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Charles Boberg

Stephanie M. Strassel

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Charles Boberg and Stephanie M. Strassel
University of Pennsylvania
cboberg@unagi.cis.upenn.edu, strassel@babel.ling.upenn.edu

1. Introduction

Two of the most important variables in the classification and description of American English dialects are the split of /æ/ and the merger of /o/ and /oh/. The split of /æ/ refers to the development (and in some cases the phonemicization) of a tense allophone ([æh]) in certain environments. The [æh] is variably raised at the phonetic level and often develops a schwa-like inglide. The merger of /o/ and /oh/ refers to the loss of a phonological distinction between the vowels in the historical word classes represented by *cot* (/o/) and *caught* (/oh/). This merger, which takes place in the low-back corner of the vowel space, is also called the low-back merger. Both variables represent vigorous and ongoing changes in contemporary American English and are key elements in extensive vowel shifts that typify the speech of large sections of the country. As a result of these shifts, urban vernaculars in different regions of the United States are diverging from one another, so that the varieties of American English spoken in New York, Chicago, Houston and Los Angeles are phonologically more different from one another than they were a century ago. In this context, an understanding of the nature, distribution and direction of changes in /æ/ and in the low back vowels is crucial to any adequate description of American English. In addition, it helps to answer central and enduring questions about the mechanism of language change and the structure of phonological space.

Thorough and systematic study of regional variation in the phonology of American English is the object of a major research project now underway at the University of Pennsylvania Linguistics Lab. This project, called Telsur, or the Telephone Survey, uses the telephone to cut the time and cost of traditional dialect research, thereby making available, for the first time, up-to-date, nation-wide data on American regional phonology that can be subjected to repeated impressionistic and acoustic analysis. One of the current concerns of the project is describing and explaining the hitherto little-known phonological systems of large Midwestern cities that fall outside the territory of both the Northern Cities Shift and the Southern Shift. This paper presents new data on one such city, Cincinnati, gathered within the framework of the larger research project. Cincinnati is the center of a metropolitan area of 1.7 million people in southwestern Ohio, on the Ohio River across from Kentucky. The city is on the southern border of what traditional dialectology has established as the Lower North, or North Midland dialect area. While our study of Cincinnati examined variation and change at many levels of

grammar, this paper will report on the two crucial phonological variables: the split of /æ/ and the merger of /o/ and /oh/.

2. Method

The data were collected in telephone interviews with fourteen Cincinnatians ranging in age from 18 to 68, allowing us to make inferences about change in progress using the apparent time construct. We also interviewed two speakers in nearby communities for purposes of comparison. In addition, six speakers from the Telsur project were used to augment our data where possible. The sample was divided into three generational groups: college-aged (Y), early middle-aged (M), and people in their 50s and 60s (O).   All of the speakers are listed below.

Figure 1: Demographic Profile of the Sample

I.D.	Sex	Age/Gen.	Speech Comm.
AmyR	F	18/Y	Cincinnati
MarissaS	F	18/Y	Cincinnati
AnneT	F	18/Y	Cincinnati
DaveH	M	23/Y	Cincinnati
GreggS	M	23/Y	Cincinnati
LindaH	F	40/M	Cincinnati
JerryH-Jr	M	40/M	Cincinnati
BruceL	M	44/M	Cincinnati
GaryS	M	46/M	Cincinnati
PatM	F	57/O	Cincinnati
JoyH	F	63/O	Cincinnati
MarilynS	F	63/O	Cincinnati
JerryH-Sr	M	68/O	Cincinnati
NancyS	F	44/M	Dayton, Oh
BillK	M	49/M	Louisville, Ky

Telsur Informants:

KeriS	F	17/Y	Cincinnati
SharonM	F	43/M	Cincinnati
LoisM	F	58/O	Cincinnati
GeorgeK	M	68/O	Cincinnati
MadelonK	F	44/M	Dayton, Oh
WarrenK	M	49/M	Dayton, Oh

The questionnaire used in the interviews entailed three principal methods of eliciting specific items: a word-list; questions about the sounds involved in

minimal pairs; and a technique called the semantic differential, in which people are asked to discuss connotational differences between near-synonyms containing the relevant phonological variables, as in *unhappy* and *sad*. Our analysis relies primarily on impressionistic listening and coding, done by both investigators. Both variables we examined involve essentially discrete values which can be ascertained for the most part by listening: the low-back vowels are either the same or different, and /æ/ is either tensed or not tensed. Therefore, in the vast majority of cases, acoustic analysis is not necessary.

3. The tensing of /æ/

The tensing and raising of /æ/, the vowel in words like *mat*, *mad* and *man*, is a widely-reported sound-change in American English dialects. It is common in the Middle Atlantic states, in the South, in the Midland, and in the North, where it is part of the Northern Cities Shift. The analysis of Labov, Yaeger, Steiner (1972) distinguishes between the phonetic raising of /æ/ and the phonological process of tensing (or peripheralization), which feeds raising. In our analysis of /æ/ in Cincinnati, we are not concerned with the phonetic degree of raising, but rather with the categorical process of tensing: which words are tensed by whom?

Our questionnaire and wordlist together elicited eight words containing /æ/. For each speaker we have an identical set of tokens: *sat*, *sad*, *fast* and *dad* from the word-list; and *sack*, *bad*, *unhappy* and *sadness* from the semantic differential section. This variety of environments allowed us not only to compare one speaker's overall pattern of tensing with another's, but to examine contextual effects on this variable in the Cincinnati speech community as a whole. We should note that in Cincinnati, as elsewhere in the Midwest, /æ/ is categorically tense before nasals and is raised to a position approximating a high-mid front vowel, as in [meˊn]. Because this is well-known, we did not include tokens of /æ/ followed by a nasal in our study. However, we were able to use the categorically tense character of the *man* class as a benchmark for tensing in other environments. We looked for two phonetic correlates of tensing: raising and the development of an offglide. We did not expect the raising of all tense vowels to approach the degree of raising before nasals, since it is well known that following nasals favor this process. We considered a vowel to be tense when it had a phonetic value of [E] or higher, as in [bEˊd]. A production of [bæd] was considered lax.

In our impressionistic coding, we assigned a value 0 to a lax vowel, 2 to a tense vowel, and 1 to indeterminate cases. These numerical codes allowed us to calculate averages for each word and for each speaker. These averages took the form of a number between 0 and 2, with 0 being categorically lax and 2 categorically tense. Combining data from all 14 speakers, the eight /æ/ words were ranked as in Figure 2 from most likely to be tensed to least likely.

Figure 2: *Average /æ/ score by word*
       (all speakers combined)

        0 = lax   1 = indeterminate 2 = tense

        Word   /æ/ *score*
        dad   1.38
        bad   1.37
        fast   1.27   tensing environments
        sad   1.18
        sadness   1.05
        ----
        sat   0.20
        sack   0.00   non-tensing environ.
        unhappy   0.00
        ----
        average   0.82

The tensing scale shows two distinct distributions on either side of the average: voiced stops and voiceless fricatives are tensing environments, while voiceless stops are not. This distribution is very similar to the Middle Atlantic pattern, particularly its New York instantiation. It is markedly different both from the Northern Cities, where /æ/ is tensed in virtually all environments, and from other areas of the Midwest and West, where it is tensed only before nasals. Cincinnati looks remarkably eastern in this respect.

        To see whether this tensing pattern was undergoing change, we looked for a relationship between the average /æ/ score and age. In cities where tensing occurs, like New York, Philadelphia and Chicago, the phonetic degree of raising tends to increase among younger speakers, while the older speakers are least advanced in the change. In Cincinnati we find just the opposite. The tensing of /æ/ is firmly entrenched among the middle and older groups, but apparently receding among the youngest group. This is shown by the average /æ/ scores for each group.

Figure 3: *Average /æ/ score by generation*
       (in tensing environments)

   0 = lax   1 = indeterminate 2 = tense

        Generation   average /æ/ score
        Oldest   1.78
        Middle   1.44
        Youngest   0.60

        Grand Mean   1.27

Figure 3 shows our three generational groups and their average /æ/ scores in tensing environments; that is, before voiced stops and voiceless fricatives. The average score for the whole population is 1.27. Both the middle and the oldest groups are above this average, while the youngest group is far below it. This suggests a wide discrepancy in tensing behavior between the youngest generation and the rest of the population. We can look at this on an individual level, too. Figure 4 shows the average /æ/ score for each speaker, arranged by age. (No Telsur informants were included in this analysis because we lacked comparable /æ/ data for them.)

Figure 4: Average /æ/ score in tensing environments

0 = lax   1 = indeterminate   2 = tense
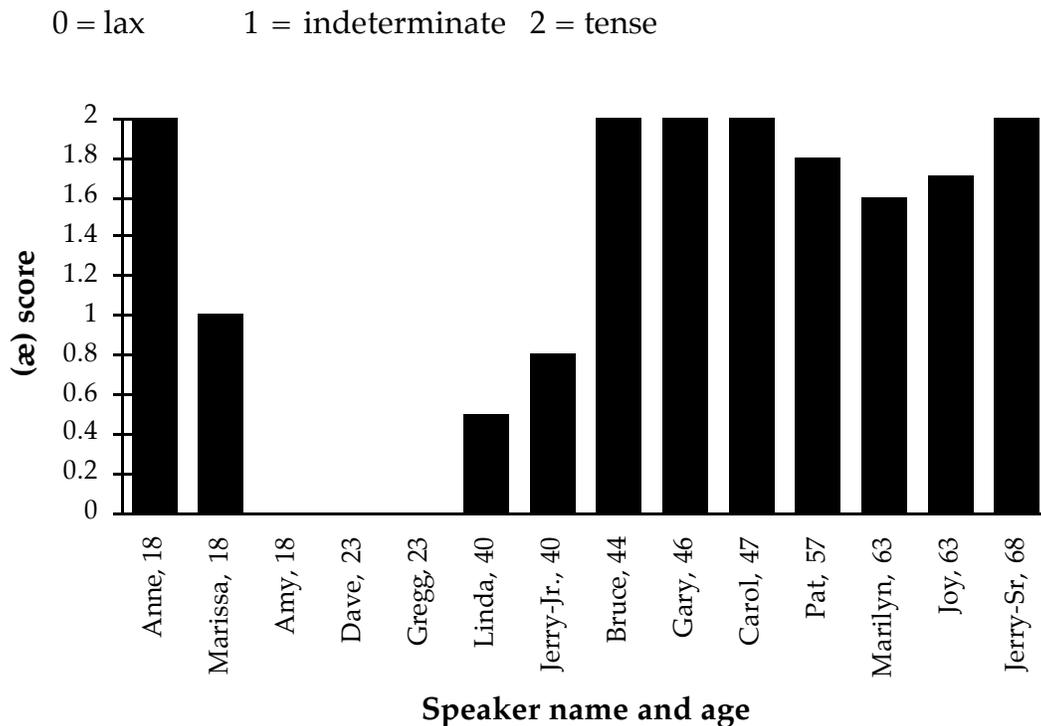
The oldest group shows the greatest consistency of any generation: all four speakers tense well above the average rate of 1.27. Those in the oldest group who show tensing scores below 2 may be showing a slight stylistic effect in their reading of the wordlist, since casual observation of their spontaneous speech showed consistent tensing in all tensing environments. The middle group shows a transitional stage, whereby the older speakers (in their mid-40's) pattern with the oldest generation, while the younger speakers (both 40 years old) behave more like the youngest group. In fact, Linda tenses only one word, *dad*, the most likely of the set to be tensed.

The youngest group shows a puzzling inconsistency. Three of the members, Amy, Dave and Gregg, show no tensing at all. But the remaining two women, Anne and Marissa, do tense, Anne as much as the oldest group.

This situation requires further investigation. One explanation that immediately presents itself is that the young men are rejecting a change they perceive as being led by women. However, this explanation has two serious weaknesses: first, Amy, one of our youngest women, does not tense at all; second, it does not look as though we are dealing with a change toward tense [æh], since it is well established among the oldest speakers. In fact, the converse explanation seems more likely: that the young men are leading the change away from the tense variant.

The data on Cincinnati /æ/ are puzzling for another reason. In no other dialect of American English has tensing been reported to be disappearing. Why this should be the case in Cincinnati is open to interpretation. One potential explanation, which we hope to investigate further, is that tensing is seen as a southern feature in Cincinnati and therefore avoided by young speakers who wish to distance themselves from the rural and rustic connotations of southern identity. In addition to our sample of Cincinnatians, we had access to similar data from one speaker in Louisville, Kentucky, an hour to the southwest of Cincinnati, and three in Dayton, Ohio, an hour to the north. These data from nearby communities support this story. Our Louisville speaker tenses everywhere, having the highest (æ)-score of any speaker we interviewed. The Dayton speakers do not tense at all (except, of course, before nasals). This suggests that if Cincinnati tensing is part of a wider regional system, it is apparently a southern, not a northern one. It is clear that Cincinnati /æ/-tensing is not an import from the north in any case because it does not show the general, context-free raising characteristic of northern cities.

4. The merger of /o/ and /oh/ (low-back merger)

The merger of /o/ and /oh/, or low-back merger, is another widely reported phenomenon in American dialects. In the Midwest, the Telsur project has shown a strong distinction between the word classes in the North, but a tendency toward merger in many Midland cities. We examined this change in Cincinnati by carrying out impressionistic analysis of six pairs of words: *hot-taught*, *sod-sawed* and *Don-Dawn* on our wordlist and *hot-caught*, *sock-talk* and a second instance of *Don-Dawn* from our minimal pair section. We have data on both production (the investigators' judgment of what the speaker says) and perception (the speaker's own judgment of what he says).

As with /æ/, we gave our qualitative codes a numerical expression. A merger -- where the vowels are identical -- was assigned a 0; a clear distinction was assigned a 2; indeterminate cases were assigned a 1. The indeterminate cases represented uncertainty either on the part of the speaker, who could not decide whether the vowels were the same or different, or on the part of the investigators, who judged the speaker's production to be too close for clear categorization. These numerical codes allowed us to calculate averages for each pair of words and for each speaker. These averages took the form of a

number between 0 and 2, with 0 being categorically merged and 2 categorically distinct. The average /o-oh/ score for each generational group can be seen in Figure 5 below.

Figure 5: Average /o-oh/ score by generation

      0 = merged   1 = close   2 = distinct

Generation	*average /o-oh/ score*
Oldest	1.50
Middle	1.39
Youngest	0.67

Grand Mean	1.19

The youngest speakers, with a group average of 0.67, are tending clearly toward merger, while the older speakers, who show averages well over 1, maintain a solid distinction.

Figure 6: Average /o-oh/ score in all environments

      0 = merged   1 = close   2 = distinct
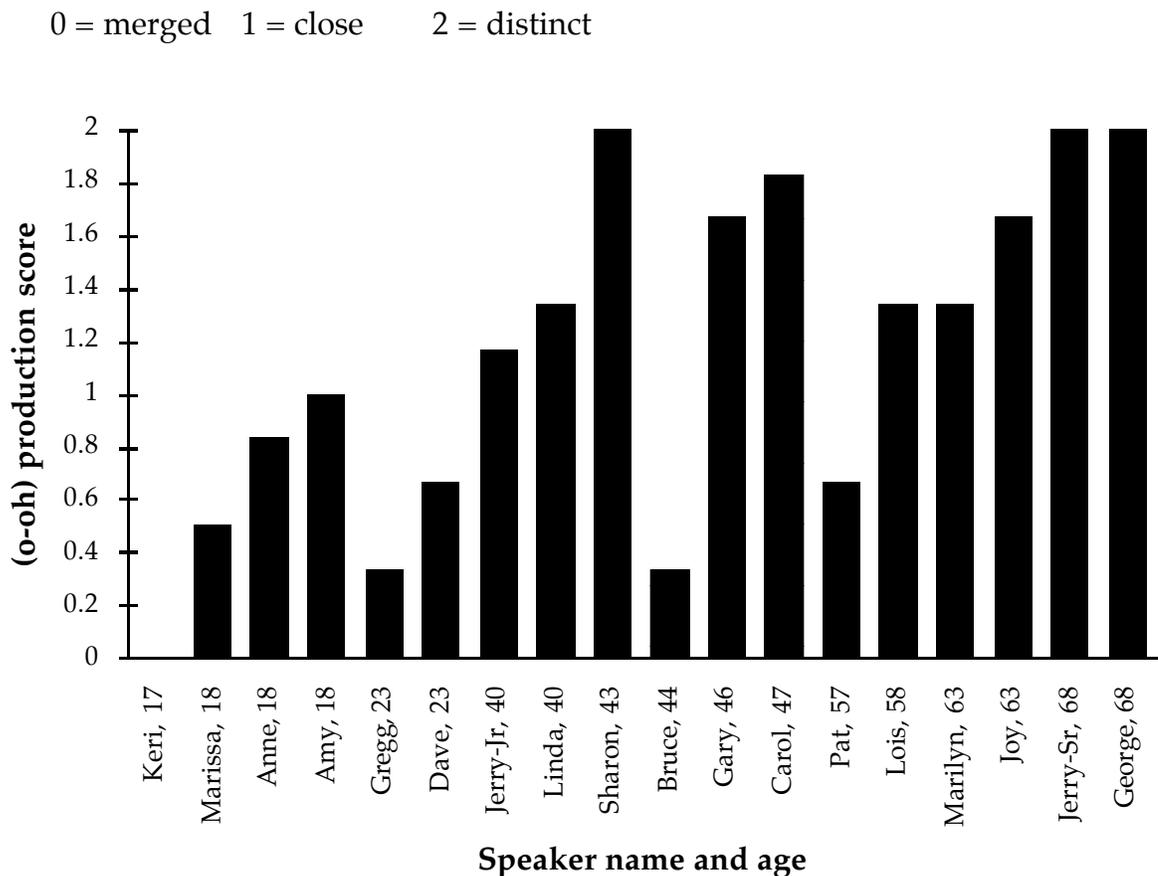
In order to compare individual speakers with one another, we calculated an average /o-oh/ score for each speaker from the production data for all environments. Figure 6 above shows the relation between this score and the speakers' ages. The four Telsur speakers from Cincinnati are included here. While there are some exceptions to the pattern -- Bruce and Pat are ahead of their peers -- the general trend is clear: the distinction between the low-back vowels is disappearing among the young.

How is this change proceeding? If we examine the score for each pair of words separately, we get the ranking shown in Figure 7 below.

Figure 7: Average /o-oh/ score by word-pair

0 = merged   1 = close   2 = distinct

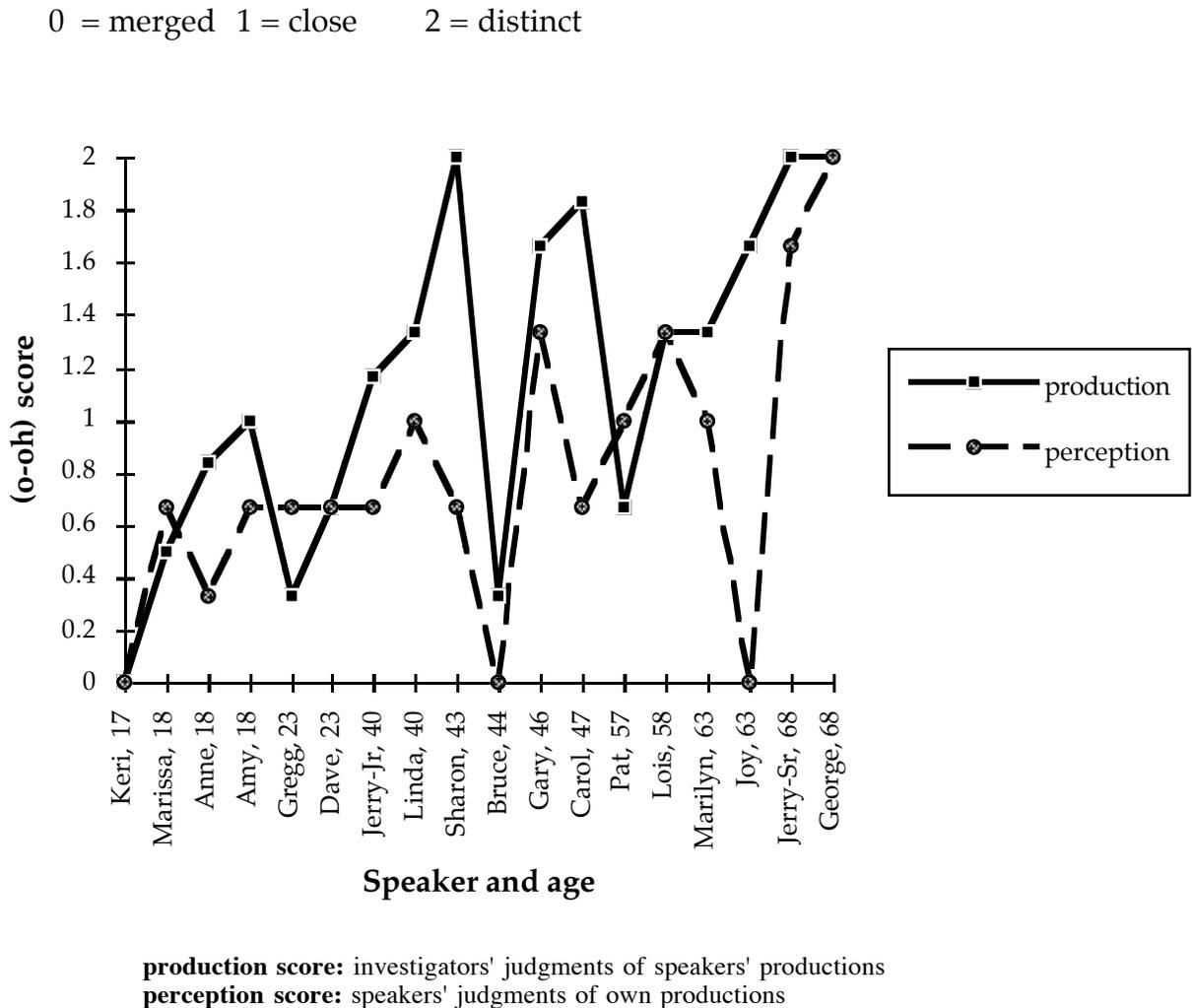| *Pair*	*i/v section*	*score*
sock-talk	minimal pairs	1.58
sod-sawed	wordlist	1.55
Don-Dawn	minimal pairs	1.12
hot-caught	minimal pairs	0.97
hot-taught	wordlist	0.88
Don-Dawn	wordlist	0.60

It is clear from this table that the merger is most advanced before /n/ and /t/; the hold-outs are the environments before /d/ and /k/. While the behavior of nasals as a favoring environment agrees with data from elsewhere, the leading role played by the unrounding and fronting of *taught* and *caught* in Cincinnati is unusual. A further observation to be made about these data is that in the case where the same pair (*Don* and *Dawn*) can be compared from the wordlist and the minimal pairs, there is a greater distinction in the minimal pairs. This suggests that even the merging speakers retain some control over the distinction, so that they can produce more of a difference when they concentrate on it.

Part of the wide difference between the environment before /t/ and that before /d/ might be explained by the possibility that *sod* and *sawed* do not really constitute a minimal pair in Cincinnati because of some noteworthy characteristics of *sawed*. Some speakers had a southern-style rounded off-glide in *sawed* (pronounced [sAwd]), while others had an intrusive [l] ([sAld]), variably vocalized. Either of these features could create an additional distinction between the environments, so that the difference between the words does not rest on the vowel alone. Obviously, the role of upglides in distinguishing the /oh/ class could be crucial and this needs to be investigated further. However, our impressionistic analysis indicates that back upglides are not a common feature of /oh/ in Cincinnati speech, as they are in Southern States English.

Another aspect of the mechanism of this change is that it is more advanced in perception than in production. Figure 8 shows average /o-oh/

scores for both perception (the speaker's judgment) and production (coders' judgment) for each speaker, by age.

Figure 8: Production versus perception of /o-oh/

0 = merged   1 = close   2 = distinct

production score: investigators' judgments of speakers' productions
perception score: speakers' judgments of own productions

In 12 out of 17 cases, the /o-oh/ score for production is higher than that for perception; in only three cases does production run ahead of perception. This accords with previous studies which show that the merger takes place first in perception, a phenomenon that can lead to a situation of near-merger in which speakers claim they cannot hear a distinction that they consistently produce.

To supplement our data from minimal pairs, we carried out commutation tests in person on two speakers, a man (Gary) in the middle generation and his daughter (Marissa) in the youngest generation. Commutation tests are a method of testing a speaker's ability to perceive a distinction between two vowels. A randomized list of minimal pairs containing the vowels is prepared and the speaker is asked to state which

word he or she hears. Speakers with a true phonemic distinction score 100% in the accuracy of their labeling of a distinct stimulus. Speakers who have lost the distinction typically score around 50%, showing that their labeling is more or less random. A score of 75% is intermediate, suggestive of a merger in progress.   The speaker can be asked to label either his or her own production, from a tape, or the production of another speaker. We did both kinds of tests, and the results can be seen in Figure 9 below.

Figure 9: Results of commutation tests for /o-oh/

	% **labeled correctly**	
	cot-caught label: 'bed-catch'	*Don-Dawn* label: 'boy-girl'
Test		
Marissa judging own speech	90%	40%
Gary judging Marissa's speech	80%	40%
Marissa judging Gary's speech	90%	80%

Marissa, the young woman, with an /o-oh/ score of 0.5, well on the way to a merger, was asked to label her own utterances of *cot* and *caught* as either *bed* or *catch*. As shown in the first line of the table, she had a surprising 90% success rate: only once did she incorrectly label a token of *cot* as *catch*. This score, well above a random result, suggests that considerable perceptive ability remains. Marissa was also asked to label her own utterances of *Don* and *Dawn* as either *boy* or *girl*. She had only 40% success in this task, a random score, with miscategorizations in both directions. This set of tests provides clear evidence that the low-back merger, at least for this speaker, is most advanced before nasals. This accords with the findings of Telsur for speakers in other regions.

In a second set of tests, Gary and Marissa were asked to label one another's productions of *cot* and *caught* and *Don* and *Dawn*, reading from prepared lists of words. These results are shown in the second and third lines of Figure 9. We found that Gary could not distinguish his own daughter's productions of *Don* and *Dawn*, scoring only 40%, and had considerable trouble with *cot* and *caught*, with 80% correct. Since Gary is not a merged speaker himself, we can attribute his performance to the merger in production exhibited by Marissa. The crucial question is whether Marissa, who is merged, can label correctly the distinct productions of her father. She had only limited success at this task, as shown in the last line of the table. As we indicated before, speakers with a true phonemic distinction score 100% in

these tests, but Marissa scored 90% with the *cot-caught* pair and only 80% with the *Don-Dawn* pair. This suggests a considerable reduction of perceptual ability but not, interestingly, a complete loss of it. In fact, this appears to be counter-evidence to the observation made earlier that a merger will occur in perception before it occurs in production. It is also puzzling that the results of the commutation test show Marissa to be less advanced in the merger than the results of our impressionistic analysis. However, ambiguous as these results may be with respect to the mechanism of change, they show very powerfully the effects of language change within a single family. This situation, in which the child has a different grammar from the parent, highlights the dynamic nature of language and the importance of including more than one generation of speakers in any description of a speech community.

5. Conclusion

These new data on Cincinnati speech bear crucially on the study of American English in two ways. First, they suggest that the low-back merger, well established in the West, in eastern New England and in western Pennsylvania, is taking hold in other areas of the country. In Cincinnati, we have an opportunity to study the inception of this change in the youngest generation, many of whom exhibit a near-merger. This transitional situation, in which production and perception data conflict, presents a challenge for the phonological description of a speech community. Second, the uniqueness of the Cincinnati /æ/ pattern stands in stark contrast to the uniformity we have found within other dialect regions and emphasizes how much we have yet to learn about Midwestern phonology. Moreover, the fact that Cincinnati appears to be reversing a change going on in other cities amplifies the evidence that major urban dialects of American English are diverging, rather than converging, in the age of mass-communication.

6. References

Labov, William, Malcah Yaeger and Richard Steiner (1972). *A Quantitative Study of Sound Change in Progress.* Philadelphia: U.S. Regional Survey.