

ABSTRACT

SELLERS, JAMES CLARK. Regional /o/ in North Carolina: A Cartographic Analysis of a Feature of the Southern Vowel Shift. (Under the direction of Erik Thomas).

This thesis examines sociophonetically the variation of /o/ in North Carolina. Though often overlooked in terms of its diagnostic status, it is one of the most symbolic vowels in terms of a range of social and ethnic variables. Previous research by Kurath and McDavid (1961), Thomas (1989), and Wolfram and Thomas (2002) has found that /o/ fronting was occurring in the late 18th Century in the northeast coastal region while in the Piedmont region /o/ was farther backed. The centralization and lowering of the nuclei of back vowels, including /o/, is considered to be a part of the Southern Vowel Shift (Labov 1991). The glide of /o/ in the Southeastern US has become fronted more recently (Labov, William, Yaeger, and Steiner, 1972; Thomas 1989; Thomas 2001). Is /o/ in North Carolina conforming to the traditional specifications of the Southern Vowel Shift? Does its conformity vary regionally? How did the change spread across North Carolina? Using acoustic analysis, this paper attempts to answer these questions by looking at the speech of European Americans from twelve sites scattered throughout North Carolina. These sites roughly represent the major dialect regions of the state in an attempt to map the fronting and raising of the nucleus and glide of /o/ regionally. Previous research has proven that the nucleus of /o/ in North Carolina cities is currently more fronted and lowered, in accordance with the Southern Vowel Shift, than it was in the past. However, the results of this comparative analysis indicate that this is not universally true for North Carolinians and that the trajectory of change for /o/ varies regionally throughout the state. For example, /o/ fronting was previously less advanced in the western part of the state but

young speakers from that area are now exhibiting a high degree of /o/ fronting while speakers from areas like Hyde County, a coastal area, have younger generations exhibiting increasingly backed nuclei for /o/. State wide, however, the range of possible values narrows among the younger speakers while the older speakers are much more varied. This variation could indicate that the possible vowel space for /o/ is becoming more static as the feature has undergone a change and is now settling into a vowel space that is shared statewide. This study focuses on a single feature and includes both a large number of subjects engaged in conversational speech and a broad-based geographic analysis with several generations of subjects for each region. This representation allows for an in depth analysis of each speech community so that instead of representing each community as a homogenous group, intra-community variation is accurately represented in a way that allows for regional comparison. For example, the younger generation in Hyde County can be divided up into those who have a fronted glide for /o/ and those who do not. This study looks at correlations between site-specific variables and represents these correlations geographically allowing for a regional evaluation of intra-community variation. By incorporating geography into sociolinguistic inquiry this study contextualizes intra-community variation within the larger regional dialect, showing how macro- and micro-variables need to be factored into variation analysis.

**Regional /o/ in North Carolina: A Cartographic Analysis of a Feature of the
Southern Vowel Shift**

by

JAMES CLARK SELLERS

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APPROVED BY:

Walt Wolfram

Jeffrey Reaser

Erik R. Thomas
Chair of Advisory Committee

DEDICATION

I would like to dedicate this thesis to George Goodyear. Without his assistance I would never have made it this far.

BIOGRAPHY

James Clark Sellers was born on February 25, 1982 in Portland, Oregon. He was raised by a single mother who died on September 23, 1997. Sellers finished out high school living with his cousin Scott Donaldson. With the financial assistance of George Goodyear, he attended North Carolina State University and completed a Bachelor of Arts Degree in English Literature with minors in Film Studies and Linguistics. Sellers graduated in May of 2005 and began his graduate study in Linguistics in the fall of 2005. With the completion of this thesis, Sellers fulfills the requirements for a Master of Arts degree in English with a concentration in Linguistics.

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1. INTRODUCTION

The centralization and lowering of the nuclei of back vowels, including /o/, is considered to be a part of the Southern Vowel Shift (Labov 1991). The glide of /o/ seems to have become centralized in the Southeastern US contemporaneously with the nucleus (Labov, Yaeger, and Steiner 1972; Thomas 1989; Thomas 2001). This thesis is an attempt to describe the trajectory of change for /o/ in North Carolina and examine whether it is conforming to the traditional specifications of the Southern Vowel Shift. I also use a unique methodology that relies mostly on a database of convenience samples taken from field sites throughout the state. However, this study is not based on a convenience sample. Conventional wisdom, based on an extrapolation of the Southern Vowel Shift, holds that the nucleus of /o/ in North Carolina has become more fronted and lowered in accordance with the Southern Vowel Shift. This seems to be more or less true for North Carolinians but the rate of change for /o/ varies regionally throughout the state while the trajectory seems to comply with the norms for the Southern Vowel Shift. Only a few sites exhibited no /o/ nucleus centralization in the older generation. However, even the regions that exhibited centralization of the /o/ nucleus in the older generation tend to have a greater degree of it in the younger generations. Moreover, the sites with less centralization in the older generation tend to be urban areas and western but exhibit a similar rate of change between the younger and the older generations while the sites with a greater degree of centralization among the older generation tend to be more rural. Seemingly, the change has spread from East to West and from rural to urban areas.

However, temporal precedence does not imply causality, and so this is not enough to prove that the shift followed a hierarchical shift. In fact, it is possible that a combination of hierarchical, counter-hierarchical, and wave diffusion were occurring. Also, it is important to note that when the feature spread the most rapidly through North Carolina, there were very few large metropolises.

Previous research has proven that /o/ fronting was occurring in Northeastern North Carolina near the northern Outer Banks area and somewhat inland during the mid to late 19th Century. Kurath and McDavid (1961) found that /o/ in the Piedmont region was further backed in the IPA space for that vowel. Thomas (1989) found /o/ to be fronted in the same region among speakers representing the conditions during the 1860s and 1870s. Notably, Thomas found /o/ fronting in rather high percentages in Hyde County among white speakers. Thomas also found some /o/ fronting to be occurring in Robeson County in lower amounts. Warren County, which was also covered by the study, did not exhibit substantial amounts of /o/ fronting. Another study by Wolfram and Thomas (2002) looked specifically at /o/ in Hyde County. In a similar diachronic analysis of speakers born between 1880 and 1985, Wolfram and Thomas found that /o/ was fairly stable in Hyde County for both the nucleus and the glide (2002). These three counties all lack large metropolises and have varying degrees of progression in the fronting of /o/. Therefore, the question of how /o/ fronting is spreading throughout the state arises. Is it spreading in a hierarchical or wave pattern? Why is there discrepancy in the degree of fronting evident in previous studies for these three rural counties and will a pattern emerge when taking more field sites into account?

1.2 DEMOGRAPHICS

North Carolina's population distribution has changed dramatically over the last century and a half. The state was mostly rural until well into the industrial revolution. In fact, according to US Census data, the percentage of the population living in urban areas did not break 10 percent until early in the twentieth century. The Twentieth Century, however, saw rapid urbanization of the state. Today, the majority of North Carolina citizens live in urban areas. The US Census department defines an urban area as consisting "of a large central place and adjacent densely settled census blocks that together have a total population of at least 2,500 for urban clusters, or at least 50,000 for urbanized areas. Urban classification cuts across other hierarchies and can be in metropolitan or non-metropolitan areas" (2006) and rural as being any territory that is non-urban. Table 1.1 includes the census data from 1850 to 2000. It includes the total population of North Carolina, the urban population, the rural population, and the percentage of the total population that is urban.

Table 1.1 North Carolina Population from 1850 to 1970 according to US Census data.

Date	Total Population	Urban Population	Rural Population	Percent Urban
1850	869,039	21,109	847,930	2.4
1860	992,622	24,554	968,068	2.5
1870	1,071,361	36,218	1,035,143	3.4
1880	1,399,750	55,116	1,344,634	3.9
1890	1,617,947	115,759	1,502,190	7.2
1900	1,893,810	186,790	1,707,020	9.9
1910	2,206,287	318,474	1,887,813	14.4
1920	2,559,123	490,370	2,068,753	19.2
1930	3,170,276	809,847	2,360,429	25.5
1940	3,571,623	974,175	2,597,448	27.3
1950	4,061,929	1,238,193	2,823,736	30.5
1960	4,556,155	1,801,921	2,754,234	39.5
1970	5,082,059	2,285,168	2,796,891	45.0

The hierarchical spread of a language feature is one that goes from urban center to the surrounding rural areas. Contagious diffusion is when a feature spreads from one area to its adjacent area and disregards whether areas are urban or rural. Within the context of North Carolina, where so much of the population lived in rural areas and there were very few urban areas, the question of hierarchical versus contagious diffusion might seem

moot. There seems to be no option of hierarchical spread since there is a lack of high density urban areas during the early decades covered in this study. However, the question remains whether once North Carolina begins to urbanize if the language spread maintains its counter hierarchical spread. There are several socio-economic factors that might have contributed toward there being a counter-hierarchical spread. During the reconstruction period after the Civil War North Carolina began to rapidly industrialize, mainly in the form of textile and tobacco mills (Leebler 1973). Prior to this, the state economy was mostly dependent on agriculture. However, after the Civil War it began to shift towards relying on industry. While this is true for the Piedmont region of the state, the southwestern portion of the state was dominated by the lumber industry, which gave rise to sawmill villages in the region (Taylor 2001). Two main factors caused industry to develop in a decentralized manner. First, these industries are all based on the extraction of resources so, since there were no pre-existing urban areas with large sources of cheap labor, the most logical location of a mill was near the raw goods that the mill processed. Second, the highways and roads in North Carolina were poor until the passing of the Highway Act of 1921 and, although there was quite a bit of railroad building after the Civil War, the railroads were expensive to use in North Carolina, meaning that the price of shipping raw, bulky goods on the railroad was high.

While there was much railroad building between the 1880s and the 1900s, it was still expensive to ship goods along the railroad, since investors were seeking to make a profit on the capital they had invested. After 1870, the state stopped giving aid towards railroad construction and control of the railroads was given to private industry (Leebler 1973). By the 1900s, North Carolina had 3,800 miles of railroad that were mostly owned

by private companies from outside the state. These railroads ran mostly from north to south. Thus, it became more logical to process the goods near the source of the raw materials before shipping them (Leebler 1973). As a result, North Carolina's emerging urban centers were simply rural areas that were urbanized because of their proximity to raw goods and railroads. For instance, in 1870s approximately 70 percent of goods hauled on North Carolina railroads went through Charlotte and Greensboro.

While the 1940s-1970s saw increases in the percentage of the population living urban areas, both urban and rural populations generally increased. Currently, the urban areas of North Carolina are increasing at a much faster rate than the rural areas, some of which are in population decline. For instance, 15 rural counties experienced a loss in population from July 2005-July 2006. One of which, Hyde County, experienced the largest population loss at nearly 8 percent. The eastern and coastal portions of the state increasingly depend upon tourism to attract population growth. However, the rural counties that are too far from the beach to attract tourists and lack urban centers to attract commuters are hit particularly hard by population loss. Much of the population loss is due to the inability to attract tourists but also from a decrease in textile mills and tobacco farming (Collins and Allegood 2007). In fact, nine of the 15 counties experiencing population loss from 2005 to 2006 are located in the northeastern portion of the state.

The economic divide between rural and urban areas of North Carolina, as represented by median household income, has likewise been steadily growing for some time at an increasingly faster rate. This is mostly due to a decrease in the standard textile plants and agricultural, namely tobacco, that many of the rural areas rely on for income (Glascock 2002). While the counties containing the metropolises, like Raleigh, Charlotte,

Wilmington, and Asheville, tend to attract people from other metropolises and all over the state, the counties without major metropolises and that tend to be more rural attract people from only the surrounding counties. However, the metropolises of North Carolina tend to attract a large amount of migrants from large, out of state metropolises (Braken 2007).

Although the percentage of the North Carolina population that lives in urban areas has increased every decade, there are two periods that show a marked spike in urbanization. During the first quarter of the twentieth century the urban population jumped from 10 percent of the population to around 25 percent. This spike was largely due to industrialization in the state. The second spike occurred during the last 30 years. Much of the urbanization of the state in this later period occurred as the state economy shifted further from relying on agriculture.

2. DIALECT MAPPING

When mapping dialect patterns, there are quite a few issues of which to be aware. One of these is the separation of the geographic space in which language change diffuses from the sociolinguistic diffusion from one social group to another and the diffusion from one linguistic environment to another (Chambers and Trudgill 1998). Moreover, the classification of a field site as urban or rural must also be taken into account (Chambers and Trudgill 1998). Another issue confronting dialectologists is collection and analysis of linguistic information. To further complicate things, some forms of linguistic analysis give discrete results and can thus be mapped discretely; however, acoustic analysis gives gradient results and must therefore be represented with gradients.

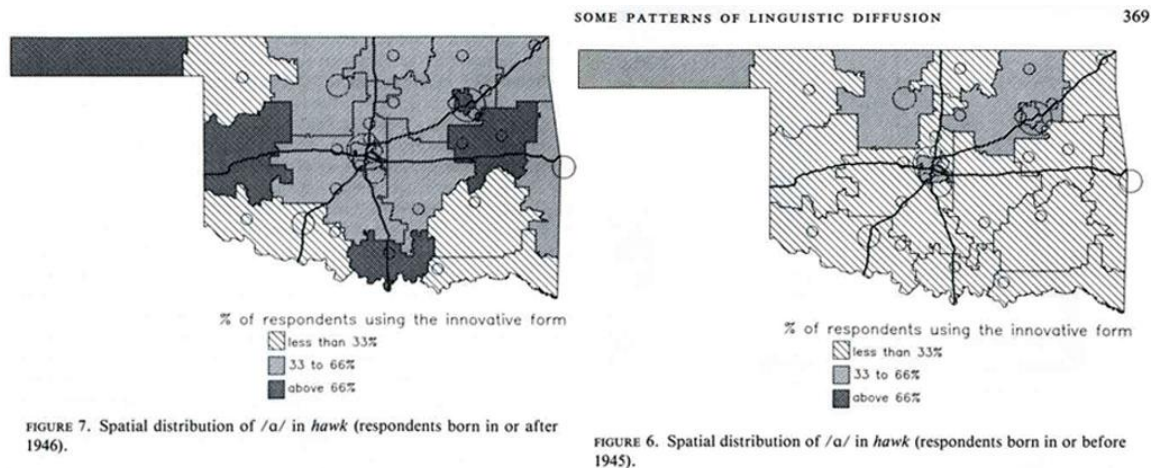


Figure 2.1 Choroplethic Maps used in Bailey et al (1994)

In Figure 2.1, Bailey et al. use choroplethic maps (1994). This type of mapping technique divides the region being analyzed into cells which are then shaded based on

their population's correspondence with a given statistic. In this instance, it is the percentage of the population that used an innovative linguistic form. The benefit of this method is that one can look at the map and easily understand the distribution of a linguistic feature. However, its drawback is that it represents continuous data discretely. For instance, in Figure 2.1 there are three categories of cell shading and they correspond to the values 0-33%, 34%-66%, and 67%-100%. Under this method, 32% and 35% are in completely different categories. However, you cannot tell how similar an area whose population exhibits 32% usage of a given feature is to an area whose population exhibits 34% usage of the feature.

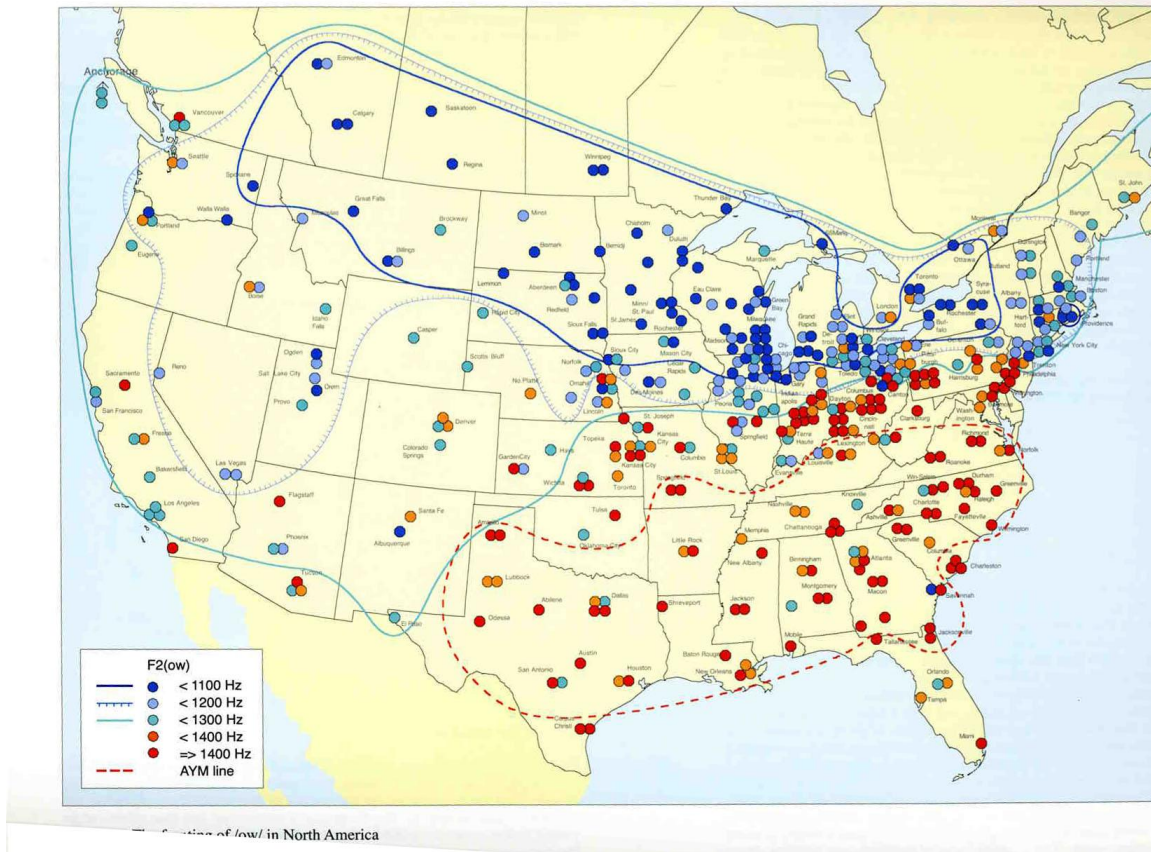


Figure 2.2 Approach to dialect mapping used in Labov et al in the Atlas of North American English (2006)

In Figure 2.2, Labov, et al (2006) take a similar approach. However, instead of using different types of line shading they use different colors to represent different Hz values. Although this has the same effect of representing continuous data discretely, it is a step in the right direction since they use a progression from warm to cool colors. They still end up with similar values being represented as being more distinct than they actually are. However, the difference between the progression from dark blue to light blue is not as stark as the progression from solid shading to diagonal shading.

3. METHODOLOGY

In this study I examine the speech of European Americans from fourteen sites scattered throughout North Carolina. I have taken speakers from pre-existing interviews from the North Carolina Language and Life Project archives as well as the New South Voices archive and the University of North Carolina at Charlotte. In total, there are 82 speakers covered in this study. In order to resolve the issue discussed in chapter 2 associated with separating geographic diffusion from sociolinguistic diffusion, I have tried to limit the amount of different social groups involved in this study. For this reason, the speakers are all white, both male and female of varying ages. The reason I chose all white speakers was because of the limitations of the available speakers in the NCLLP archive. Some of the field sites I wanted to include only had white speakers, or had too few representatives of other ethnicities. The reason I chose to use both males and females was a similar reason. There were not enough males and females in every field site for all age groups to use a single sex. While females can often lead sound changes, it is generally relative to the community in which the sound change is occurring. Therefore, using all of one sex, females for instance, might lead to having a one community where females are the innovators and another where they are not. The result would be that one field site appears to be more advanced in the change when in reality they are not. The solution that I found for this problem was to try to get an even mix of males and females where I could. However, for the older generation it was often the case that there simply were not any males available.

The majority of these interviews range from 45 to 90 minute conversations. The

field sites are represented in Figure 3.1. These field sites were gathered as part of ethnographic and social network language variation analyses. These sites roughly represent the major dialect regions of the state in an attempt to map the fronting of the nucleus and glide of /o/ regionally.

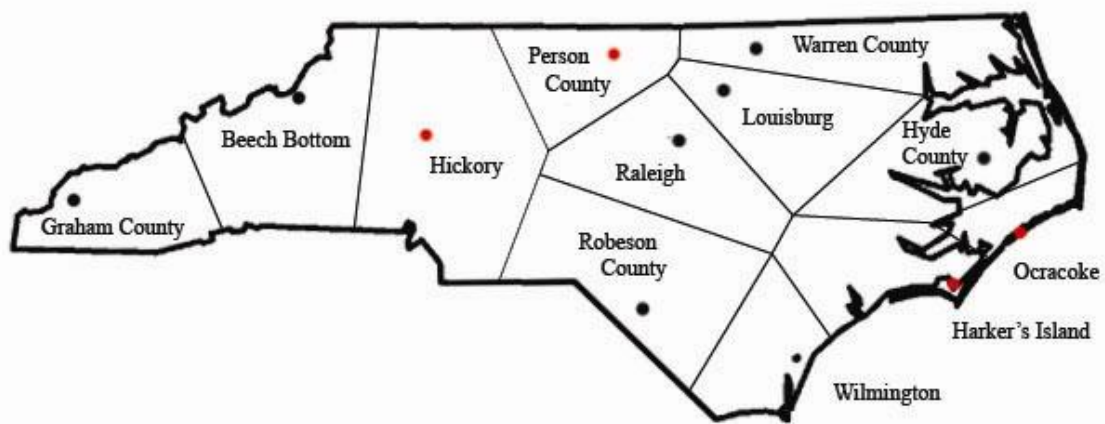


Figure 3.1 Map of Field sites in North Carolina

I divided the speakers up into three age groups. Age group one consists of those born before 1945, age group two consisted of those born between 1946 and 1970, and age group three consists of those born after 1971. These divisions represent events that are generally considered to be linguistically significant. Age groups one and two are demarcated by the end of WW2 while group two and group three are separated by integration of European Americans and African Americans in schools. With this type of study it is difficult to find an event that equally impacts all regions of the state, but this system seems to suffice in that its age group boundaries exhibit a distinct change over

time. Where possible, I tried to exclude speakers that were within three years of each age group boundary in order to avoid situations in which speakers represent different age groups but are only a few years apart. Each field site consists of at least 2 members of age group one, 1 member of age group two, and 2 members of age group three, except in a few cases. However, most of the sites exceed these numbers.

The older generation was born during a time when there were very few high population towns, while the youngest generation was born during a period in which there was a greater difference between the urban and rural areas of the state. Since the distinction between rural and urban is relative to the population density of the area being studied, it is difficult to come up with a standard that would apply equally to all age groups in a region such as North Carolina where rapid population and city density growth occurred during the time being studied. What would be considered urban for the older generation could be considered rural for the younger generation. However, this study will attempt to use the classifications of urban and rural as defined by the United States Census Bureau as they apply to each age group. The only group for which this method poses a problem for, however, is the older age group, which includes all speakers born pre-1945. Due to rapid industrialization and this being the period of time during which drastic differences between urban and rural areas began to emerge, it is feasible that what might have been an urban area for someone born in 1910 was no longer an urban area for someone born in 1939.

The digitized speech samples were analyzed using PRAAT phonetics software. Ten to fifteen tokens of /o/ were extracted from conversational speech for each speaker examined. The F_1 , F_2 and F_3 value for each speaker's /o/ was taken at 35ms from the

onset of the vowel for nucleus measurements and 35ms from the offset of the vowel for glide measurements. Only the F_1 and F_2 were analyzed in this study, but the F_3 was used for normalization. I avoided using the same phonetic environment more than twice and used only tokens on the stressed syllable for polysyllabic words. I avoided phonetic environments involving /r/, /w/, /y/, nasal and laterals. Nasals have been shown to cause false formants due to the presence of anti-formants while laterals and approximants have been shown to cause strong coarticulatory effects. Many pre-vowel position /o/s were also excluded since a /w/ can often be present in this environment. The phoneme /w/ is particularly troublesome for /o/ measurements since lip rounding can create the appearance of backing and rising. At least ten tokens of /o/ were measured for each speaker. The mean formant value was taken for all the tokens of each individual speaker. The means were normalized by converting the Hertz value to Bark metric values and then subtracting the Z_2 from the Z_3 value to represent the F_2 and the Z_1 from the Z_3 value to represent the F_1 value. This normalized value was used to represent each speaker.

4. RESULTS

North Carolina currently has thoroughly fronted /o/ in the youngest population group. In the youngest generation, /o/ is often lowered on both the nucleus and the glide. While the patterns for the onset of F₂ seem to be pretty uniform throughout the state, both the onset and offset of F₁ and the offset of F₂ have a high degree of variation. The pattern of variation seems to be that the field sites with large metropolises and the extremely isolated portions of the state are more resistant to the shift of /o/. However, they are resistant in different ways. The isolated areas shift later, but fairly quickly, while the field sites that tend to be more urban and have metropolises shift more gradually. This is probably because the isolated areas have less exposure to the change, but once the area has a greater amount of exposure to it they adopt it rather quickly. The sites with metropolises are exposed early on, but it is possible that it takes longer for the shift to diffuse across all the social networks within the metropolitan community. While both metropolises and isolated areas may follow the same pattern of change that other regions of the state are following, they tend to differ from their surrounding areas. In the areas that have less urban centers and are smaller but are not isolated, the change seems to be more consistent from field site to adjacent field site. However, the ways in which the urban and isolated regions are resistant differ. For instance, the F₂ in both Wilmington and Beech Bottom from the oldest to the middle generation shifts only slightly forward while the rest of the state is either already fronted and exhibits little change or is slightly backed and exhibits a substantial change. However, the nucleus of /o/ in Ocracoke,

another area that was isolated during this period, follows the trend of the rest of the state while the glide differs from the surrounding regions in that it is front gliding while its rural neighbors are back gliding. The glide for F₂ tends to have a high degree of variation in terms of both its trajectory and its intensity. Most of the state tends to move from back gliding to little difference between the nucleus and the glide, but some areas shift from a small shift from the nucleus to the glide to front-gliding or back-gliding to front-gliding. Previous research, displayed in Figure 4.1, depicts samples from all the major cities in North Carolina having F₂ values greater than 1300Hz (Labov, Ash and Boberg 2006). According to the system that Labov et al use, these values represent a greatly fronted /o/, which means that North Carolina has already shifted into the specifications of the Southern Vowel Shift, as least as far as the F₂ of the nucleus is concerned.

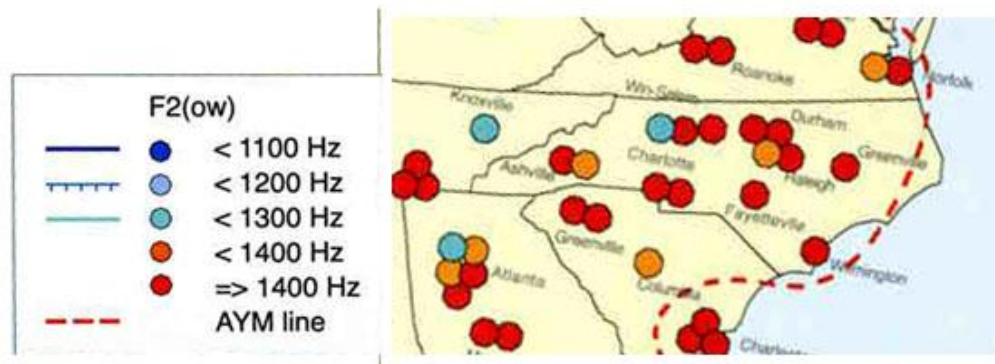


Figure 4.1 North Carolina /o/ fronting data taken from the Atlas of North American English (Labov, Ash and Boberg 2006)

In the oldest generation, as represented in Figure 4.2, the rural areas exhibit the greatest degree of /o/ fronting in North Carolina. The urban areas are much farther

backed and the northeastern portion of the state seems to be leading the change. It is important to note that for the oldest generation, Wilmington was the only city that was a metropolis from beginning to end. Charlotte, Asheville, and Raleigh become much more urban and began developing into metropolises during the later part of the oldest generation and the bulk of people moving to those cities came from the surrounding rural areas.

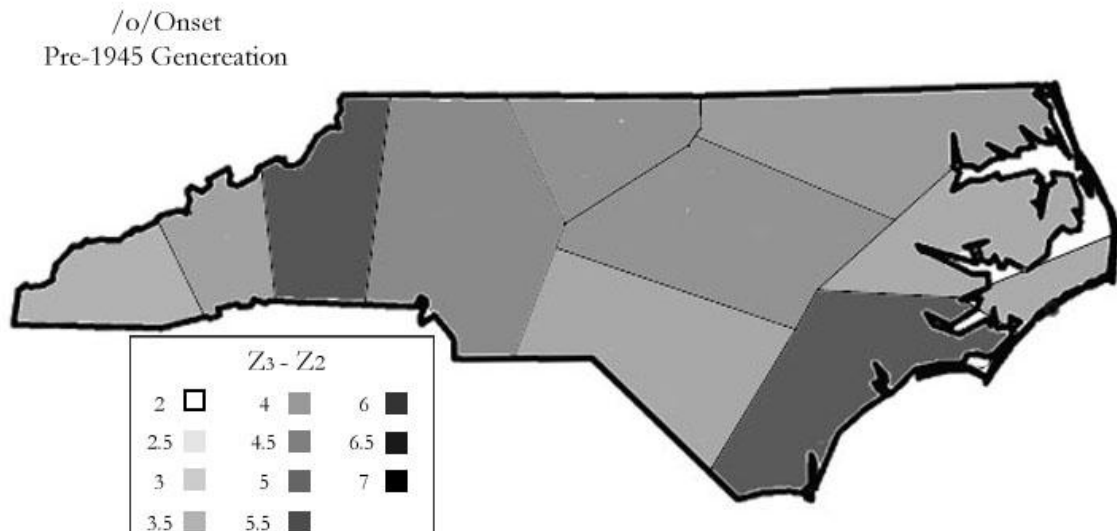


Figure 4.2 Map of /o/ Onset for the Pre-1945 generation

4.1 ANALYSIS OF THE F₂ ONSET

The sound change for the onset of F₂ appears to have begun in the northeastern portion of the state and spread in a wave pattern throughout the state. As seen in Figure 4.2 which depicts the onset for the pre-1945 generation. It also appears that it spread counter-hierarchically into the major cities. However, Raleigh, Charlotte, and Asheville

experienced a dramatic population increase during the early 20th Century, which came mostly as a result of immigration from rural areas to those cities. In fact, the pre-1945 generation is the time period that they became major cities. Wilmington was the only major city before this and it seems to be minimally affected by the shift in the nucleus of /o/, with only mild fronting occurring in the youngest generation. The northeastern rural areas of the state seem to have led the sound change, although that is not to say that it was the sole influence on the regions that later followed the sound change. Hyde County has a 3.54 mean Z_3 - Z_2 Bark metric value while Ocracoke has a 3.61 Z_3 - Z_2 Bark metric value, which is not a substantial difference

Since several parts of the state shifted in the same ways, but some of the sites were isolated from the others, it is likely that a degree of independent development occurred throughout the state. For example, Hyde and Ocracoke have similar values for the F_2 onset in the oldest generation. It is possible that one of the sites had a direct influence on the other, but it is more likely that the fronting of the nucleus of /o/ developed independently in these sites. However, Robeson County exhibits similar shifting to the northeastern counties. While these sites are not isolated from one another, they probably had little influence on each other. Therefore, there is probably some greater influence that is responsible for the initiation of the shift in multiple regions of North Carolina. One explanation for this could be in the fact that the railroads in the pre-1945 generation ran mostly from north to south. Both Robeson County and the northeastern field sites are closer or nearly equidistant to cities in other states as they are to cities in North Carolina. Since the shift is most uniform in the piedmont and northeastern coastal region, this might imply that South Carolina and Virginia have an influence on the

southern vowel shift in North Carolina.

Ocracoke and Hyde County are the northeastern most regions included in this study and they also exhibit the most fronting of /o/ in the oldest generation, followed closely by Robeson County. In fact, Hyde and Ocracoke seem to have finished moving into the new vowel space and have stopped shifting frontward. They seem to have been fluctuating around their new vowel space from generation to generation without much substantial change. Wilmington and Raleigh exhibit the most backed /o/ with 5.45 and 4.05 Z_3 - Z_2 Bark difference metric values respectively. Beech Bottom also has a substantially backed /o/.

In the 1946-1970 generation, which is represented in Figure 4.3, urban areas have caught up with the change as well as the western portions of the state. Rural areas seem to have initiated the shift, because they exhibit shifting earlier than the urban areas, but the urban areas did not take long to begin shifting as well. This might imply that both the urban and the rural areas began shifting at or around the same time, but the rural areas shifted more quickly than the urban areas. The younger generation, represented in Figure 4.4, shows urban areas with a more advanced /o/ fronting than some of the rural areas that initiated the change. However, regional variation has decreased substantially and the map is now much more uniform. In fact, the only areas that are consistently distinct from the rest of the state are Wilmington and Beech Bottom.

/o/Onset
1946-1970 Generation

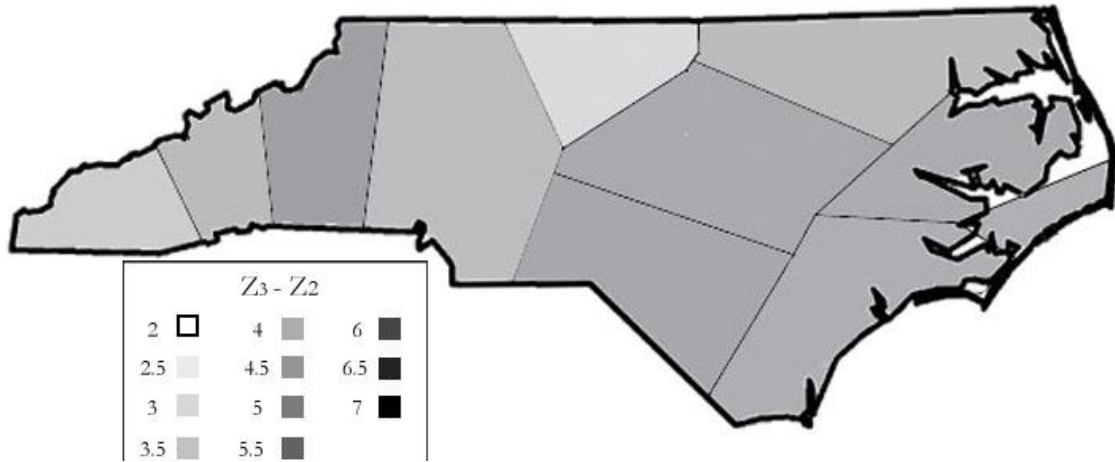


Figure 4.3 Map of /o/ Onset for the 1946-1970 generation

/o/Onset
1971-Present Generation

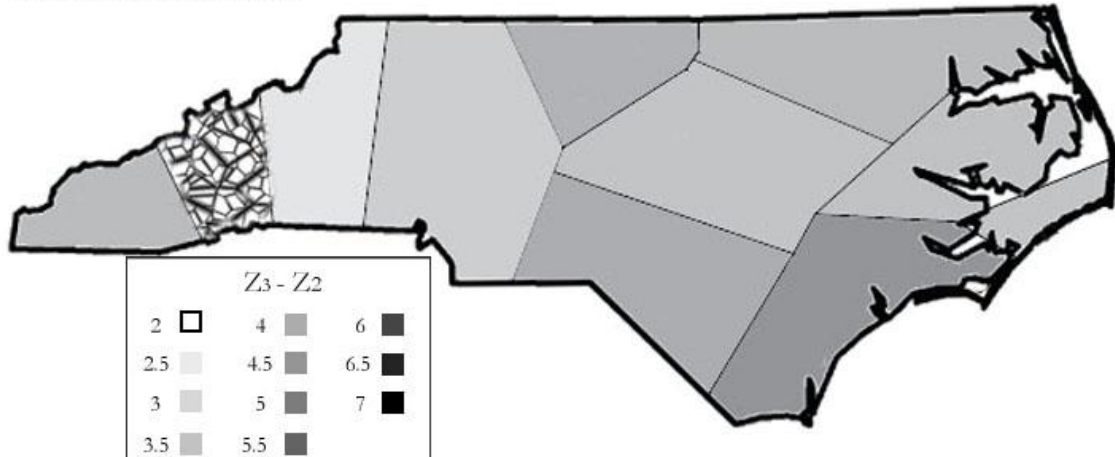


Figure 4.4 Map of /o/ onset for the 1971-Present generation¹

¹ Here Asheville is represented with a special fill color on the map. This special color indicates that there is no data for this field site for this particular generation.

It seems that the portions of the state most resistant to this particular shift are the extremely urban areas and the extremely isolated areas. Ocracoke appears to invalidate this theory because it independently shifts in a similar way to the non-isolated rural regions. Even though Wilmington exhibits a fronting trend, it remains further backed than the rest of the state by a substantial margin. The youngest generation only has a Bark difference metric value of 4.16, which is much higher than the rest of the state.

In the middle and youngest generation, the newly emergent cities begin to exhibit a certain amount of distinctiveness from the rest of the state. From the oldest to the middle generation the shift appears to be at about the same rate throughout the state, particularly in the piedmont region. In general, the sites tend to be similar to adjacent sites, except in the case of extremely isolated field sites or field sites from very urban areas.

4.2 ANALYSIS OF THE F₂ OFFSET

Since the glide for /o/ appears not to be as far along in the shift than the onset in the oldest generation, perhaps it can tell us more about how the sound change spread in the early stages. In the older generation, represented in Figure 4.5, Hyde County is clearly the leader of the change with Robeson County and Warren County both close behind. The glide has begun to centralize in the northeastern and central rural areas. The older generation from field sites that tend to be more urban, have little to no fronting of the

glide. Figures 4.6 and 4.7 show that the same scenario that occurred for the nucleus also occurred for the glide. The fronting began in the northeastern rural portions of the state and then quickly began diffusing westward and into the urban areas in a somewhat uniform manner. It appears that the sound change spread so quickly that the generation division used in this study is somewhat insufficient in tracking the spread. The change demonstrably began in the rural areas of the state and seems to be most drastic in the early stages in the northeastern portions of the state. Figure 4.5 depicts the /o/ offset for the pre-1945 generation.



Figure 4.5 Map of /o/ offset for the Pre-1945 generation

The urban portions of the state seem to follow more closely the general trend for the state for the glide than for the nucleus. Wilmington has a much more drastic shift

from the oldest to the middle generation. Also, Raleigh, Charlotte, and Asheville are more substantially affected by the influx of people from the rural portions, since this period saw rapid growth in those cities mostly due to migration from rural areas. Those areas have a much further backed nucleus for /o/ in the oldest generation and have a substantial change from the oldest to the middle generations suggesting a direct influence from the surrounding rural areas. Figure 4.6 depicts the /o/ offset for the 1946-1970 generation.

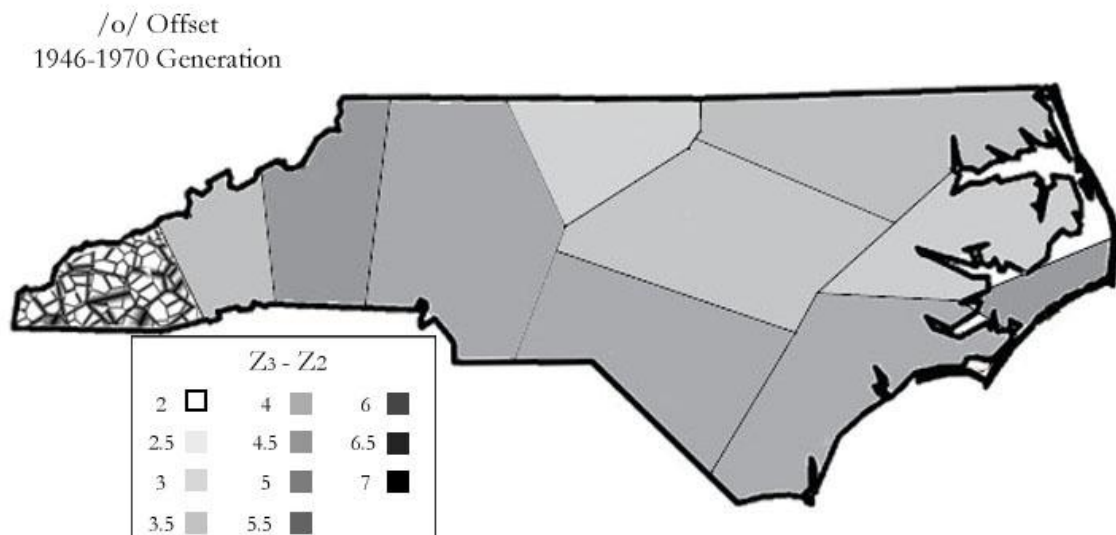


Figure 4.6 Map of /o/ offset for the 1946-1970 generation

Again, the frontward shift seems to have largely taken hold by the middle generation and is generally continued in the younger generation. Once a portion of the state has completed the shift, it appears to fluctuate from generation to generation around its fronted values. In Wilmington, the glide is more obviously affected by the shift than the nucleus. However, it still remains distinct from the rest of the state in that it does not

exhibit as much fronting as the other field sites. This suggests that while the urban areas may be resistant to the rural-centric shift, they are not impervious to it and are ultimately influenced by it.

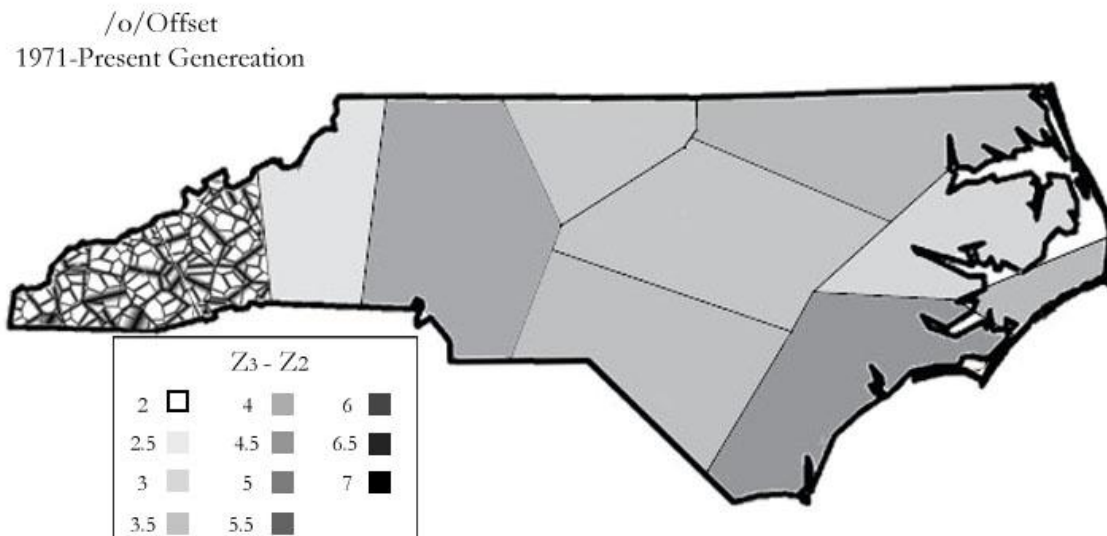


Figure 4.7 Map of /o/ offset for the 1971-Present generation

4.3 ANALYSIS OF THE F_1 ONSET

For the glide, the same characteristic of resistance to the rural-centric sound change exists for both the urban and the isolated field sites as it existed for the nucleus, only this time Ocracoke conforms to the trend. These sites seem to shift latest, if at all, and are often still distinct from their adjacent rural field sites. Ocracoke lags behind in the oldest generation, exhibiting only mild fronting. Beech Bottom and Wilmington are still extremely backed. Raleigh, Charlotte, and Asheville do not count as truly urban field sites until the middle generation since they are only just becoming urban in the oldest

generation. Interestingly, they seem to have started shifting later anyways in the oldest generations suggesting that they may have already started taking on some of the characteristics of an urban area.

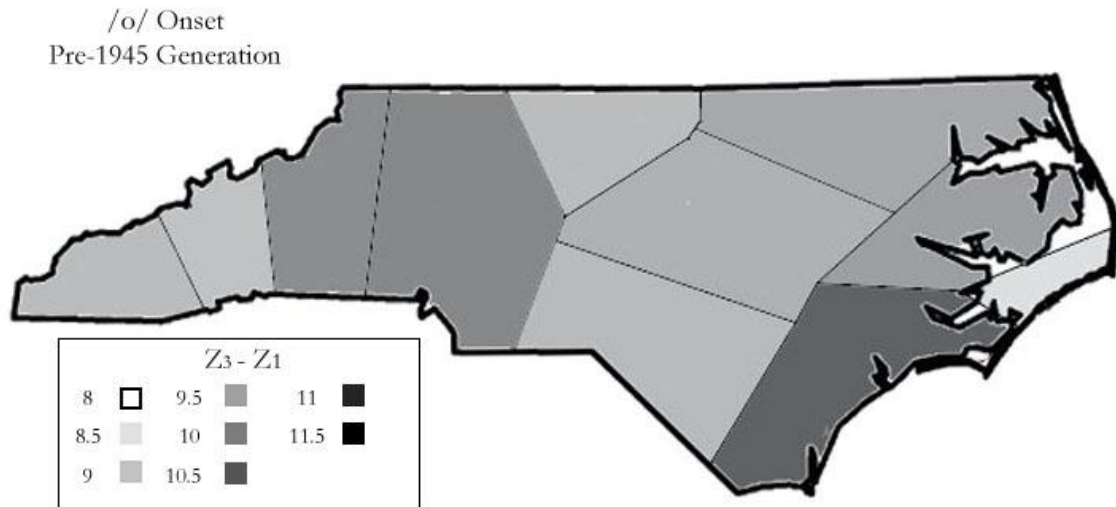


Figure 4.8 Map of /o/ onset for the Pre-1945 generation

In the maps representing the spread of F_1 , the darker shades represent a more raised F_1 . For F_1 , the shift seems to be much less uniform throughout the state. Some parts of the state that are already lowered become raised while some raised ones become lowered. In particular, Raleigh and Asheville become raised while the areas around them become increasingly lowered. The isolated and rural portions of the state still seem to be resistant to what is going on in the rest of the state. Figures 4.8, 4.9, and 4.10 represent the /o/ onset for the pre-1945 generation, 1946-1970 generation, and 1971-present generation respectively. Ocracoke already has an unusually lowered /o/, by North Carolina standards, in the oldest generation. The /o/ in Ocracoke seems to be undergoing

a much different shift than the rest of the state. The F_2 is fronting from generation to generation, which is happening for most of the state, but the F_1 is rising.

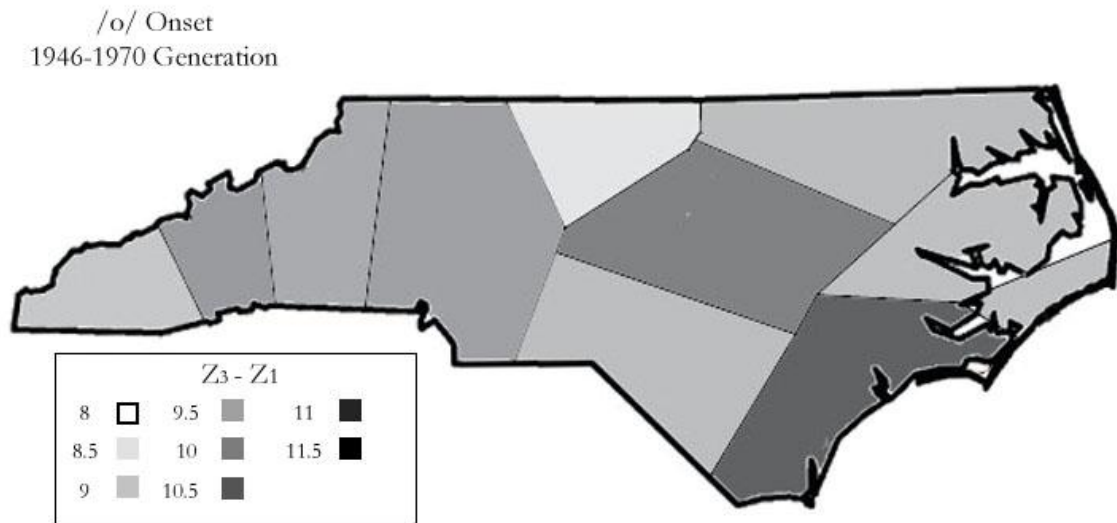


Figure 4.9 Map of /o/ Onset for the North Carolina generation 1946-1970

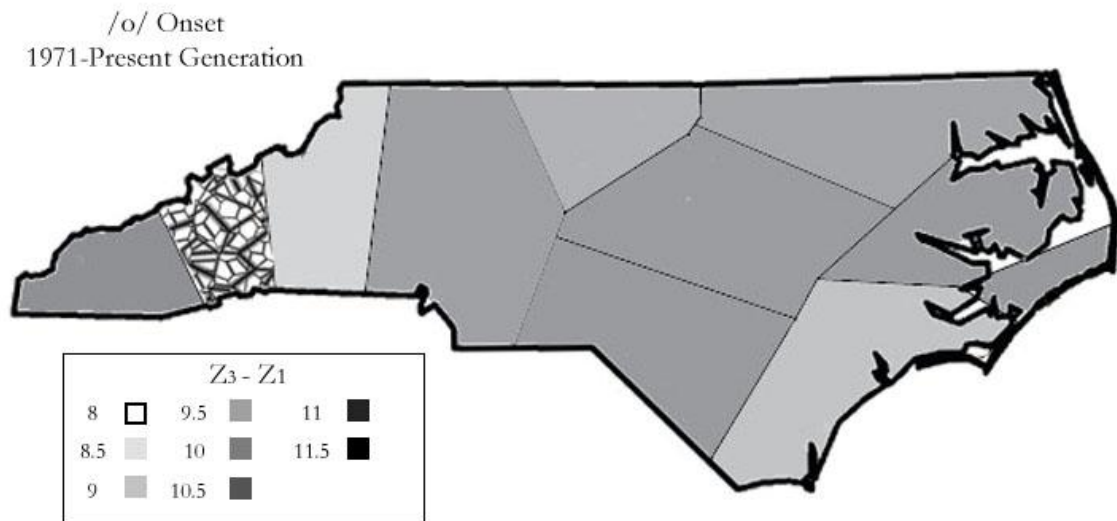


Figure 4.10 Map of /o/ onset for the 1971-Present generation

4.4 ANALYSIS OF THE F₁ OFFSET

In the F₁ shift, we see that the rural areas are undergoing change much more quickly than the urban areas, especially in the piedmont region, but this does not mean that the rural areas are initiating the change. The change seems to be happening simultaneously with a slight lag in the urban areas. In the oldest generation, the field sites with major metropolises have the highest Z3-Z1 values, but in the middle and younger generations they begin to follow the trends for the rest of the state. The only abnormality is how Raleigh is behaving. Raleigh seems to be pretty lowered already in the oldest generation, but reverts to a more highly raised /o/ in the middle generation but then in the youngest generation becomes lowered again. However, the vowel is still fronting along the F₂ axis. Thus, it may not qualify as a reversion. Rather, it may be moving into a slightly different vowel space than the rest of the state during the middle generation and then lowering back down into the vowel space that most of the state shares. While this site seems to be shifting in a way that differs from the rest of the state, it most likely does not represent a split between the cities and the rural areas since it is the only metropolis that is behaving this way. It is also interesting that while its path differs from the rest of the state, its destination is the same. Although there is a distinction between the urban /o/ and the rural /o/, the way in which the urban areas are distinct is not uniform throughout the state.

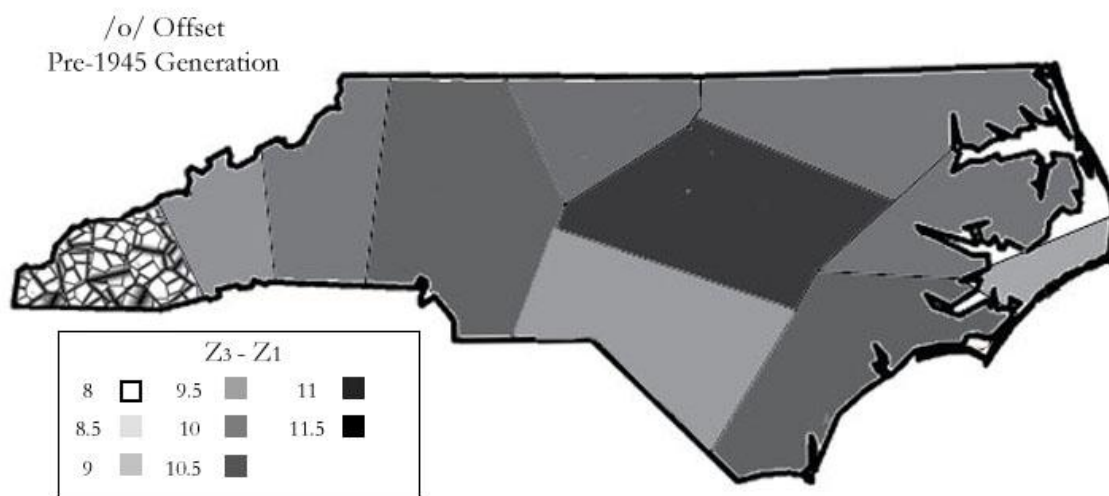


Figure 4.11 Map of /o/ offset for the Pre-1945 generation

The F_1 of the offset of /o/ seems to be shifting more uniformly; however a few sites are anomalous. Most of the sites either start off with fairly a fairly lowered glide or they become lowered over time. The ones that start out lowered stay at around the same values from generation to generation. Again, the sites that are more rural tend to shift earlier than the sites with major metropolises. Figure 4.11 represents the /o/ offset in the pre-1945 generation. In the offset, Raleigh is fairly raised, which is the exact opposite of the situation for the onset. Excluding Raleigh, the metropolises are similar to the more rural field sites. The rural areas have already exhibited quite a bit of shifting downwards in the middle generation, but the field sites with major cities are shifting less in the middle generation and do not seem to catch up until the younger generation. Robeson County is deviating from the norm, however. It starts out pretty lowered in the older generation then becomes increasingly raised. Figures 4.12 and 4.13 represent the /o/

offset in the 1946-1970 and 1971-present generations respectively.

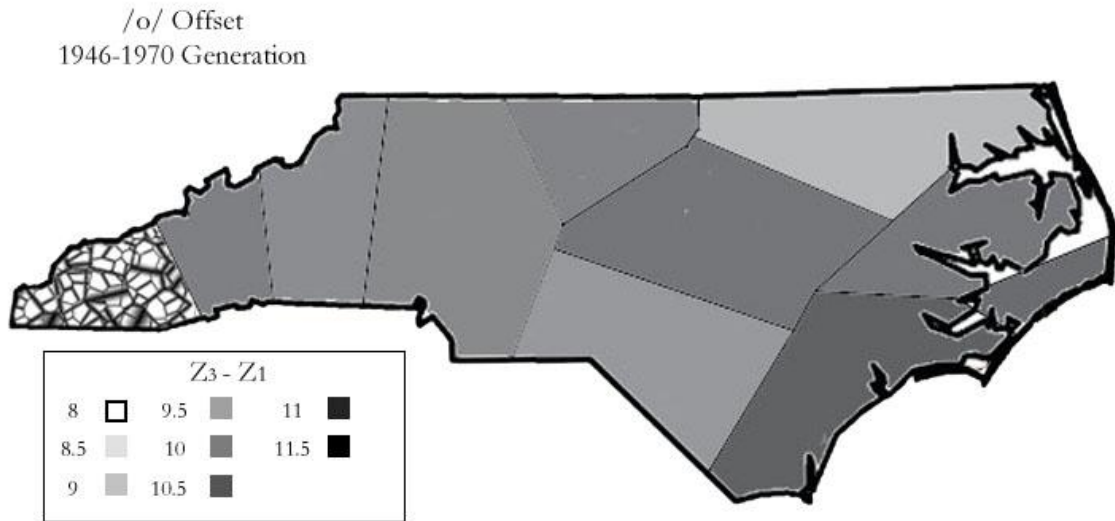


Figure 4.12 Map of */o/* offset for the 1946-1970 generation

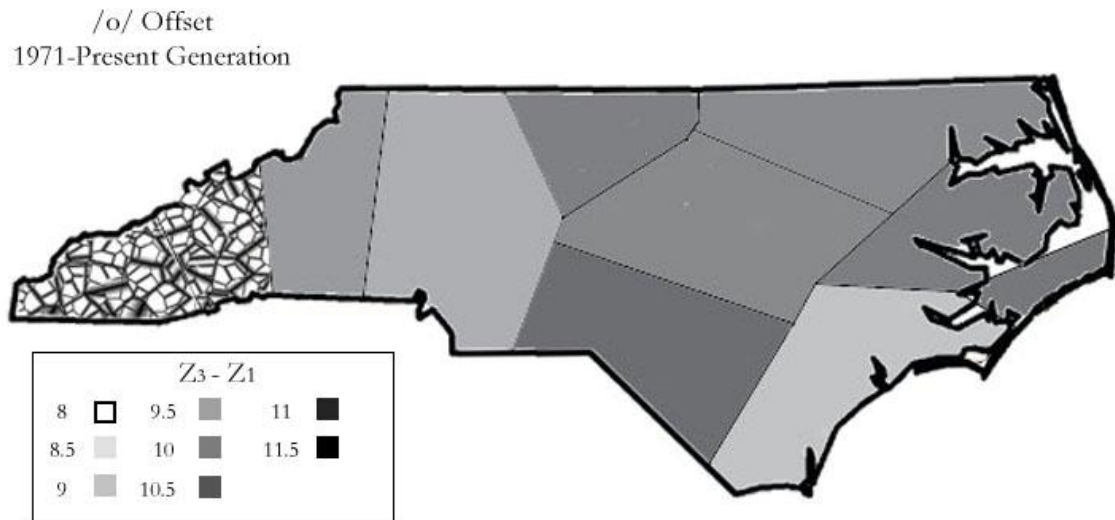


Figure 4.13 Map of */o/* offset for the 1971-Present generation

5. CONCLUSION

/o/ in North Carolina seems to conform to the precepts of the Southern Vowel Shift, meaning that the vowel is shifting in the expected way with fronting of the nucleus and glide in most of the state. However, what is interesting about the shift is how it plays out regionally in the state. It appears that the shift is conforming to the wave or contagion model for sound change where the change starts out in a specific geographical region, northeastern North Carolina in this case, and spreads out from there. However, this shows the ordering of events for the shift, but says little about causality. Although the shift happened in the northeastern part of the state first, that does not mean that part of the state initiated the change and influenced the other regions. It is more likely that the change was simply able to spread through that area more quickly than the other areas but did not initiate the change.

One of the difficulties inherent in dialect cartography is that it shows geographic diffusion over time and therefore it does not accurately represent causality and the diffusion of a language change through social networks. The northeastern part of the state was most likely influenced by either another area in North Carolina or by parts of Virginia at the same time that the Piedmont region was being influenced. Yet, it appears to shift first on the map. The shift spread through the northeastern regions more quickly, but it is not evident that this region is the initiator of the shift in North Carolina.

This paper also demonstrates that the North Carolina Language and Life archive has become large enough that larger dialectal studies are now possible. This study offers more questions than answers, however, in respect to geographical spread of language

change. Because of the structure of the railroads through North Carolina ran mostly from north to south, it is likely that the speech in the piedmont region, particularly Charlotte and Raleigh, was influenced by cities in Virginia and South Carolina while the more rural sites, particularly the ones that border other states, were influenced by the cities and rural areas of Virginia and South Carolina. The northeast appears to be leading the shift, but they are probably being similarly influenced by parts of Virginia at about the same time as the Piedmont, the northeast simply goes through the shift faster. Although Raleigh, Charlotte, and Asheville is more fronted than Wilmington in group one, none of the metropolitan locations seem to be leading the change.

It is possible that the change follows the counter-hierarchical diffusion, where the change spreads from rural to urban. This poses an interesting question for future research in North Carolina because it is unclear what happens once the change reaches the cities. Does it then begin to spread from city to city or does it remain strictly a rural to urban phenomenon? Perhaps the change began in rural areas but once it reached urban areas it began spreading in accordance with both the wave model and the hierarchical model, continuing from east to west but also spreading from city to city and outwards. On the other hand, the change might have come to North Carolina by way of cities in Virginia and South Carolina at around the same time that it was spreading according to the wave theory from their rural areas into North Carolina's rural areas. It is critical to have data from Virginia and South Carolina to really see what is going on, however. Future analysis should include those states and see what their relationship is to the border rural areas and the rest of North Carolina. Further research should also include larger numbers of

speakers per site in order to adequately explain how the change is diffusing through the social networks, and which parts of each community were affected by the change first.

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APPENDICES

APPENDIX A: AVERAGE BARK METRIC VALUES BY FIELD SITE

Field site	Z3-Z1 for pre-1945	Z3-Z1 for 1946-1970	Z3-Z1 for 1971-present
Beech Bottom	9.901943	9.372139	8.679703
Graham County	9.070602	8.881513	9.813121
Hyde	9.575621	9.268225	9.582582
Ocracoke	8.479018	9.011047	9.678031
Person County	9.076767	8.383322	9.208372
Raleigh	9.255698	10.105	9.625
Robeson	9.119734	9.049526	9.662025
Warren County	9.385604	9.047461	9.445239

Field site	Z3-Z2 for pre-1945	Z3-Z2 for 1946-1970	Z3-Z2 for 1971-present
Beech Bottom	5.532084	4.193293	2.535461
Graham County	3.415039	3.099297	3.570508
Hyde	3.542196	3.893872	3.413168
Ocracoke	3.610289	3.819104	3.334735
Person County	4.074716	2.806696	3.741789
Raleigh	4.054682	3.925	3.37
Robeson	3.60205	4.019798	3.890484
Warren County	3.843079	3.560801	3.561343

APPENDIX B: RATIO OF ONSET TO OFFSET BY FIELD SITE

Field Site	Z2-Z3 onset/offset for pre-1945	Z2-Z3 onset/offset for 1946-1970	Z2-Z3 onset/offset for 1971-present
Asheville	0.788381	1.024115	No data
Beech Bottom	0.847841	0.954018	0.970232
Charlotte	1.004808	0.870062	0.774092
Hyde County	1.11805	1.307803	1.187515
Ocracoke	0.775998	0.87425	0.921125
Person County	0.733366	0.939376	1.193121
Raleigh	0.767523	1.193016	1.030612