thus, a Cascade Model spread of the merger to Warren County is not contradicted by the evidence from these three speakers, but a more geographically continuous model also cannot be ruled out by the dates. Finally, the oldest DARE speaker from Meadville, the largest city in Crawford County, also appeared to be transitional (see Table 6.4). She was born in 1899. The mergerd LAMSAS speaker in Crawford County was from the rural town of East Fallowfield, in the southern part of the county, and was born in 1859. Again, it is possible for the Cascade Model to explain this situation (assuming the merger was in transition in Meadville for two generations); however, a model in which the merger spread monotonically from the South to the North would also apply.

The only county which is a clear counter-example to the Cascade Model for the spread of the merger is Chautauqua County, NY. In that county, the merger has spread to Ripley, a

small farming town, but none of the other larger towns. In this case, proximity to the large city of Erie seems to be the dominant factor. Ripley is just across the state line from North East, PA, and is only about 25 minutes away from Erie. Residents of Ripley are much more connected to Erie than to other cities in Chautauqua County, such as Jamestown. Furthermore, the other cities and towns in Chautauqua County have more structural resistence to the merger of /o/ and /oh/, because /o/ is more strongly fronted there than in Ripley. This aspect of the spread of the merger will be explored more in Section 7.3.2.