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Phonological Transfer as a Forerunner of Merger in Upstate New York

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Abstract

Herold (1990) discusses three mechanisms by which phonemic merger can take place: expansion, approximation, and transfer. A fourth possibility Herold touches on but does not explore might be called phonological transfer: as in (lexical) transfer, words move abruptly from one phonemic class to another; but rather than one lexeme at a time being transferred, all words of a particular phonological class move simultaneously. This paper provides evidence that phonological transfer is playing a role in the movement toward merger of /o/ (as in LOT) and /oh/ (as in THOUGHT) in Upstate New York. Words containing (olF)—i.e., historical /o/ followed by /l/ plus a labiovelar, as in *golf* and *revolve*—are produced with /oh/ rather than /o/ in 74 percent of tokens; this use of /oh/ is increasing in apparent time. Many speakers using /oh/ in (olF) words have an otherwise clear phonemic distinction between /o/ and /oh/; however, the geographic distribution of this phonological transfer is correlated with other indices of progress toward the low back merger. This indicates that phonological transfer can be regarded here as an early sign of merger in progress, and that a single merger can proceed by two mechanisms simultaneously (here, approximation and phonological transfer).

Keywords

merger, low back merger, phonological change, American English, New York State, dialects, sociophonetics

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1. Mechanisms of Merger

Phonemic merger occupies a central role in the study of phonological change. When a merger achieves completion, a language or dialect has undergone a categorical shift in its phonological structure: where there were once two discretely contrasting phonological entities, with distinct abstract underlying representations and distinct surface-level phonetic manifestations, there is now only one. In order to explain how such drastic changes in phonological structure can come about, it is necessary to examine the intermediate stages of the change in progress. This can shed light on the nature of the smaller changes in phonological structure that can eventually lead to large-scale merger, and at what point in the course of phonetic changes phonological changes might take place.

Trudgill and Foxcroft (1978) defined two mechanisms by which phonemic merger can take place, to which Herold (1990) added a third (see also Maguire, Clark & Watson 2013 for a review). These three mechanisms, schematically represented in Figure 1, are as follows:

- Merger by approximation: two phonemes that are in the process of merging move gradually toward each other in phonetic space until they eventually collide, illustrated in panel (a) of Figure 1. Merger is the result when the phonetic distance between the two original phonemes has become small enough that the contrast can no longer be maintained. For example, Baranowski (2013) shows that this is the mechanism of the *caught-cot* merger in Charleston, South Carolina.
- Merger by transfer: words that historically contained one of two phonemes switch, one at a time, to containing the other. Merger takes place when all of the words from one class have been moved to the other, so only one phoneme remains, as illustrated in panel (b) of Figure 1. This process is observed by Baxter (2010) in the development of the *merry-marry* merger in southern Quebec: she finds that, for example, *carry* was transferred early from the /æ/ to the /e/[1] class while *marry* and *carrot* retained /æ/ for longer, before the merger eventually went to completion.
- Merger by expansion: this third type of merger was discovered by Herold (1990) in Tamaqua, Pennsylvania. In merger by expansion, phonemic contrast is lost immediately, and all the words with either historical phoneme may come to be distributed across the entire region of phonetic space formerly occupied by both of them, as illustrated in panel (c) of Figure 1.

Labov (1994:321) states that vowel mergers that proceed by approximation are most likely to be those that occur as the result of general principles of vowel movement, whereas mergers by transfer are likely to be the result of change from above the level of consciousness, away from a phonemic contrast that is not made in the standard language. Herold (1990) suggests that merger by expansion can be attributed to a sudden large increase in contact with merged speakers. Fruehwald (2013:19) notes that

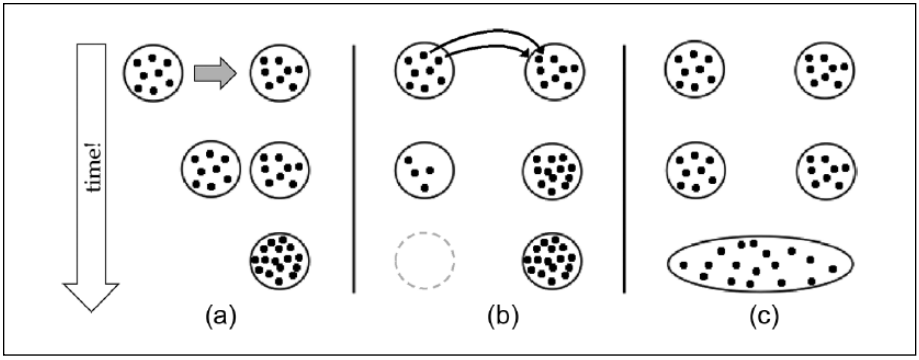

Figure 1. Schematic Representations of the Three Mechanisms of Merger from Herold (1990): (a) Approximation, (b) Transfer, and (c) Expansion
Circles represent the phonetic value of a phoneme and dots represent lexical items containing that phoneme, with time on the vertical axis

each of these three mechanisms represents a different type of change in speakers' phonetic or phonological knowledge, though they all lead to the same ultimate result for the phonological system: approximation involves change in the phonetic implementation of phonological entities; transfer involves changes in which of the existing phonemes appears in which lexical items; and expansion involves immediate change in the system of contrasts allowed by the phonological grammar.

What I will call merger by "phonological transfer" is a fourth mechanism that Herold (1990:53–54) proposes as a theoretical possibility but does not discuss in depth. She characterizes it as follows: "phonologically conditioned two-way transfer in which all words with a following /l/, for example, are transferred into the set of words pronounced with X, while words with a following /p/ are transferred into the Y set." In other words, rather than individual lexical items being transferred one at a time from one phonemic class to the other, entire sets of words, determined by the phonological environment of the merging phoneme, are transferred simultaneously. Phonological transfer bears interesting similarities to and differences from the other three mechanisms of merger in its relationship to phonological structure:

- It differs from what Herold (1990) and Trudgill and Foxcroft (1978) call merger by transfer (which we may call "lexical transfer" for clarity) in that it is phonologically regular: the treatment of a lexical item depends strictly on its phonological content. It resembles lexical transfer in that it is phonetically abrupt: affected words have one phoneme discretely replaced by another, without passing through the phonetically intermediate space between the two phonemes.
- Similarly, it differs from merger by approximation in being phonetically abrupt, and resembles it in being phonologically regular.
- It resembles merger by expansion in that a (conditioned) phonemic contrast may be lost immediately—the contrast between phonemes X and Y in the

pre-/l/ or pre-/p/ environment, in Herold's (1990) example. It differs in that the immediate result of phonological transfer is still unambiguously part of one phoneme or the other, not distributed across the entire phonetic space of both original phonemes.

In the "two-way transfer" scenario Herold (1990) describes, at the completion of the merger X and Y still both exist, but as allophones of the resulting merged phoneme rather than phonemes in their own right. One-way phonological transfer—in which, for example, words with a following /l/ are transferred from phoneme Y to phoneme X but no transfer from X to Y takes place—would, if it went to completion, leave only X at the end of the merger. Despite differences in the ultimate output, however, one-way and two-way phonological transfer are fundamentally the same type of phonological process—the discrete transfer of phonologically-defined classes—with the same similarities to and differences from the other mechanisms of merger as listed above. It is such a one-way transfer, and its implications for the phonological theory of merger in progress, that is the subject of this paper.

The low back merger, also known as the *caught-cot* merger, between /oh/ as in *thought* and *caught* and /o/ as in *lot* and *cot*, is a frequent focus of research into mergers because it is vigorously in progress: the United States contains substantial regions where the merger is rare, where it is nearly complete, and where it is highly variable, with different communities undergoing the merger at different paces and in different ways (see Labov, Ash & Boberg 2006). This paper follows up on a study (Dinkin 2009, 2011b) that found evidence that the merger is in progress in most regions of Upstate New York. Although the merger is not close to complete in many of those regions, in that nearly all speakers sampled clearly maintained the *caught-cot* distinction, apparent-time evidence indicated a long-term trend in the direction of merger, apparently by approximation. Here I revisit the same set of Upstate New York data and find phonological transfer to be taking place as well, indicating that a single merger in progress can have two phonological mechanisms underlying it.

In merger by expansion, the phonemic contrast is lost or weakened first, with the result that two phonemes fall together instantaneously. Approximation, lexical transfer, and phonological transfer, on the other hand, are merely types of phonological or phonetic changes that may lead to merger eventually if allowed to run their course, but could be arrested at any time. An illustrative example is the phonological transfer that caused /o/ to become /oh/ before certain voiceless fricatives in the prehistory of American English, as in *cloth* and *loss*; it would be unreasonable to claim this as evidence that the wholesale *cot-caught* merger was already underway at that early stage, even though a phonological class of words was moved from one phoneme to the other. Thus, when a merger has taken place, it is possible to characterize it in retrospect as having taken place via one (or more) of these mechanisms. However, while approximation or transfer is in progress, in order to correctly describe the change as "merger in progress," it is necessary to demonstrate that the change is likely to go to completion and produce merger. Thus the investigation below will involve finding evidence that the phonological transfer in question actually is motivated by pressure toward merger.

The question of the teleology of mechanisms of merger will be revisited toward the end of this paper.

2. Phonetic and Phonological Structure

According to Bermúdez-Otero's model of the life cycle of sound change (2007, 2015; Bermúdez-Otero & Trousdale 2012), phonological rules begin their lives as gradient phonetic tendencies ("Phase 1") and then may undergo "restructuring," or "stabilization," into categorical and discrete phonological processes ("Phase 2"). For example, in most dialects of American English, /æ/ is higher and fronter before nasals than in other environments. In some dialects, there is a single extended region in phonetic space occupied by /æ/, with the highest and frontest edge of this area tending to instantiate pre-nasal tokens of /æ/; in others, pre-nasal /æ/ occupies a discretely separate region of phonetic space higher and fronter than the non-pre-nasal allophone (Labov, Ash & Boberg 2006). In the former dialects, the raising of pre-nasal /æ/ is a Phase 1 process according to this taxonomy, and in the latter, it's a Phase 2 process (Dinkin 2011a:78). Bermúdez-Otero (2015) predicts that a variable Phase 2 process may coexist in the grammar with the Phase 1 process that gave rise to it—a situation he terms "rule scattering."

An example of this type of stabilization taking place is presented by Baker, Archangeli, and Mielke (2011), who carried out an experimental acoustic study of "s-retraction"—i.e., the backing of /s/ to something phonetically close to [ʃ] before rhotic clusters such as /tr/, as in *street*. Baker, Archangeli, and Mielke (2011) contrast "retractors," those who have a clearly perceptible, discretely backer allophone of /s/ in the majority of /str/ tokens, with "non-retractors," who never produce such an allophone. They find that non-retractors still tend to have /s/ substantially backer before /tr/ than in other environments—but in a phonetically gradient way and with high inter-speaker variability. Baker, Archangeli, and Mielke (2011) argue that the non-retractors' gradiently backer /s/ before /tr/ represents (in Bermúdez-Otero's terms) the Phase 1 stage of this sound pattern, and the retractors' discretely backed allophone represents the result of restructuring that backing into a Phase 2 allophonic process. They posit that the high degree of inter-speaker variability among the non-retractors is a prerequisite for stabilization, since the existence of such variability means that there are more likely to be extreme phonetic outliers that may be misinterpreted by learners as phonologically distinct.

Baker, Archangeli, and Mielke (2011) do not claim that the result of stabilized s-retraction is phonologically identified with /ʃ/. Indeed, they find that the result of s-retraction has slightly higher frequency than typical /ʃ/, whereas the frequency of /ʃ/ itself tends to be depressed by a following /r/. So, by this argument, the result of this stabilization of a gradient pattern into a discrete one is the creation of a phonologically discrete allophone of /s/, and not the replacement of /s/ with the phoneme /ʃ/ in words in which /tr/ follows. On the other hand, merger by phonological transfer can be understood as a situation where the opposite is true: a gradient phonetic pattern is stabilized into a discrete one, with the result that (in a certain environment) one

phoneme is simply discretely replaced by another existing phoneme, rather than creating a new allophone.

In any gradual change in the phonetic target of a phoneme, some phonetic environments will be somewhat more advanced in the change, and others somewhat less advanced; the position of any given token within the general distribution of a phoneme in phonetic space is, in Bermúdez-Otero's (2007:499) words, "exquisitely sensitive to a broad range of properties of its phonetic environment" via Phase 1 phonetic conditioning. For instance, if /o/ is backing toward /oh/, it may be that tokens of /o/ before /l/ occupy the back edge of the phonetic range of /o/ as this happens, and therefore lead the change. If this phonetically gradient rule should undergo stabilization, it will become a discrete phonological rule: instead of the pre-lateral allophone of /o/ being merely the backest part of the phonetic range of /o/, it will move to a distinct backer position in phonetic space, represented by a different set of phonological features. And if that set of phonological features happens to be the features of /oh/, then the words that formerly contained /o/ before /l/ now contain /oh/ instead: the phonological environment at the leading edge of the merger by approximation has undergone phonological transfer.

This makes two concrete predictions about phonological transfer. First, a phonetic environment in which phonological transfer occurs will be one in which, before stabilization, the allophone of the original phoneme was closest to the target phoneme already—e.g., if /o/ before /l/ has merged into /oh/ by phonological transfer, then prior to the phonological transfer, the pre-/l/ environment must already have already conditioned backing within the phonetic distribution of /o/. And second, after phonological transfer has taken place, there will be no distinction within the phonetic distribution of the target phoneme between tokens of the two historical phonemes—e.g., in words that originally contained /o/ before /l/ the vowel will have the same phonetics as in words containing /oh/ before /l/, and not be phonetically closer to /o/.

3. Data and Methodology

The data on which this study is based are derived from interviews with a total of 119 speakers in Upstate New York carried out between 2006 and 2008. There are twelve communities in which between seven and ten interviews were conducted, allowing for a relatively clear picture of their dialectological status: Amsterdam, Canton, Cooperstown, Glens Falls, Gloversville, Odgensburg, Oneonta, Plattsburgh, Poughkeepsie, Sidney, Utica, and Watertown. An additional eleven communities were sampled with between one and three interviews each; of these, the only one relevant to the current paper is Cobleskill.

The 119 interviews include ninety-one conducted in person and twenty-eight by telephone. Interviews of both types included several formal data-elicitation tasks: subjects provided explicit perceptual judgments of mergedness of minimal pairs such as *cot* and *caught*, and, in in-person interviews, read a word list. First and second vowel formant frequencies were measured by hand at a single point in the vowel nucleus and log-mean normalized to the same norm used in the *Atlas of North American English* (Labov, Ash & Boberg 2006; henceforward *ANAE*). Full methodological details and

maps can be found in Dinkin (2009, 2011b, 2013). Formant measurement files are available on request from Aaron Dinkin.

Based on data from these interviews and *ANAE*, Upstate New York can be divided into several dialect regions. Data from both minimal-pair judgments and production indicate apparent-time progress toward the *caught-cot* merger in all but one of these regions (Dinkin 2011b). In the North Country, at the northeastern edge of the state, containing Canton and Plattsburgh, the merger is nearly complete, with only the two oldest speakers in the sample fully distinct in minimal-pair judgments. In other regions, at most a few younger speakers have merged or transitional minimal-pair judgments, but overall younger speakers on average have /o/ about 120 Hz backer in F2 (and thus closer to /oh/) than older speakers. On the other hand, in the Hudson Valley core, containing the city of Poughkeepsie, /oh/ is quite high, and there is neither evidence of merger in minimal-pair judgments nor any motion of /o/ or /oh/ toward merger by approximation.

Finding merger by phonological transfer was not one of the goals of this study during the data-collection phase; it was discovered serendipitously during analysis. For this reason, the amount of relevant data is fairly sparse, but it is still enough to convincingly indicate that phonological transfer is at work. In this, I follow the example of Baxter (2010), who was able to demonstrate lexical transfer with a comparably sparse data set.

An example of the result of phonological transfer can be seen in Jess M.[2] from Ogdensburg. Figure 2 displays Jess's /o/ and /oh/, plotted in terms of vowel height (modeled by the frequency of the first acoustic formant, F1) and frontness (the second formant, F2). Each small symbol represents the measured F1 and F2 of a single token of /o/ or /oh/ (represented by squares and triangles respectively); some—chiefly those followed by /l/—are labeled with the lexical item in which the vowel occurred. This chart includes all the tokens of /o/ and /oh/ from Jess's speech extracted for measurement by the methodology of Dinkin (2009). Large circles represent the overall mean position of Jess's /o/ and /oh/, excluding function words and tokens before /l/ (and /r/).

As Figure 2 shows, Jess has a clear phonemic contrast between /o/ and /oh/; the two phonemes occupy mostly disjoint regions of phonetic space. But two tokens of expected /o/ are within the phonetic distribution of /oh/: *revolve* and *Ogdensburg*. According to Labov, Ash, and Boberg (2006:58), original /o/ before /g/ has experienced substantial individual lexical transfer in American English, but not regular phonological transfer; so we will ignore *Ogdensburg* and focus on *revolve*.

Revolve satisfies both of the expected phonetic criteria mentioned above, and thus is a likely case for phonological transfer. First, the position before coda /l/ induces retraction of many back vowels, as is documented in *ANAE*; so it is to be expected that a word like *revolve* would be among the backest tokens of /o/ if it were among tokens of /o/ at all. Indeed, if we examine a speaker such as Buck B., depicted in Figure 3, whose *resolve* clearly belongs to /o/ and not /oh/, we find that it is nevertheless among the backest tokens of /o/; as we will see below, this is the case for many other speakers. Moreover, in Jess's case, we see that although /o/ before coda /l/ seems to be

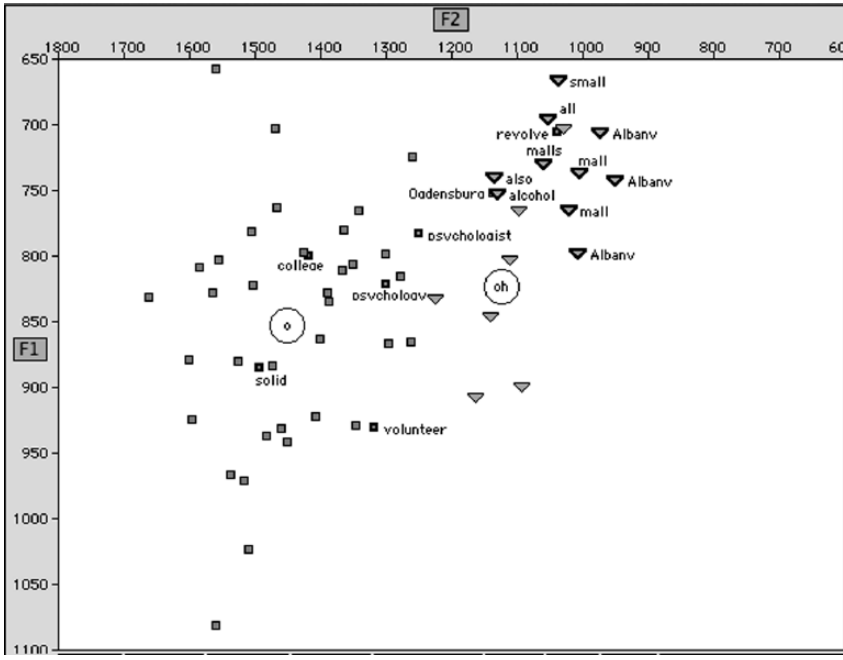

Figure 2. The /o/ and /oh/ of Jess M., a Twenty-Two-Year-Old Student and Receptionist from Ogdensburg
Squares = /o/; triangles = /oh/; tokens before /l/ are highlighted with a black outline

transferred to /oh/, tokens of /o/ in a very similar environment—before intervocalic /l/, as in *solid, college, volunteer*, and *psychology*—do tend to be in the back half of the /o/ distribution. So there is a phonetic tendency for /o/ to be relatively back before /l/; this is one of the preconditions for phonological transfer.

In addition, Jess's *revolve* is found among a large cluster of tokens of /oh/ before /l/—some word-final, such as *all* and *small*, and some preconsonantal, such as *Albany*—and not at all close to other tokens of /o/, whether before /l/ or elsewhere; indeed, *revolve* is among the highest and backest /oh/ tokens. Although Figure 2 only depicts F1/F2 measurements taken at a single point in the vowel's duration, *revolve* resembles /oh/ in other respects as well: like Jess's /ohl/ words, *revolve*'s vowel is a steady-state monophthong, with no discernable glide trajectory before the /l/, and its duration is within the range of durations the /ohl/ tokens exhibit as well. It would be implausible to claim that this *revolve* merely contains an extremely high and back token of /o/; everything about its phonetics suggests that the phoneme in it is the same as the phoneme in *small* and *Albany*. This is the second diagnostic for phonological transfer: *revolve* is indistinguishable from any other instance of /oh/ before /l/. This

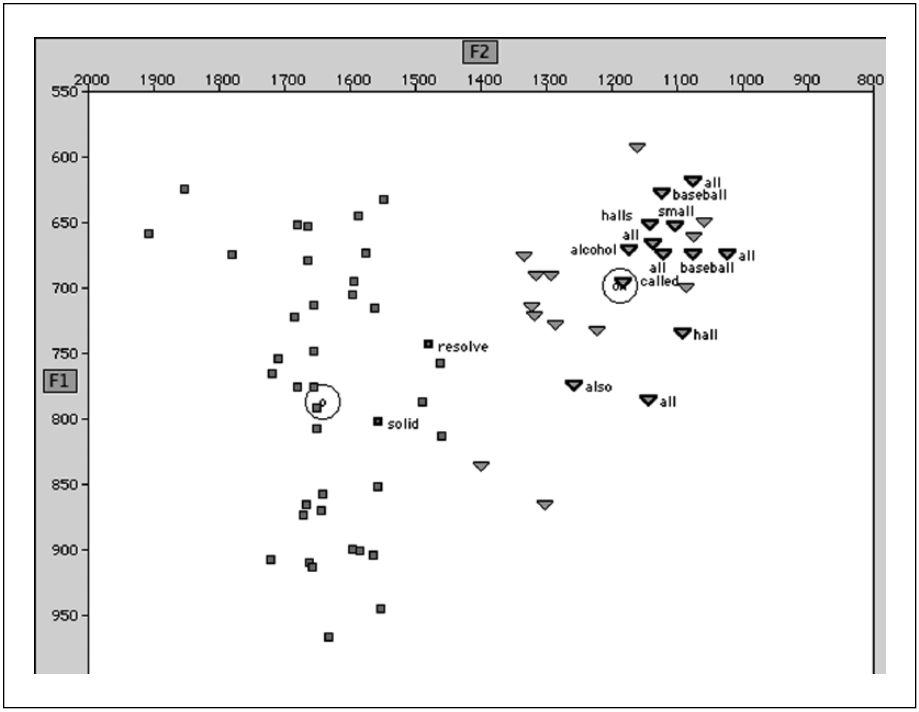

Figure 3. The /o/ and /oh/ of Buck B., an Eighty-Two-Year-Old Retired Grocery Store Worker from Cooperstown, Highlighting Tokens Before /l/
Two tokens of /o/ with F1 > 1000 are not shown

indicates that the environment of *revolve* is a good candidate in which to look for merger in progress by phonological transfer.

The 119-interview data set contains a total of 106 tokens of words containing historic /o/ before coda /l/, as identified by the pronunciations provided in mid-twentieth-century American dictionaries (*Funk & Wagnalls* 1954; *Webster's* 1961). These tokens may be broken down into the following categories:

- Twenty tokens of the word *doll*, elicited via formal methods in two communities, Oneonta and Watertown.
- Eighty-five tokens of /ol/ followed by a labiodental fricative /f/ or /v/. This includes fifty-three tokens of *revolve*, which was elicited via wordlist in several of the communities studied. It also includes three tokens of *resolve* and one of *evolve* (each of them a misreading of the wordlist item *revolve*), fourteen of *golf*, eleven *involved*, two *involvement*, and one *involving*. We shall refer to this category by the notation (olF).
- One token of the word *volcano*, produced by Larry R., a sixty-one-year-old speaker from Oneonta.

Since (olF) is the only environment in which the data contain more than one lexical item, it is in this environment that we are able to look for phonological transfer. The English lexicon contains only a handful of words in this class, but if they consistently pattern together, we can infer that it is the phonological environment that is targeted for change, not the individual words.

Revolve was a wordlist item in eight communities—Canton, Cooperstown, Ogdensburg, Oneonta, Plattsburgh, Poughkeepsie, Sidney, and Watertown—and therefore we have at least one (olF) token from each in-person interview subject in each of those communities, and may be able to get the clearest picture of its status in them. In addition, between one and three speakers produced at least one token of (olF) in Amsterdam, Cobleskill, Glens Falls, Gloversville, and Utica.

Although inferring phonological structure from phonetic production data alone may in some cases be a slippery task, here it seems relatively straightforward: if a speaker pronounces a given (olF) word with a vowel that is phonetically typical of their /oh/ and not their /o/, the most parsimonious inference is that the phoneme that is phonologically present is /oh/. A similar basic criterion is used by Baxter (2010) to examine lexical transfer in the *merry-marry* merger, and, as far as I can tell, apparently in *ANAE* to diagnose whether the word *on* contains /o/ or /oh/ (Labov, Ash & Boberg 2006:187).

In particular, for each token, we shall judge whether the vowel is /o/ or /oh/ based on whether it appears in the same phonetic vicinity as other tokens of /oh/ before /l/, and/or whether it is higher and backer than the mean /oh/.[3] Jess M.'s *revolve*, discussed above and shown in Figure 2, meets both of these criteria. On the other hand, if a token appears lower and fronter than mean /oh/ and relatively close to other tokens of /o/, while most tokens of /oh/ before /l/ are higher and backer than that mean, it will be considered to be /o/. Figures 3 and 4 illustrate speakers for whom this is the case. In Figure 3, Buck's /o/ and /oh/ are quite separate in phonetic space, and his token of *resolve* is clearly part of the /o/ cluster—at the back edge of /o/, but still closer to /o/ than to /oh/. In Figure 4 we see George S. from Sidney; his overall /o/ and /oh/ distributions are closer together than Buck's and have some overlap, and his two (olF) tokens, *revolve* and *involved*, seem closer to the center of /oh/ than that of /o/. But George's /oh/ has a consistently higher and backer realization before /l/, as we can see in his tokens of *mall, small*, and other words, and (olF) has a lower and fronter realization than mean /oh/, placing *revolve* and *involved* in the phonetic vicinity of words with /o/ before intervocalic /l/, such as *college* and *solid*, and quite distant from *mall* and *small*. By these criteria, then, George has /o/ for (olF): although it may be the case that his (olF) has phonetically drifted into the phonetic range of /oh/, it clearly has not undergone the phonological transfer that is the subject of this paper and become phonologically identified with /oh/.

Categorizing vowels based only on single-point F1 and F2 values always runs the risk of missing some phonetic detail not captured in that measurement, such as duration or formant contour. As a sanity check, after classifying each (olF) token according to the criteria above, I randomly selected five speakers[4] whose (olF) had been classified as /oh/, in addition to Jess M. from Ogdensburg as mentioned above, to inspect in

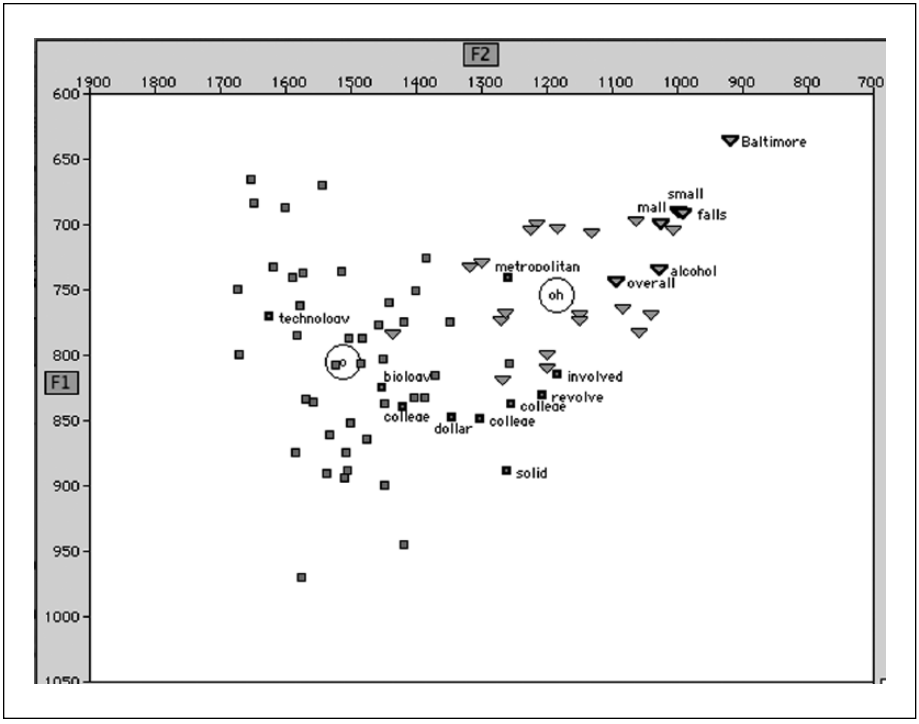

Figure 4. The /o/ and /oh/ of George S., a Sixty-One-Year-Old Teacher from Sidney, Highlighting Tokens Before /l/

more detail. None of these six speakers showed any difference in duration or formant contour between (olF) and other tokens of /oh/, or any impressionistically salient auditory differences, beyond the range of variation seen between tokens of /oh/ proper. This suggests that the single-point F1/F2 measurements are an adequate mechanism for evaluating whether (olF) is identified with /oh/.

Of the eighty-five tokens of (olF), nine were produced by speakers for whom the *caught-cot* merger is already complete in production, to the extent that the phonetic range of /o/ overlaps with even the highest and backest tokens of /oh/; these tokens are excluded from analysis.[5] The remaining seventy-six tokens were produced by a total of fifty-eight different speakers. This is a small number of tokens, with only rarely more than one per speaker. We will see below, however, that the resulting patterns are surprisingly clear; by approaching the data from several empirical directions, we will be able to draw tentative conclusions from each, converging on an overall pattern of phonological transfer involved in the *caught-cot* merger.

The following sections will demonstrate, via the lexical and apparent-time distribution of (olF), that phonological transfer is taking place; compare its geographical distribution with that of other indices of the *caught-cot* merger, both within and beyond

Table 1. The Frequency of /o/ vs. /oh/ in the Most Frequently Occurring (olF) Words, Excluding Fully Merged Speakers

Word	Total tokens	Total /o/	Total /oh/	Percentage /o/
revolve	45	11	34	24
golf[6]	14	4	10	29
involved etc.	13	3	10	23

New York State, in order to establish that the transfer is part of the merger in progress; and examine whether the phonological transfer has continued to a new environment beyond (olF). The concluding sections tie the results back in with the broader theory of merger and phonological change.

4. Overall Results

Of the seventy-six (olF) tokens produced by non-merged speakers, twenty are identified as having been produced with /o/, and the rest with /oh/. Of the twenty /o/ tokens, all but two are at or near the back edge of the speaker's overall phonetic range of /o/; this position is implied by the life-cycle model of phonological change to be a precondition for phonological transfer to /oh/.

It is possible that some speakers or tokens may have been misdiagnosed—i.e., that the *a priori* criteria laid out above for identifying an (olF) token as /oh/ may in some cases apply to a token that should have been classified as /o/, or vice versa. This is most likely to be the case for speakers for whom /o/ has both a widely dispersed phonetic range and a substantial overlap with /oh/, so that /o/ and /oh/ might have merely merged by approximation in the (olF) environment at the leading edge of the change, without need for transfer. However, speakers such as Jess M., for whom (olF) is clearly separate from the phonetic range of /o/ and part of /oh/, are found throughout the apparent-time span of the corpus. These fully unambiguous speakers include approximately half of speakers coded as using /oh/, and are definite evidence for transfer; the fact that some speakers' /o/ and /oh/ have greater degrees of overlap should not cause us to discard the methodology out of hand.

The three most frequent (olF) words in the sample are *revolve, golf*, and inflected or derived forms of *involve* (*involving, involved, involvement*). Two of these share the morpheme *-volve*; the third is unrelated. As Table 1 shows, these three lexical items all have very similar frequencies of /o/ versus /oh/. This distribution thus supports the hypothesis that the presence of /oh/ in (olF) words is the result of phonological transfer rather than the result of the transfer of individual lexical items: all eligible words are affected seemingly equally.

The twenty cases in which /o/ was used for (olF) include all eight tokens produced by natives of Poughkeepsie, over an apparent-time span from 1932 to 1993; therefore we can be reasonably confident that the transfer is not taking place there. The remaining twelve tokens of /o/ for (olF) are listed in Table 2. At least one, and perhaps two,

Table 2. Speakers not Native to Poughkeepsie who Produced (olF) Words with /o/

Speaker	Community	Year of birth	Word(s)
Fred B.	Amsterdam	1945	*golf* (× 2)
Pat S.	Amsterdam	1955	*involved*
Monica M.	Canton	1938	*revolve*
Buck B.	Cooperstown	1926	*resolve*
Janet H.	Cooperstown	1950	*revolve*
Peg W.	Cooperstown	1957	*revolve*
Carol G.	Oneonta	1952	*evolve*
Larry R.	Oneonta	1946	*golf*
George S.	Sidney	1947	*involved, revolve*
Lisa S.	Sidney	1949	*revolve*

of the speakers listed in Table 2 produced (olF) words with both /o/ and /oh/: Larry R. from Oneonta produced *revolve* and two tokens of *golf* (and *volcano*) with /oh/ but one token of *golf* with /o/. Pat S. from Amsterdam produced two tokens of *involved*, of which one was coded as /oh/ by the criteria above while the other was ambiguous and so was coded as /o/; but the phonetic range of his /o/ is sufficiently spread out that the former could conceivably be interpreted as an outlying /o/ as well.

Speaker-internal variation does not per se vitiate phonological transfer—what it suggests is merely that there may have been a stage of variability in the transfer, where (olF) words could be variably pronounced with /o/ or /oh/, but Larry is the only speaker of the appropriate age who produced enough tokens of (olF) for variation to be clearly visible. Speaker-internal variation certainly doesn't support either of the alternative hypotheses: Larry's /o/ in *golf* isn't phonetically intermediate between /o/ and /oh/, as would be predicted by an approximation model; and (olF) doesn't show differences between lexical items (Larry and Pat's variation is between tokens of a single word), so lexical transfer is not supported either. Larry exhibits the rule scattering that Bermúdez-Otero (2015) discusses; i.e., while the majority of his tokens of (olF) undergo phonological transfer to /oh/, the one that is left behind as /o/ is still subject to the gradient phonological rule causing it to be a fairly back token of /o/.

All ten speakers in Table 2 were born in 1957 or earlier. The median year of birth of all unmerged speakers not from Poughkeepsie who produced (olF) is 1968–1969; the speakers of Table 2 are not only older than the median but substantially so. The probability of all those who used /o/ for (olF) being older than the median (let alone older than 1957) by chance is less than 0.0005. The fact that /o/ remains for (olF) only among older speakers constitutes an apparent-time pattern that indicates that the phonological transfer of (olF) from /o/ to /oh/ is in fact an innovation.

Even more strikingly, in any given community, every speaker who produced (olF) as /o/ is older than every speaker who did not. In other words, for example, George and Lisa S. (a husband-and-wife pair) were the two oldest speakers interviewed in Sidney, and they both produced (olF) as /o/; all speakers younger than them in Sidney from

whom any tokens of (olF) were measured at all used /oh/. The same is true in all other communities in which both /o/ and /oh/ are attested for (olF). The closest thing to an exception to the age pattern is in Oneonta, where Carol G., who produced *evolve* with /o/, is younger than Larry R., whose (olF) is variable. However, it is nonetheless the case that anyone who used /o/ at all is older than anyone who produced only /oh/.

It seems clear that (olF) is undergoing phonological transfer in (most of) the sampled communities. Baker, Archangeli, and Mielke's (2011) analysis implies that high inter-speaker variability in the backness of /o/ before /l/ is a prerequisite for phonological transfer (as the stabilization of a gradient phonetic tendency); in a later section, we will discuss how Baker, Archangeli, and Mielke's (2011) analysis interacts with these results.

5. Geography of Phonological Transfer

It is conceivable that the transfer of (olF) from /o/ to /oh/ might not be related to the *caught-cot* merger per se, but rather an independent phonological change affecting the distribution of /o/ and /oh/ but not threatening the overall contrast. Several facts, however, indicate that the transfer is indeed connected to the merger in progress.

Most obvious is the complete absence of /oh/ for (olF) in Poughkeepsie, in the Hudson Valley core region. In other words, the phonological transfer is absent in the only region where the trend toward merger by approximation is also absent. Poughkeepsie is the southernmost community sampled, and Dinkin (2011b) shows greater evidence of the merger in perception in further-north dialect regions,[7] culminating in the North Country with nearly complete merger. In what follows, I shall demonstrate that the same is true of the phonological transfer of (olF): it is more complete as you go further north.

As noted above, outside of Poughkeepsie all speakers using /o/ for (olF) were born in 1957 or earlier. There are sixteen sampled speakers outside of Poughkeepsie born before 1957 who produced (olF), from ten different communities. These sixteen speakers and their locations are mapped in Figure 5, along with the three pre-1957 speakers in Poughkeepsie.

Let us group together the five further north of these ten communities (Plattsburgh, Canton, Watertown, Glens Falls, and Gloversville) for comparison against the five further south (Amsterdam, Cooperstown, Cobleskill, Oneonta, and Sidney). This division conveniently corresponds to a major dialect boundary (Dinkin 2009, 2013) separating Gloversville, in the region called the Inland North fringe, from Amsterdam, in the Hudson Valley fringe.

Only one of the six more northern speakers uses /o/ for (olF), while all but one of the ten more southern speakers do so (Table 3). Despite the small number of speakers, this difference is statistically significant ($p < .01$ by Fisher's exact test[8]), indicating that the transfer of (olF) from /o/ to /oh/ is more pervasive further north, and perhaps therefore originated in the north and is spreading south. This is the same direction of diffusion which was hypothesized on the basis of *caught-cot* minimal-pair judgments, and so this likewise suggests that the transfer of (olF) from /o/ to /

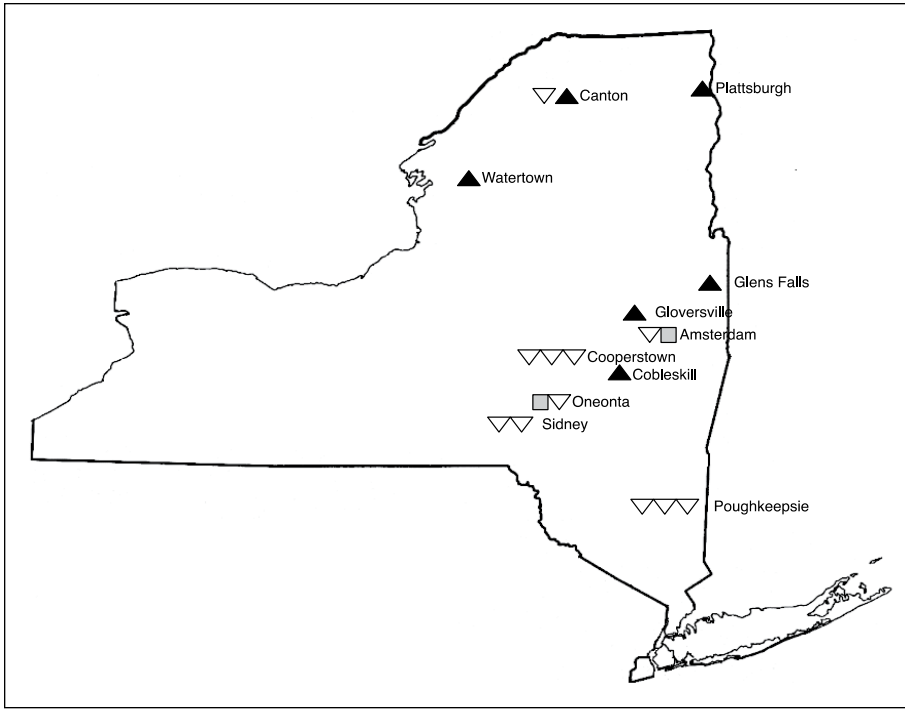

Figure 5. 19 Unmerged Speakers Born Before 1958 Who Produced (olF)
White triangles denote /o/, black /oh/, and gray squares speakers who used both

Table 3. Geographic Distribution of /o/ vs. /oh/ for (olF) Among Speakers Born Before 1958 (Excluding Poughkeepsie)

	/o/	/oh/
Further north	1	5
Further south	9	1

oh/ is associated with the spread of the merger, rather than being of coincidentally unrelated origin.

The apparent-time evidence points in the same direction: as far as the data indicate, the shift of (olF) to /oh/ appears to have gone to completion sometime around 1960 (in apparent time)—roughly the same time that /o/ appears to have been moved back by about 120 Hz in these regions[9] (Dinkin 2011b). The general patterns of correspondence in apparent-time and geographical distribution between backing of /o/, phonological transfer of (olF), and *caught-cot* merger in minimal-pair judgments suggests that they are all different reflections of the ongoing trend toward the merger, which is proceeding simultaneously by approximation and by phonological transfer.

6. (olF) in the *ANAE* Data

The corpus of telephone interviews collected and phonetically analyzed for *ANAE*, known as the Telsur corpus, can provide a look at the status of (olF) in a more diverse set of dialect regions to establish a broader viewpoint on its relationship to the *caught-cot* merger. The scope of this paper will not permit more than a brief overview of the complexities of (olF) in the Telsur data; however, this overview will help to clarify our interpretation of the Upstate New York data and its implications.

There are a total of sixty-three tokens of (olF)[10] in the Telsur corpus, of which twenty-two are produced by speakers with sufficiently complete *caught-cot* merger that tokens cannot be confidently classified as /o/ or /oh/. This leaves forty-one analyzable tokens, produced by thirty-one different speakers.

One such speaker is actually located in Upstate New York, and thus can be compared somewhat directly with the current sample—Simon Z. from Syracuse, born in 1948, who produced three tokens of (olF), including two of *involved* and one of the town name *Solvay*, all with /o/. Syracuse is in the Inland North core, the region characterized by an advanced degree of the Northern Cities Shift, including fronting of /o/. Two speakers from this region in the current sample, both from Utica, also produced (olF); both were born in 1989 and used /oh/. This suggests that the behavior of (olF) in the Inland North core region of Upstate New York lines up with that of other regions: one speaker born earlier than 1958 uses /o/, but by 1989 in apparent time, the transfer to /oh/ had taken place. This is true even though Utica has a larger-than-average phonetic distance between /o/ and /oh/; the large phonetic gap does not prevent the phonological transfer from taking place.

Outside New York State but still in the Inland North, only two Telsur speakers produced any measured tokens of (olF): Tricia K. from Flint, Michigan, born in 1947, and Alice R. from Cleveland, Ohio, born in 1962. Both of these speakers produced the word *dolphin*, apparently both with /o/, although the phonological identity of Tricia K.'s vowel in *dolphin* is somewhat ambiguous. Alice is younger than any speaker in the Upstate New York sample who used /o/ for (olF), but not by very much. Moreover, as an anonymous reviewer notes, *dolphin* contains a syllable boundary within the (olF) sequence that is absent in words such as *golf* and *revolve*, which may exclude *dolphin* (and *Solvay*, above) from the phonological class subject to transfer. So the status of (olF) in the midwestern component of the Inland North must remain ambiguous.

There are somewhat more Telsur tokens of (olF) in a few other regions. In the Midland, a region in which the *caught-cot* merger was vigorously in progress at the time of the Telsur data collection (Labov, Ash & Boberg 2006:65), eleven Telsur speakers produced (olF). Seven of these speakers do not appear to be fully merged in production, although their /o/ and /oh/ typically overlap substantially in phonetic space. These speakers produced four tokens of *dolphin*, four of *golf*, and two *involves*. It is overall much more difficult to confidently identify these speakers' tokens as /o/ or /oh/ than those of Upstate New York speakers, due to the greater overall overlap of the two phonemes. Only two tokens, both *dolphin* (of Mia M. from Omaha and Roscoe V. from Lyons, Indiana) seem unambiguously part of /o/. In most cases (olF) is both close

to the phonetic range of /ohl/ and not obviously separated from the edge of the range of /o/; there are no speakers as unambiguous as Jess M. from Ogdensburg, New York. It seems most likely that this distribution is the result of merger by approximation bringing pre-/l/ /o/ and /oh/ into contact with each other, rather than phonological transfer. This is consonant with the portraits Fogle (2007) and Strelluf (2014) provide of the merger in progress in the Midland cities of Indianapolis and Kansas City, which also appear to exhibit only the effects of approximation (with the pre-/l/ environment in the lead).

One token of (olF) in the Telsur corpus is from St. Louis, Missouri. St. Louis was historically part of the Midland dialect region, but unlike other Midland communities it has been subject to diffusion of the Northern Cities Shift from the Inland North (Labov 2007) and shows no evidence of *caught-cot* merger in progress in *ANAE*. Judy H. from St. Louis, born in 1937, shows a high incidence of Northern Cities Shift features herself and has a very clear *caught-cot* distinction, resembling a typical Inland North speaker more than a typical Midland speaker. However, she has /oh/ in *dolphin*.

Twenty tokens of (olF) in the Telsur corpus are from the South (including the fringe southern cities of Tampa, Florida, and Charleston, South Carolina). The overall status of the merger in the South is complicated: *ANAE* (p. 61) identifies it as one of the regions with "resistance" to the merger due to its distinctive back upgliding diphthong for /oh/, but "this region is the most susceptible to the merger wherever the back upglide is beginning to disappear". Fourteen of the Southern (olF) tokens are produced by a total of twelve different unmerged speakers, five of whom have the back upgliding /oh/. These five speakers uniformly have (monophthongal) /o/ for (olF). Of the seven speakers with no back upglide for /oh/, five appear to have /oh/ for (olF); although for some this may be the result of approximation as described above for the Midland, for others it is clearly transfer. Thus here, as in New York State, we see the cooccurrence of the phonological transfer with other features correlated with *caught-cot* merger (in this case, lack of diphthongal /oh/), even among speakers whose /o/~/oh/ distinction is otherwise robust.

The region *ANAE* occasionally refers to as the "Eastern corridor" is characterized by very high /oh/, stretching from Providence, Rhode Island down along the East Coast through Philadelphia; the region containing Poughkeepsie may be considered a northern extension to this region. Seven speakers from the Eastern Corridor have a total of ten (olF) tokens in the Telsur corpus. Unlike all the other regions examined, in the Eastern Corridor (olF) is almost universally unambiguously /o/; only one token contains /oh/—*golf*, produced by Alexa L. from Wilmington, Delaware, born in 1966—and this speaker *also* has two tokens of *involved* with /o/. This demonstrates that Poughkeepsie is not a fluke; the only city in the current sample that lacks /oh/ for (olF) is following the lead of the rest of the region that shares its raised /oh/, which apparently does an effective job (so far) at resisting the overall trend toward *caught-cot* merger.

Thus, on a national scale, just like in Upstate New York, we find that the incidence of transfer of (olF) to /oh/ is correlated with other indicators of merger in progress, and

Table 4. Incidence of /o/ and /oh/ in *Doll* per Speaker by City and Year of Birth

	1946–1952	1958–1978	1982–1990
Oneonta	2 /o/	2 /o/	2 /o/, 3 /oh/
Watertown	1 /o/	6 /o/	1 /o/, 2 /oh/

is less frequent in regions with more resistance to the merger. This supports the hypothesis that the phonological transfer of (olF) is part of an ongoing change toward merger, not an independent change that happens to be taking place at the same time.

7. *Doll*

Now that phonological transfer is established in (olF), we can examine the behavior of the word *doll* in the two cities in which data on it were collected. If *doll* shows the same behavior as (olF) words do, then we can hypothesize that the environment in which phonological transfer applies is before coda /l/, not specifically before coda /l/ plus /f/ or /v/.

The data contain nine speakers from Oneonta and ten from Watertown, each of whom read the word *doll* as part of an elicitation task. One speaker, Allie E. from Watertown, read it twice. Table 4 summarizes the results: only five of these nineteen speakers used /oh/ in *doll*—a much lower rate than the incidence of /oh/ for (olF), in these two cities and in the corpus as a whole. Fully twelve out of nineteen had /o/ in *doll* but /oh/ for (olF). Matt F. from Watertown, whose /o/ and /oh/ are shown in Figure 6, is a very clear example of this pattern. We can therefore infer that the phonological transfer discussed in the foregoing sections does not apply to /o/ before coda /l/ in general, but only before pre-labiodental /l/ (or potentially preconsonantal /l/).

Like (olF), *doll* shows movement from /o/ to /oh/ in apparent time, but substantially later than the transfer of (olF). Whereas, outside of Poughkeepsie, all speakers born later than 1957 use /oh/ for (olF), /oh/ in *doll* is only found in speakers born in 1982 or later, and even after 1982 some incidence of /o/ in *doll* remains (although in some cases the young speakers' /o/ and /oh/ are close enough together that it was difficult to tell). With no use of /oh/ for *doll* at all among speakers born before 1982, the difference between pre- and post-1980 speakers is statistically significant at the $p < .005$ level (by Fisher's exact test).

So although *doll* does not appear to be involved in the same instance of phonological transfer that affects (olF), it does appear to be following in (olF)'s footsteps. Since *doll* is the only word in the corpus with word-final /ol/, it is impossible to directly determine whether it is affected by a phonological transfer of its own or merely an individual lexical transfer. However, given that (olF) had already undergone phonological transfer by the time *doll* began to change, it seems plausible that further phonological transfers might ensue as merger continues to progress, and that *doll* might be involved in one of these.

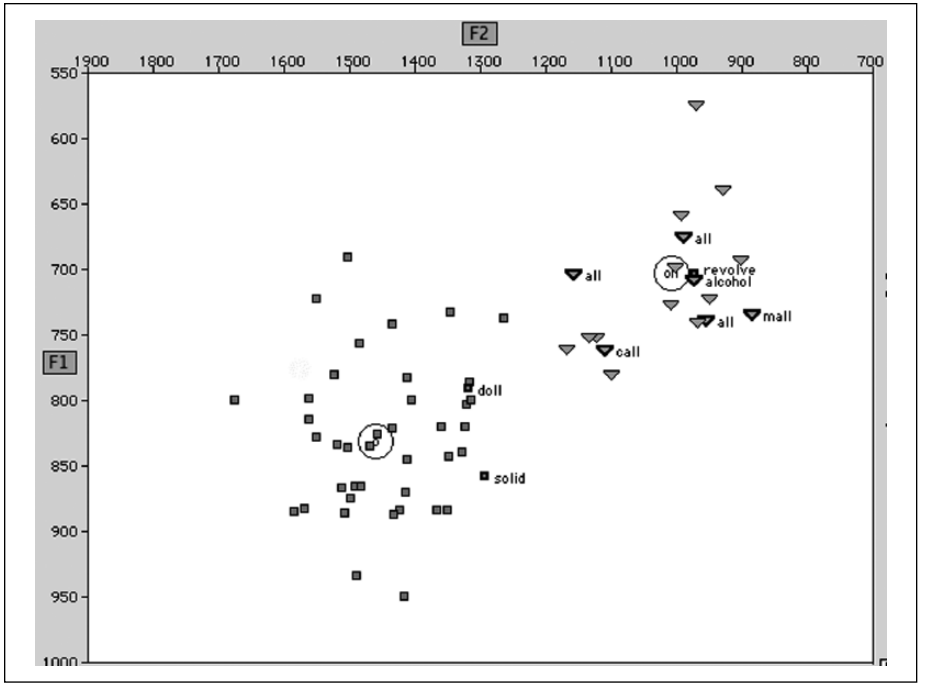

Figure 6. The /o/ and /oh/ of Matt F., a Thirty-Six-Year-Old Shoestore Owner from Watertown, Highlighting Tokens Before /l/

8. Discussion

The foregoing discussion establishes that phonological transfer—i.e., change that is both phonologically regular and phonetically abrupt—is taking place in Upstate New York, and that it is involved in ongoing progress toward the *caught-cot* merger. Phonological transfer is not the only mechanism of merger at work here, however: the previously documented apparent-time backing of /o/ (Dinkin 2011b) indicates progress toward merger by approximation. The phonological transfer observed here is in the same direction as the approximation: words that originally contained /o/ move back in the vowel space, while words that originally contained /oh/ remain stationary.

It is probably not a coincidence that the direction of the discrete change is the same as that of the gradient change. Is this predicted by the life-cycle model of phonological change? Well, perhaps. The phonological transfer is clearly not itself the stabilization of the change toward merger by approximation; the gradient change affects the entire phoneme, and the result of stabilization of that would be a (possibly variable) discrete movement of the entire phoneme to a backer position in phonetic space as a result of a change in its discrete phonological feature values.[11] Phonological transfer of (olF) is

the stabilization of the phonetic fact that /o/ tends to be relatively backer before coda /l/ than in other environments. However, according to Bermúdez-Otero (2015), the life-cycle model implies that a more general instantiation of a single phonological process is likely to inhabit a less advanced stage of the life cycle (and thus both be more recent and operate at a lower level of phonological structure) than a more specific instantiation of the same rule. The backing of /o/ in all environments is certainly more general than the backing of /o/ in the (olF) environment, and the latter does appear to exist at a more advanced stage of the life cycle, as a phonological rather than a phonetic innovation; however, it seems implausible that the general backing of /o/ originates as a generalization of the backing of /o/ before coda /l/.[12]

Is there a good reason, then, for the backing of /o/ in general and the phonological transfer of (olF) to be occurring at the same time as part of the same process? Recall that Baker, Archangeli, and Mielke (2011) argued that substantial inter-speaker variation in the phonetic magnitude of a gradient phonetic pattern is a prerequisite for the stabilization of that pattern into a discrete phonological rule, since such variation will produce outliers that less-extreme learners might interpret as belonging to a different phonological category. But no appreciable degree of inter-speaker variation is in evidence among Upstate New Yorkers for synchronic /o/ before /l/.

I have argued (Dinkin 2011b:336) that the reason for the incursion of the *caught-cot* merger into Upstate New York, and not into other parts of the Inland North, is diffusion: Upstate New York is geographically closer to and apparently more subject to dialect diffusion from fully merged regions than the rest of the Inland North is. Diffusion is a result of linguistic contact between adult speakers of different dialects (see Labov 2007), and it is this contact which might give rise to the inter-speaker variation that Baker, Archangeli, and Mielke (2011) claim is necessary for phonological stabilization: although substantial variation in the degree of backing of /o/ before /l/ does not exist among Upstate New Yorkers, it may well exist between Upstate New Yorkers and speakers of other dialects with whom they are in contact.[13] Speakers from western Pennsylvania or Canada, for instance, who interact with Upstate New Yorkers will typically have a merged /o/~/oh/ phoneme that is substantially backer than the Upstate New York /o/. The overall backness of their /o/ words could lead Upstate New Yorkers to back their own /o/ phoneme overall; but the even greater backness of their /o/ before coda /l/[14] could be perceived by Upstate New Yorkers as /oh/ rather than /o/, and lead to the stabilization of their already existing phonetic backing of /o/ before coda /l/. Thus diffusion provides Upstate speakers with access to the inter-speaker variation that may be a prerequisite for stabilization.

The role of diffusion in creating the conditions for phonological transfer contrasts with the Midland region, in which the Telsur data, as well as Fogle (2007) and Strelluf (2014), suggest approximation without phonological transfer. Labov (1994:327) and Herold (1997) describe merger by approximation alone as the expected course for "internally motivated" mergers—mergers caused by the existing phonetic pressures of a dialect's phonological inventory. The "external" motivation in Upstate New York (as well as, probably, the South) is what causes phonological transfer to be involved.

This scenario is also consistent with the non-teleological model (Dinkin 2011b:341) of the diffusion of merger: when merger is diffused from one region to another, the actual feature being diffused is not the merger per se, but rather sound changes in the direction of the merger. This follows from Labov's (2007) argument that diffusion only directly affects superficial linguistic features (such as the phonetic realization of a phoneme, or which words contain which phoneme), and not abstract structural properties (such as the number of phonemes in the phonological system). Under a non-teleological model, it is not the case that first diffusion weakens the contrast between two phonemes, and then that weakening allows the phonemes to move together in a way that they would not if the contrast were still robust. Rather, diffusion causes the phonemes to move together (via approximation, phonological transfer, or what have you), with the contrast between them remaining robust for some time, but eventually weakening as the phonetic or lexical means of contrast between them diminishes.

Therefore, although I have referred to what is happening in Upstate New York as "merger by phonological transfer" and "merger by approximation," I am justified in doing so only by the fact that merged or transitional minimal-pair judgments are already attested among younger speakers—that is, that we already know that weakening of the phonemic contrast between /o/ and /oh/ is the result of the changes. Above I have argued that the phonological transfer and the general backing of /o/ are part of the same overall process in Upstate New York, which we may loosely call diffusion of the merger; however, while that process is driven by the existence of the merger and contact with merged dialects, the feature that is actually subject to the diffusion is not the merger itself but these phonetic and phonological "mechanisms." Diffusion of mergers thus differs from what Johnson (2010:221) calls "transfusion"—the propagation of change by contact between children of differing dialect backgrounds, rather than adults—which appears more likely to be a cause of immediate merger by expansion.

The phonological transfer of (olF) gives us a rare view of phonological stabilization in progress: it seems clear that in the initial condition, the relative backness of (olF) was a mere phonetic tendency within the single phonological distribution of /o/, while after the transfer, (olF) belongs entirely to the phonological category of /oh/. Baker, Archangeli, and Mielke's (2011) model of the stabilization of /s/-retraction depends on the hypothesis that the gradient retraction pattern in their data represents the state of affairs prior to phonologization; in the current study, the apparent-time pattern in (olF) puts the diachronic inference on more solid empirical ground.

Bermúdez-Otero's (2015) picture of the process of stabilization is as follows: in the initial condition, (olF) will merely "gravitate toward the back" (Bermúdez-Otero 2015:386) of the phonetic distribution of /o/, but then

> the magnitude of this conditioned F2-lowering effect increases historically through phonologization, possibly reinforced by feedback and sociolinguistically driven incrementation: as a result, the distribution becomes skewed, with some affected tokens lying far back of the overall mean. . . . [Then in the next stage,] some outliers have been reanalysed as tokens of a new surface category.

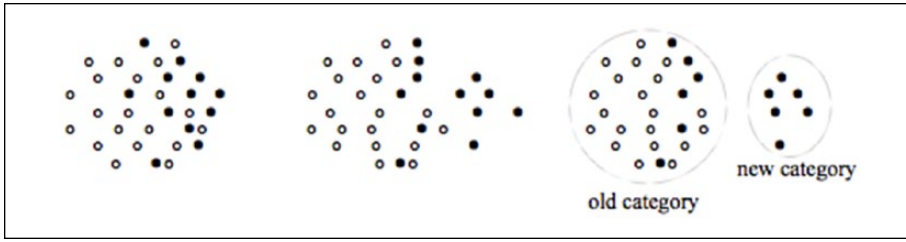

Figure 7. Three Stages of Phonologization
From left to right: initial state; phonologization of a phonetic rule; and stabilization into discrete categories (Figure 7 from Bermúdez-Otero 2015; used with permission from Oxford University Press)

In other words, Bermúdez-Otero (2015) predicts that (olF) would begin by drifting further back from the center of the phonetic distribution of /o/, and only then be reinterpreted as members of a distinct phonological category. He schematizes this sequence of stages with the diagrams shown here as Figure 7. Fruehwald (2013), however, argues that the creation of a new phonological category is an early step in changes of this type, followed by the drifting apart of the two newly distinct categories, rather than one phonetic environment beginning to differentiate itself from the rest of the phoneme while still part of the same phonological category.

George S. from Sidney, whose /o/ and /oh/ are shown above as Figure 3, seems to match the intermediate stage of Bermúdez-Otero's (2015) sequence, as depicted in Figure 7, quite well. His (olF) is almost certainly not merged phonologically with /oh/; it's phonetically nowhere near his pre-lateral /oh/ tokens. But George's pre-lateral /o/ is overall substantially backer than and semi-detached from the overall phonetic cluster of /o/; his /o/ alone closely resembles the middle diagram of Figure 7. The backness of his /ol/ seems still to be a gradient property of the phonological category instantiated by /o/, rather than a phonologically discrete pre-lateral allophone. If George's /o/ system is typical, it would challenge Fruehwald's (2013) case against gradual phonologization. However, George is just one speaker out of the handful who have /o/ for (olF) at all, and not the youngest of them; given the overall sparsity of data, it is hard to know whether he is a good representative of the immediate predecessor system to the phonological transfer of (olF).

9. Conclusion

Despite only a small set of relevant data points, it seems clear that phonological transfer has taken place as part of the movement toward the *caught-cot* merger in Upstate New York. Phonological transfer—i.e., the discrete replacement of one phoneme in a given phonological environment with a different phoneme—as a possible mechanism of merger is proposed in passing by Herold (1990), but not examined or exemplified, and it is not mentioned in more recent discussions of mechanisms of merger such as Maguire, Clark, and Watson (2013). Thus this paper reintroduces phonological transfer

to the repertoire of mechanisms of merger. The phonological transfer of (olF) is identifiable as part of the progress toward the merger (rather than an unrelated, but similar, phenomenon) due to the fact that its regional distribution coincides with those of other indices of merger in progress in New York.

Although approximation is also involved in the progress toward merger, it does not appear to be the case that phonological transfer is merely a consequence of the approximation nearing completion—i.e., that once /o/ and /oh/ are sufficiently close overall, /o/ in the prelateral environment is phonetically close enough to /oh/ for (olF) to be reinterpreted as /oh/. There are in the data individual speakers for whom the phonological transfer of (olF) is well in advance of the approximation. Matt F. from Watertown, shown above in Figure 6, is a good example of this: his *revolve* contains /oh/ even though the back edge of his /o/ phoneme, including *doll* and *solid*, is not yet even close to /oh/. So it appears that phonological transfer is not merely a consequence of an advanced stage of approximation, but a distinct parallel process. The occurrence of phonological transfer is, however, correlated with merger by approximation in Upstate New York: the one sampled city in which (olF) is found to be stably /o/ is Poughkeepsie, also the only one where there is no approximation in progress. This suggests that phonological transfer is also caused by whatever force is pushing Upstate New York as a whole toward *caught-cot* merger.

Due to the sparseness of the data, the implications of phonological transfer for the theory of phonological change are hard to infer. If the similarity of George S.'s /o/ to the middle diagram of Figure 7 is representative and not coincidental, however, it would tend to support Bermúdez-Otero's (2015) model of gradient phonologization prior to stabilization. However, in any event, the phonological change here is of a different sort than the typical changes discussed by Bermúdez-Otero (2007, 2015) and Fruehwald (2013). The examples they discuss are largely phonological splits: cases in which a given phonological environment detaches itself from the principal phonetic target of a phoneme and goes on to become a separate allophone, perhaps eventually undergoing phonemic split and becoming an entirely new phoneme (as is the case, for example, for pre-voiceless /ay/, notated (ay0), in Philadelphia). In the current study, however, when (olF) detaches itself from /o/ it seemingly more or less immediately merges with /oh/, not spending any appreciable amount of time as a separate allophone of /o/. This means that the time at which the phonological change takes place should be relatively easy to see, given sufficiently detailed data, and thus such transfers could be a focus for future research into phonological change. In the case of the raising of pre-voiceless /ay/, Fruehwald (2013) argues that (ay0) had become a phonological entity distinct from the default allophone of /ay/ before it began to detach itself phonetically; thus the phonologization of (ay0) itself is not directly observable. In the case of phonological transfer, the phonological change is more directly visible because it is constituted by the movement of (olF) from /o/ to /oh/. Thus phonological transfer could be a fruitful area of study for pinpointing when phonological change happens.

The immediate consequence of phonological transfer would seem to be a conditioned merger: in the case of (olF), /o/ and /oh/ merge before pre-labiovelar /l/. This is more or less illusory, however, in that there are no (or nearly no) words originally

containing /oh/ before tautomorphemic /lf/ or /lv/. Thus the phonological transfer of (olF) specifically does not itself lead to any noticeable loss of phonological contrast. It is an open question, and a topic for future research, whether the lack of functional load for the /o/~/oh/ contrast in this environment is relevant for enabling phonological transfer to take place. Indeed, as an anonymous reviewer points out, relatively few vowel phonemes occur in the pre-/lC/ environment to begin with, and the environment appears in relatively few words; either of these facts may conceivably make such environments in general more subject to phonological transfer. Sadly, the data at hand are not sufficient to answer this question, as there is even less data in the corpus for other vowels before /lf/ and /lv/ than there is for /o/. *Valve* was elicited in the same communities in which *revolve* was, but it showed no notable difference from other words containing /æ/. However, a few speakers with advanced raising of /æ/ in the Northern Cities Shift tantalizingly produced /o/ in the first syllable of *alcohol*, and one in *salvation*; this is reminiscent of Labov's analysis of the transfer of *great, break*, and *drain* from the MEAT class to the MATE class during the Great Vowel Shift (Labov 2014), and another possible direction for future work.

ANAE reports that the *caught-cot* merger is most advanced overall before nasals, an environment in which the /o/~/oh/ contrast has a somewhat higher functional load, but does not discuss whether this is the result of phonological transfer or some type of approximation.[15] Among conditioned mergers which are not part of ongoing movements toward unconditioned merger, Baranowski (2013) suggests that the *pin-pen* merger is taking place by approximation in Charleston, South Carolina; and Baxter (2010) finds the *merry-marry* merger took place by lexical transfer in southern Quebec. Another open question, therefore, is whether phonological transfer can take place only between two phonemes that are already on track toward merging unconditionally, or whether it would be possible for a single phonological transfer to create a conditioned merger and then halt.

The serendipitous nature of the discovery of phonological transfer in (olF) in this study thus leaves several questions unanswered about how phonological transfer fits into the broader picture of merger and phonological change. This paper serves as a reminder that phonological transfer exists as a mechanism of merger, and that a single merger may take place due to two or more simultaneous mechanisms. Future work with more focused investigation into phonological transfer per se will build on that foundation.

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Notes

1. I use the notation of Labov, Ash, and Boberg (2006) for vowel phonemes.
2. All names given to individual speakers in this paper are pseudonyms.
3. In the event of irresolvable ambiguity, we will default to the conservative assumption that /o/ is used.
4. Shelley L. from Ogdensburg, Jess L. from Oneonta, Ida C. from Canton, Jennifer B. from Sidney, and Amanda N. from Plattsburgh.
5. Such exclusion is determined only on the basis of production; this means that some speakers who are fully merged in their minimal-pair judgments still have /o/ and /oh/ distinct enough in production to determine which category (olF) words belong to. All of the speakers who are excluded in this way are at least partially merged in their minimal-pair judgments.
6. In two of these tokens of *golf*, produced by Fred B. from Amsterdam, the /l/ is not audible. Assuming the /l/ is present, these tokens appear to contain /o/, and are counted as such in the analysis in this paper. However, the editors of this journal raise the suggestion that Fred's *golf* may be lacking /l/ in its lexical representation. If it is the case that Fred's *golf* should not be counted as (olF) at all, the data relating to *golf* are somewhat weaker. However, since older dictionaries clearly indicate /o/ for *golf*, the fact that the majority of speakers in the sample have /oh/ in *golf* remains evidence, though less direct, for the word's participation in phonological transfer.
7. The exception to this is Cooperstown, where all younger speakers are merged or transitional. However, this is likely the result of relatively recent new-dialect formation (Dinkin 2012), rather than the gradual changes advancing the merger in the other communities studied, and thus less likely to be relevant for the older speakers considered in this section.
8. The two variable speakers are both counted here in the /o/ column. If instead they are counted as half a point for each column, the result remains significant ($p \approx 0.02$).
9. Note that the shift of (olF) to /o/ does not itself contribute to this backing of mean /o/; tokens before /l/ are disregarded in computing formant means.
10. The Telsur corpus contains no clear tokens of /o/ followed by /l/ plus any other consonant.
11. This may have already happened; cf. Dinkin (2011b:336–339).
12. By contrast, the treatment of *doll* discussed above is a better candidate for rule generalization: the stabilized backing of /o/ before preconsonantal /l/ is generalized to coda /l/ in general.
13. This is not a claim that speakers of other dialects have a greater difference between /o/ in pre-/l/ and non-pre-/l/ environments—merely that speakers of other dialects may have /o/ so back in general that Upstate New York speakers could perceive the backest tokens of /o/, those before /l/, as containing /oh/.

14. It is beyond the scope of this paper to present additional vowel charts, but my inspection of *ANAE*'s Telsur data shows that the majority of sampled speakers in nearby merged cities such as Toronto, Ottawa, and Pittsburgh do have pre-/l/ tokens clustered toward the back of their merged /o/~/oh/ distributions.
15. However, one of the Telsur speakers examined in the course of research for this paper, Grant K. from Cincinnati, shows evidence of phonological transfer of /ond/, as in *fond* and *bond*, to /oh/.

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