

Weakening Resistance: Progress Toward the Low Back Merger in New York State

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1 Background

The merger of the low back vowel phonemes /o/ (as in *lot* and *cot*) and /oh/¹ (as in *thought* and *caught*) is very widespread in North American English. The *Atlas of North American English* (Labov, Ash, and Boberg 2006; henceforward *ANAE*) shows that the merger is complete or nearly complete in a collection of regions amounting to nearly half the population of Anglophone North America, including all of Canada, nearly all of the western United States, northern and eastern New England, and western Pennsylvania. In certain other regions, the merger is observed to be incomplete and in progress: notably the area identified as the Midland, including the major cities of central and southern Ohio, Indiana, and Illinois.

There remain three regions that *ANAE* describes as showing “stable resistance” to the low back merger, by virtue of the fact that in each of the three regions either /o/ or /oh/ has undergone some change that has increased the phonetic distance between the two phonemes. In the South, /oh/ is developing into a diphthong with a rounded offglide. In a collection of urban areas in the Northeast from Providence, R.I., through New York City and down toward Baltimore, /oh/ is substantially raised out of the low back area of the vowel space. And in the Inland North (the region on the south side of the Great Lakes reaching at least from Syracuse, N.Y., in the east to Milwaukee in the west), /o/ is fronted out of the low back area as part of the Northern Cities Shift (NCS), a chain shift involving /o/ and several other vowel phonemes.

Labov (1994) states what he calls Herzog’s Principle: “Mergers expand at the expense of distinctions.” If we take Herzog’s Principle seriously, it implies that there shouldn’t be areas of “stable resistance” to the low back merger; there should only be areas that haven’t undergone the merger *yet*. So the question being examined in this paper is the following: is the posited resistance to the merger in regions such as those listed in the foregoing paragraph strong enough to withstand the general tendency of mergers to expand? Or is it just a matter of time before the low back merger spreads to those areas too?

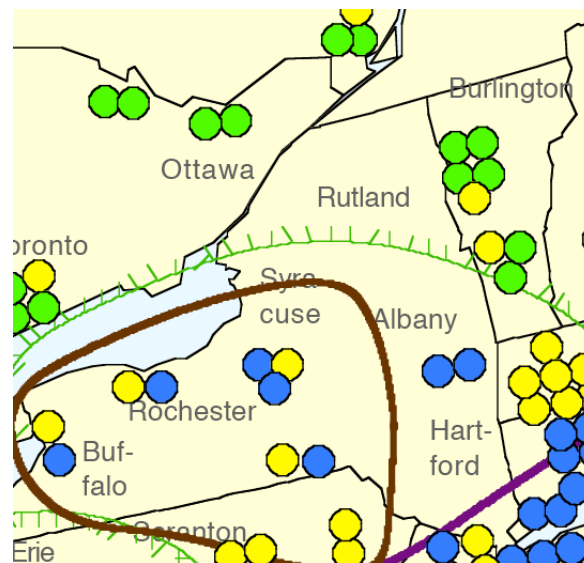


Figure 1: Upstate New York as shown in *ANAE*. The brown line outlines the Inland North region; the purple line sets off the region of raised /oh/; the green line marks areas of completed merger.

¹I use the notation of Labov, Ash, and Boberg (2006).

2 Sample of Communities

Upstate New York, as shown in Figure 1, provides a handy opportunity for examining multiple /o/~/oh/ systems in close contact with one another. Upstate New York includes part of one of *ANAE*'s three areas of resistance, the Inland North. To the south, it's adjacent to the New York City area, which is part of another area of resistance. To the north and northeast, it's adjacent to Canada and Vermont, areas where the merger is complete. And in between, there appears to be an area where none of these things are the case. In this paper, I examine the status of the /o/ and /oh/ phonemes in a set of 146 speakers: 27 interviews from *ANAE*'s data set with speakers in or near upstate New York, and 119 new interviews conducted with Upstate speakers. A full list of communities and the exact number of sampled speakers from each appears in the Appendix to this paper; a map showing the location of each community appears as Figure 2.

The bulk of the new interviews were conducted according to the Short Sociolinguistic Encounter methodology developed by Ash (2002): 10- to 25-minute semi-anonymous interviews with individuals approached in public places, including spontaneous conversation and some formal data-elicitation methods. These were supplemented with a smaller set of telephone interviews carried out following the *ANAE* methodology. All speakers analyzed confirmed that they had lived in the community in which they were interviewed since before starting school. Measurements were taken in Praat of the first and second formants of stressed vowels and log-mean normalized in Plotnik, using the same group norm used in *ANAE*.

Since this sample overlaps several dialect regions where the low back vowels have different statuses, it will be advisable to look at each region individually and compare the behavior of the low back vowels in each of them. Figure 2 shows the five dialectological sets into which the data is divided for the purposes of this paper.

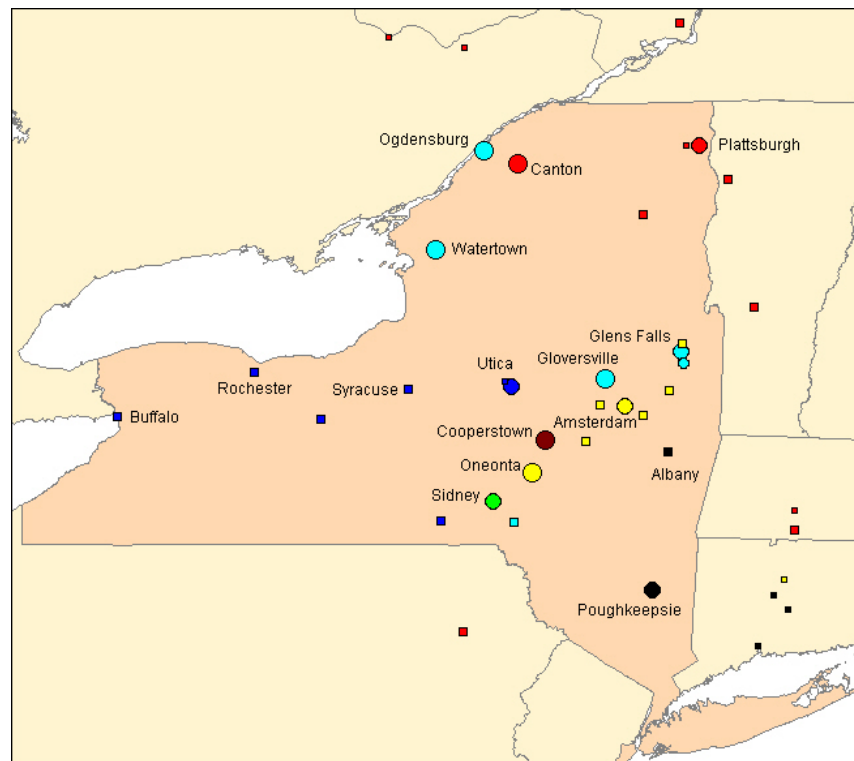


Figure 2: The current study's sample. The size of the symbols approximately indicates the number of speakers interviewed in each community; details are in the Appendix. Colors indicate the dialectological subsets, as described below.

In red on Figure 2 are communities where there is already strong evidence that the low back

merger is in progress: in 12 of the 13 red communities, more than half of the sampled speakers judged *cot-caught*-type minimal pairs as the same or close. Cities in black are those with raised /oh/, as in New York City; in each of those five cities, the mean F1 of /oh/ over all sampled speakers was less than 700 Hz. Communities in dark blue are part of the “core” of the Inland North, where /o/ is fronted as part of the NCS: these are communities classified by *ANAE* as Inland North, or in which all speakers I interviewed showed the NCS to a more or less advanced degree. The light blue communities are what I call the “fringe” of the Inland North (Dinkin 2008), in which the NCS is present in the speech community, but a majority or large minority of speakers don’t exhibit it or exhibit it to a reduced degree. In communities marked in yellow, none of those conditions obtain: /oh/ is not raised, the NCS is absent, and the low back merger is not already obviously dominant. That leaves two villages: Sidney (marked in green) and Cooperstown (marked in maroon). In these villages, the NCS appears to be receding; some older speakers exhibit it, but younger speakers don’t.

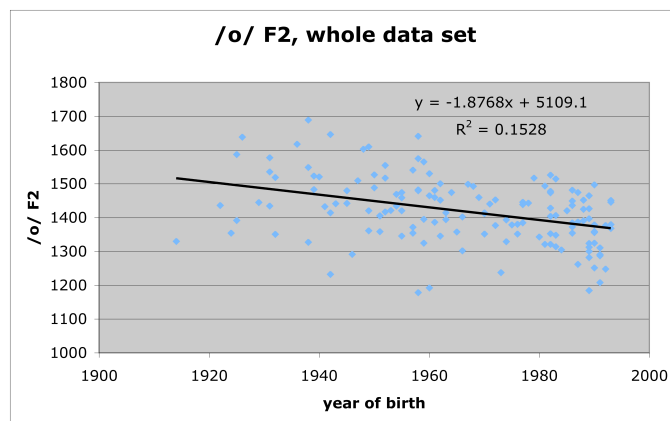


Figure 3: The backward movement of /o/ in apparent time.

3 Backing of /o/ in Apparent Time

In the full corpus of 146 speakers, the Cartesian F1/F2 distance between /oh/ and /o/ is diminishing in apparent time at a rate of -2.13 Hz per year: /oh/~/o/ distance is correlated to speaker’s year of birth relatively weakly ($r^2=0.12$) but statistically significantly ($p < 10^{-4}$). Although /oh/ is marginally lowering in apparent time (0.53 Hz/year, $r^2=0.04$, $p < 0.02$), the bulk of the movement seems to be the backing of /o/ (-1.88 Hz/year, $r^2=0.15$, $p < 10^{-5}$), as shown in Figure 3. So overall, it looks like /o/ and /oh/ are getting closer together in Upstate New York by the backing of /o/.

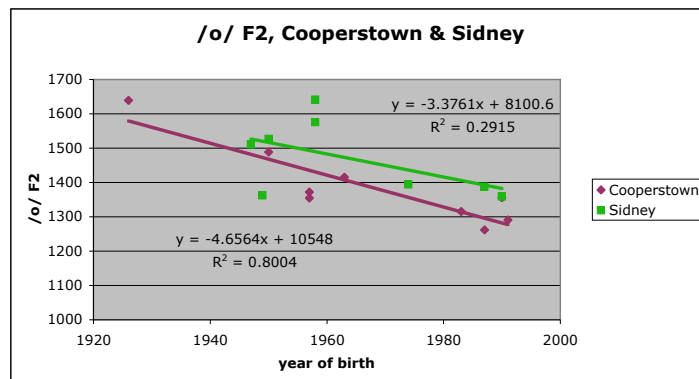


Figure 4: The backing of /o/ in Cooperstown and Sidney.

Now let's break the corpus down into subsets and see how /o/ is behaving in each. There are two villages in the corpus, Sidney and Cooperstown, in which the NCS is apparently receding in apparent time. In such communities, we'd *expect* /o/ to be backing, since the fronted /o/ is part of the NCS. In Figure 4, that's exactly what we find. Although the Pearson correlation for Sidney does not reach the level of statistical significance due to the small sample size and one low outlier among the older speakers, in both communities *t*-tests find the younger speakers to have /o/ significantly backer than the older speakers.

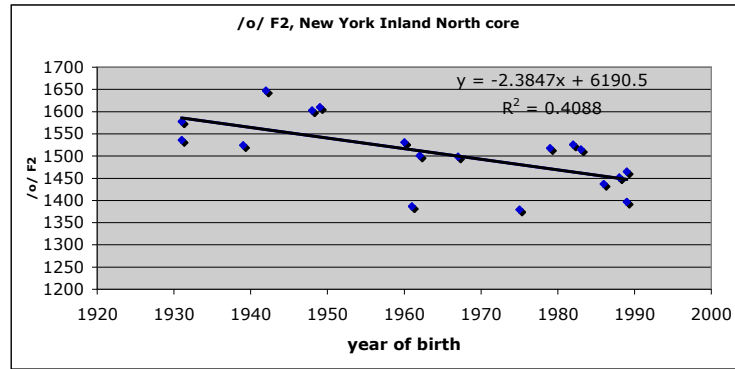


Figure 5: Backing of /o/ in apparent time in the Inland North core communities.

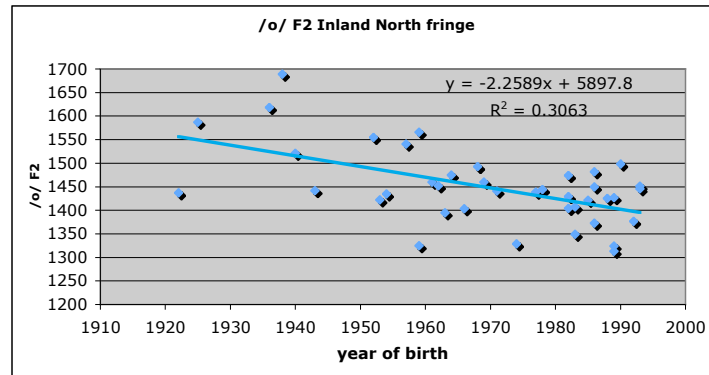


Figure 6: Backing of /o/ in apparent time in the Inland North fringe communities.

While it is unsurprising to find /o/ backing in apparent time in communities where the NCS as a whole is receding, what is surprising is to find the same change in communities where the NCS seems otherwise stable. But that's exactly what we see in Figures 5 and 6 for the Inland North core and fringe communities; F2 of /o/ is more tightly correlated with year of birth in both the core and fringe than it is in the data set as a whole. These are communities that are not retreating from the NCS wholesale; there is no statistically significant apparent-time trend away from other features of the NCS. In fact, in the fringe, one NCS feature, the backing of /e/, is still in progress in apparent time, even as /o/ is moving away from its NCS position. Moreover, even though the Inland North fringe contains some speakers who do not exhibit the NCS, the trend remains even if all non-NCS speakers are excluded. There are 34 speakers in the sample of 146 who satisfy at least four of the five criteria of NCS participation defined by Labov (2007); even among those, /o/ is still clearly backing in apparent time ($r^2=0.42$). So the backing of /o/, though it is the opposite of one of the key NCS changes, is capable of coexisting with the NCS in the same set of speakers.

This leads us to the following hypothesis: the backing of /o/ is a new internal development of the NCS phonology in the Inland North: perhaps /o/ has simply moved forward as far as it can and is now reversing its direction of movement among younger Inland North speakers. We can test this by looking at speakers in the rest of the Inland North: *ANAE* presents phonetic data on 61 speakers in the Inland North region, of whom 53 are not from Upstate New York and therefore not

included in Figure 5. If backing of /o/ is simply a new development of the NCS phonological system in the Inland North region, we should see backing among those speakers as well. Figure 7 shows that this is not the case: among the full set of *ANAE* speakers in the Inland North region, there is no apparent time change in F2 of /o/ whatsoever. Backing of /o/ is a feature of the Upstate New York portion of the Inland North, but not of the Inland North region as a whole.

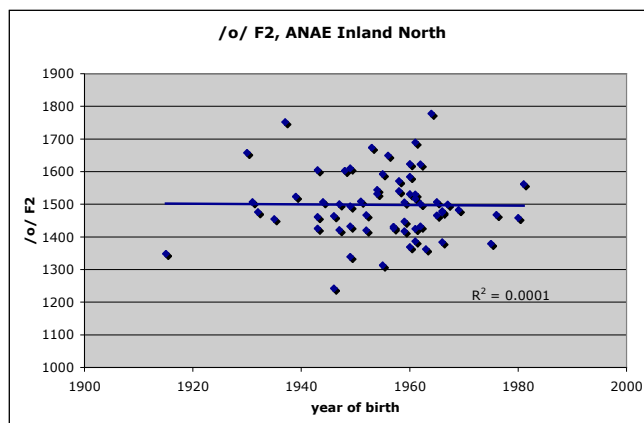


Figure 7: The lack of change in F2 of /o/ in the Inland North as a whole, using *ANAE* data.

Is the backing of /o/ then only a development of the Inland North portion of Upstate New York, or is it a feature of Upstate New York as a whole? Well, the communities marked in yellow on Figure 2 are the residual class of communities where the NCS is absent but which are not categorized by low back merger or raised /oh/; Figure 8 shows that these communities show the same backing of /o/ that appears in Figures 5 and 6. In other words, the backing of /o/ does not respect the boundary separating communities with the NCS from communities without it; it is not a new development of the NCS contingent on the phonological structure of the chain shift.

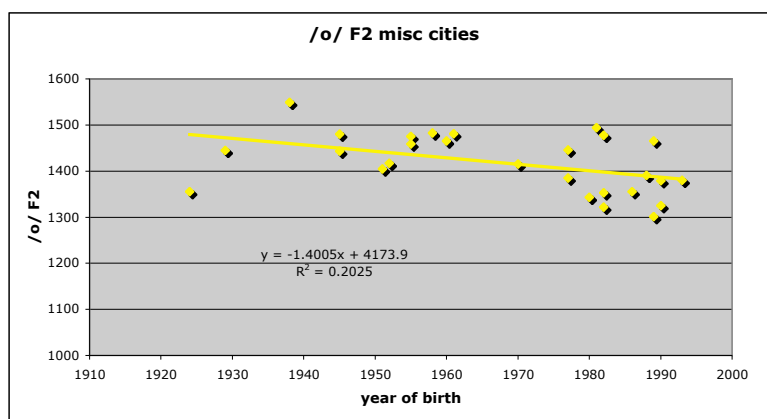


Figure 8: Backing of /o/ in the residual class of communities.

There remain two subsets of communities to examine: those where the low back merger is already having a direct effect on speakers' explicit phonological judgments, and those where /oh/ is raised as in New York City. In the communities where the merger is already evidently in progress, there is a slight trend towards backing of /o/ ($r^2=0.13$, $p < 0.05$). It is of course extremely unsurprising that in communities where the merger is ongoing and partially complete, /o/ should be approaching /oh/ in apparent time. Moreover, if we exclude the *ANAE* cities in Canada and Vermont, in which the merger is already *fully* complete, the apparent-time trend in the remaining cities becomes much clearer: r^2 rises to 0.41 ($p < 0.001$), as shown in Figure 9.

The only one of the five subsets of the data where there is no statistically significant correlation of F2 of /o/ with year of birth consists of the communities with raised /oh/. Table 1 sums up the apparent-time status of F2 of /o/ and the Cartesian distance between /oh/ and /o/ for all five sets of communities.

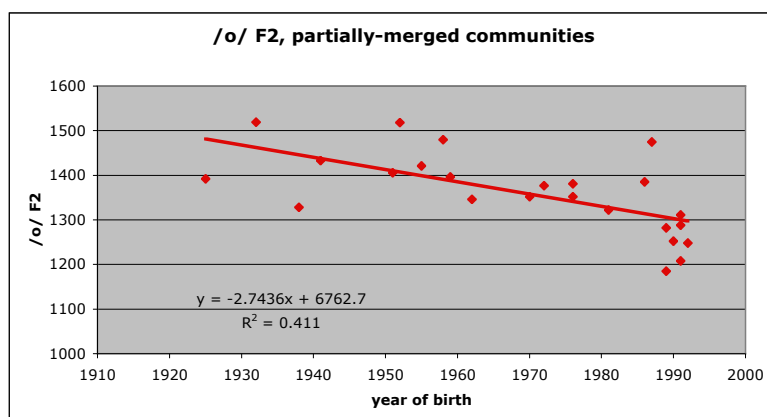


Figure 9: Backing of /o/ in communities where the low back merger is in progress.

subset	n	/o/ F2 vs. year of birth			/o/~oh/ Cartesian vs. year of birth		
		r^2	p	slope	r^2	p	slope
IN core	18	.4088	< .005	-2.385	.2267	< .05	-2.169
IN fringe	40	.3063	< .0002	-2.259	.3018	< .0005	-2.301
misc.	27	.2025	< .02	-1.400	.2718	< .01	-1.968
merging	32	.1295	< .05	-1.559	.0760	n.s.	
mrg in prog.	24	.4110	< .001	-2.744	.5143	< .0001	-2.978
raised /oh/	12	.1220	n.s.		.0515	n.s.	

Table 1: Pearson correlations of F2 of /o/ and of the Cartesian distance between /o/ and /oh/ in Hz with year of birth for each of the five subsets of communities.

So to sum up the story so far, /o/ is backing in four out of five subsets of Upstate New York communities, including both communities with the NCS and communities where the low back merger is in progress. This leads us to the hypothesis that the backing of /o/ spread to the rest of New York *from* the communities where the merger is in progress: for example, that in those communities, in the northeastern corner of New York, /o/ was backing as part of the merger; and then the backing of /o/ spread from there to the Inland North fringe communities to the immediate south and west, and then beyond into the Inland North core and miscellaneous groups of communities. The details of the apparent-time profile of /o/, however, make this scenario seem unlikely, as will be discussed in the next section.

4 Abrupt Change in /o/?

A closer look at Figures 5, 6, 8, and 9 in the foregoing section reveals that, although each displays a statistically significant change in apparent time, they do not show the smooth trajectory expected of a phonetic change in progress. Rather, the backing of /o/ seems to have occurred suddenly: in nearly all cases, the only change is between speakers born before about 1960 and speakers born after, with no statistically significant change in apparent time either among the older speakers alone or among the younger speakers alone.

For example, look back at the Inland North fringe communities from Figure 6. The speakers born before 1959 have F2 of /o/ almost all between 1420 Hz and 1620 Hz, and the speakers born after 1959 are all between 1300 Hz and 1500 Hz. It doesn't appear to be a robust change in

progress; it looks as if something happened in 1959 and suddenly everyone's /o/ was about 120 Hz backer. Figure 6 is reproduced as Figure 11, highlighting the difference between the older and younger speakers and showing that there is no correlation between F2 of /o/ and age if the older speakers or younger speakers are considered alone.

The other three subsets of the data show similar jumps, with occasional individual outliers; in each case the younger speakers' /o/ occupies a range about 100 Hz backer than the older speakers'. The break can be made within a couple of years of 1960 in each case, although due to gaps in the data it could be as early as 1950 in the Inland North core communities and as late as 1970 in the miscellaneous subset. The only subset of communities in which there is any significant change in apparent time either before or after about 1960 is in the communities where the merger is in progress (Figure 9 above), which shows a similar abrupt leap around 1987. Table 2 summarizes the difference between older and younger speakers in each subset of the data.

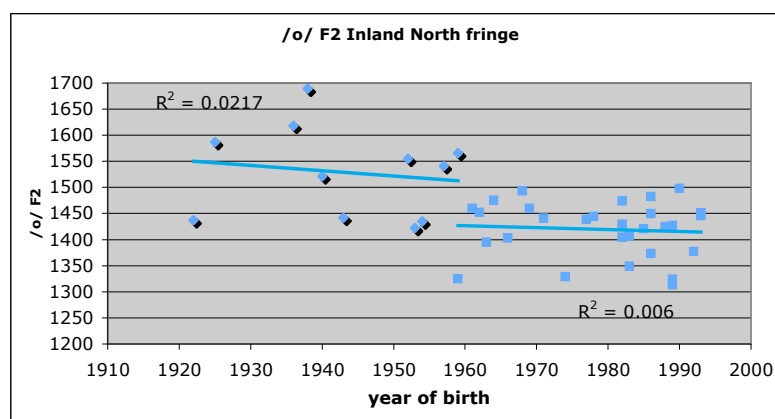


Figure 11: F2 of /o/ in the Inland North fringe, divided into older speakers and younger speakers. There is no apparent-time trend within either of the two age groups, only between them.

subset	year of split	older speakers /o/ F2			younger speakers /o/ F2			<i>p</i> (<i>t</i> -test)
		range	mean	<i>n</i>	range	mean	<i>n</i>	
IN core	1960	1524–1647	1576	7	1379–1526	1461	11	< .0005
IN fringe	1959	1422–1689	1528	11	1313–1498	1420	29	< .002
misc. ²	1961	1355–1549	1455	12	1301–1494	1389	15	< .005
mgr in prog.	1959	1328–1519	1433	9	1185–1475	1318	15	< .001

Table 2: The difference between older and younger speakers in F2 of /o/ for each subset. “Year of split” denotes the latest year of birth included in the “older speakers” group.

So the backing of /o/ seems to have happened somewhat abruptly, and at about the same time throughout Upstate New York; or if anything, it happened in the Inland North core earlier than in other regions. What this means is that the backing of /o/ didn't begin in communities without the NCS, and then spread to affect NCS communities also; this backing must have been present in the Inland North from the outset.

5 Discussion

To sum up the findings of the previous two sections, around 1960, most of Upstate New York, including parts of Upstate New York with the NCS, moved /o/ back by about 100 Hz. In the rest

²In this subset, all but two older speakers are between 1400 and 1500 Hz. The five younger speakers who are fronter than 1400 Hz are all from communities with at most two speakers sampled, and it is possible that if more data were available some of these communities would be classified in the Inland North fringe.

of the Inland North, i.e., other places with the NCS, that didn't happen. Why, then, is there a difference between the Upstate New York component of the Inland North and the remainder of the Inland North? To answer that, let's look at *ANAE*'s map of the distribution of the low back merger, part of which is reproduced here as Figure 12.

Upstate New York is surrounded on almost half its circumference by regions where the low back merger is complete: Vermont to the northeast, Canada to the north and west, and western Pennsylvania to the southwest. On the other hand, the rest of the Inland North has relatively few points of contact with areas of completed merger: one between northeastern Ohio and northwestern Pennsylvania; one between southeastern Michigan and southwestern Ontario; and possibly a boundary somewhere between the Upper Peninsula of Michigan and the NCS regions of Wisconsin and the Lower Peninsula. To put it quantitatively, Upstate New York has an area of 44,000 square miles, and has at least 400 miles of land boundary with the merger. The western component of the Inland North is at least 58,000 square miles in area, and has at most 350 miles of boundary with the low back merger (if we include the Upper Peninsula, which isn't really directly adjacent to the Inland North). If we don't include the Upper Peninsula, the boundary of the western component of the Inland North with the low back merger is a total of 140 miles at most.

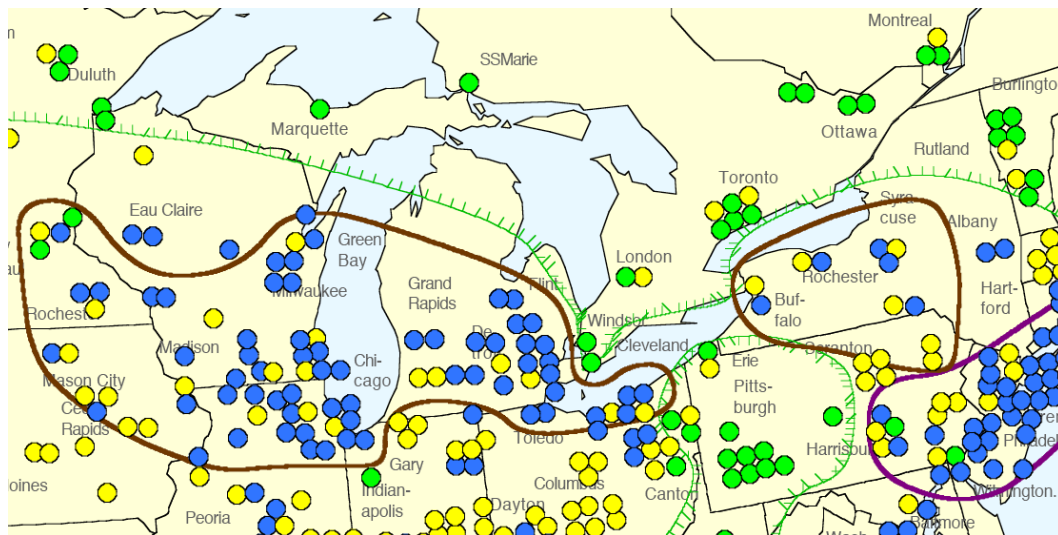


Figure 12: The distribution of the low back merger around the Inland North in *ANAE*. Green spots represent speakers with full merger; blue spots represent speakers with full distinction. The brown isogloss identifies the Inland North; the green isogloss regions of completed merger.

Obviously these numerical figures are extremely sketchy and not to be taken too seriously. The point, however, is the following: Upstate New York is much smaller than the western component of the Inland North, and unlike the western Inland North it is bordered in multiple directions by large areas where the low back merger has been established for decades. So that's the difference between Upstate New York and the western Inland North: Upstate New York is simply geographically **closer** to the low back merger. And so, keeping in mind Herzog's Principle that mergers expand, it seems reasonable to expect that Upstate New York would be subject to a greater degree of linguistic influence from the low back merger than the rest of the Inland North is. And since in most of the adjacent regions /o/ and /oh/ are merged in back position, the influence of those areas on Upstate New York could easily take the form of backing /o/.

This seems like a vindication for Herzog's Principle over the idea that the NCS affords "stable resistance" to the low back merger: Upstate New York is surrounded by the merger, and the merger seems to have the same effect on communities with the NCS as on communities without it, namely backing /o/ by about 100 Hz around 1960.

But suppose this analysis is wrong: suppose the backing of /o/ in Upstate New York is not caused by the presence of the merger in adjacent regions but has some other unidentified cause. After all, I have not presented any explanation for *why* the influence of the merger's presence in

adjacent regions should be a one-time backing of /o/ around 1960, rather than a gradual ongoing change. But even if /o/-backing isn't caused by the merger spreading from Canada and western Pennsylvania, it still constitutes evidence against the claim of "stable resistance."

What, after all, would "stable resistance" mean? In other words, how could you tell the difference between a community that stably resists a merger and one in which the merger is simply absent? It must be that the synchronic phonologic relationship between the two phonemes is different in merger-resistant dialects than in non-resistant dialects; for example, perhaps in a dialect that resists a merger the two phonemes simply differ in too many phonological features for the presence of the merger in a neighboring dialect to have any influence on the phonology of the resistant dialect.

In the Inland North, the feature that's supposed to cause "stable resistance" is the frontness of /o/. If true, this means that /o/ must be phonologically different in NCS dialects than in non-NCS dialects, which means that /o/ should respond differently to phonological pressure in NCS dialects than in non-NCS dialects. But here we've got some (possibly unknown) phonological influence causing /o/ to move back 100 Hz in Upstate New York around 1960, and it has *exactly* the same effect in communities with the NCS as in communities without the NCS. This is pretty strong evidence that /o/ in the Inland North is not *that* different, phonologically, from /o/ outside the Inland North. That means that we don't have, in the Inland North, a situation that can be described as *resistance* to merger, just a situation in which speakers don't *have* the merger.

And they really don't have the merger: outside the communities in red or maroon on Figure 2, perhaps 10 speakers out of 105 so much as judged /o/ and /oh/ as "close" or were confused about them. It's easy to see why there might be a temptation to describe a region where almost no speakers are merged or close as "resistant" to the merger. But consider *ANAE*'s three supposedly resistant regions: the Inland North, the South, and the raised-/oh/ Northeastern cities. The Inland North has been shown in this paper not to be effectively resistant to the effects of the merger. In the South, *ANAE* itself found a statistically significant apparent-time trend toward the merger, which questions the judgment of "stable resistance" there. The raised-/oh/ communities in the current sample did not show a trend toward backing of /o/ or lowering of /oh/, so they might constitute a more authentic case of stable resistance; perhaps the raising of /oh/ creates a more substantial phonological difference between /oh/ and /o/ than the NCS fronting of /o/ does.³ However, even in the raised-/oh/ Northeastern region the low back merger is encroaching: Johnson (2007) found the merger present among younger speakers in towns at the northeastern edge of this region as a result of migration into the area from merged regions, so the low back distinction is not secure even there. So the moral of this paper, then, is that mergers really do expand at the expense of distinctions.

Appendix: Data Set

The data analyzed in this paper includes:

- 10 telephone interviews with Upstate New York natives, and 17 with natives of nearby areas, conducted and analyzed by the Telsur project, 1995–2000 (*ANAE*), from the following communities:
 - Albany, Binghamton, Buffalo, Rochester, Syracuse (2 speakers each); Burlington VT, Rutland VT, Springfield MA, Scranton PA, Montreal QC (2 each); Hartford CT, Middletown CT, New Britain CT, New Haven CT, South Hadley MA, Amprion ON, Ottawa ON (1 each)
- 28 telephone interviews with Upstate New York natives, conducted 2006–08, from the following communities:

³For what it's worth, the phonetic distance in F1 of /oh/ between the raised-/oh/ and other communities in the current sample appears to be larger than the distance in F2 of /o/ between NCS and non-NCS communities: /oh/ in the raised-/oh/ communities is on average 124 Hz higher, 31% of the difference between the highest and lowest vowel means in the Telsur corpus, whereas /o/ in the NCS communities is only on average 83 Hz fronter, which is between 12% and 20% of the difference between the backest and frontest low vowel means in the Telsur corpus (depending on what counts as "low").

- Amsterdam, Canton, Cobleskill, Fonda, Geneva, Gloversville, Lake Placid, Ogdensburg, Saratoga Springs, Schenectady, Sidney, Walton (2 each); Cooperstown (4)
- 91 in-person interviews with Upstate New York natives, including Short Sociolinguistic Encounters (Ash 2002) and a few scheduled interviews, conducted 2006–08, from the following communities:
 - Amsterdam (5), Canton (7), Cooperstown (5), Glens Falls (7), Gloversville (7), Morrisonville (1), Ogdensburg (7), Oneonta (9), Plattsburgh (7), Poughkeepsie (7), Queensbury (2), Sidney (6), South Glens Falls (3), Utica (7), Watertown (10), Yorkville (1)

Communities are sorted into subsets as follows, based on the phonetic and phonological criteria outlined in Section 2:

- Inland North core:
 - Binghamton, Buffalo, Geneva, Rochester, Syracuse, Utica, Yorkville
- Inland North fringe:
 - Glens Falls, Gloversville, Ogdensburg, South Glens Falls, Walton, Watertown
- Raised /oh/:
 - Albany, Middletown, New Haven, New Britain, Poughkeepsie
- Low back merger complete or in progress:
 - Complete: Arnprior, Burlington, Montreal, Ottawa, Rutland
 - In progress: Canton, Lake Placid, Morrisonville, Plattsburgh, Scranton, Springfield, South Hadley
- Miscellaneous communities:
 - Amsterdam, Cobleskill, Fonda, Hartford, Oneonta, Queensbury, Saratoga, Schenectady
- Cooperstown and Sidney, treated separately

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