# THE ROLE OF HIGHER EDUCATION IN LINGUISTIC CHANGE

Hilary E. Prichard

A DISSERTATION

in

Linguistics

Presented to the Faculties of the University of Pennsylvania

in

Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

2016

Supervisor of Dissertation

_____

William Labov

John H. and Margaret B. Fassitt Professor, Linguistics

Graduate Group Chairperson

_____

Rolf Noyer

Associate Professor, Linguistics

Dissertation Committee

Robin Dodsworth, Associate Professor, Linguistics, North Carolina State University

Meredith Tamminga, Assistant Professor, Linguistics

Charles Yang, Associate Professor, Linguistics

THE ROLE OF HIGHER EDUCATION IN LINGUISTIC CHANGE

For my parents, Sandra and Mark,
who gave me a desire for knowledge
and a deeply confused idiolect.

# Acknowledgements

One of my first experiences of grad school was sitting in Houston Hall, listening to one of the deans describing the process of working towards a Ph.D. as a "monastic endeavor." It's a romantic image, right? The lone academic, spending long hours cloistered in the library, grappling with the big questions, pouring their soul into the work. Emerging at last 5-10 years later with more grey hairs, fewer friends, but an absolute expert in their field.

If there's one thing I have learned since that day, it's that the best academic work cannot be done in isolation, and that grad school cannot be survived without the support of friends and family. *Pace* the dean who spoke at my orientation, I would not have made it out of grad school if I'd holed myself up for years doing nothing but working. So above all, I'd like to acknowledge the friends who were there for me along the way, without whom I couldn't have done this.

My fellow grad students, who were there for commiseration and celebration in equal measures, especially my cohort, Meredith, Kobey, and Yong-cheol, and my socio lab family, Betsy, Sabriya, Marielle, Soohyun, and Sue. Caitlin Light, Joel Wallenberg, and Chris Ahern have been constant sources of support, and regular brunches with Christine Boylan have kept me from becoming a complete ascetic. I am especially indebted to Constantine Lignos, whose pragmatism and extremely good taste in music have helped me stay grounded.

Of course this dissertation would not have been possible without the patience and wisdom of my first advisor at Penn, Gillian Sankoff, my dissertation supervisor, Bill Labov, and my committee member from afar, Robin Dodsworth. I would not be at Penn at all without the encouragement of the very excellent linguistics faculty at Emory University, especially Susan Tamasi, Marjorie Pak, and Don Tuten. I'm also grateful for my *non*-academic support team: Di O'Neill and Jo Anna Turner have each kept me sane in their own way, while Arwen Myers, Anthea Barnett, and my family have been my cheerleaders.

Last, but never least, Kyle Gorman, for helping me see light at the end of the tunnel.

# ABSTRACT

THE ROLE OF HIGHER EDUCATION IN LINGUISTIC CHANGE

Hilary E. Prichard

William Labov

This dissertation examines the interaction between a social variable, higher education, and the linguistic variables which constitute local dialects. It draws on literature in both sociolinguistics and the sociology of education to propose a reformulation of the education variable which recognizes the ways in which the social meaning of education has changed over time. Two case studies are presented which examine the effect this new education variable has in ongoing local sound changes. The first uses data from the Philadelphia Neighborhood Corpus to study the extent to which Philadelphians with differing educational backgrounds have maintained local dialect features over the past century, while the second uses the Raleigh Corpus to study education's role in the reversal of the Southern Vowel Shift.

The results of these two studies are explained with reference to the social salience of the features which show stratification according to education. I argue that data from previous sociolinguistic perception studies as well as new data regarding attitudes towards the local dialects show that speakers with elite educational backgrounds are avoiding only the most stereotypical and negatively-evaluated local features, while participating fully in the rest of the local system. This result has significant implications for future work, as it shows that social evaluation does not simply arise in response to linguistic innovation, but may also act in turn as a driving force behind linguistic change.

# Contents

# List of Tables

# List of Figures

# Chapter 1

# Introduction

Why do sociolinguists study education? Put another way, what is our hypothesis concerning the relationship between education and language variation? One straightforward possibility is that education is simply either a proxy for or contributing factor to social class—and it is by now a well-established fact that there are class-based differences in the way people speak. However, if we simply equate education with social class, we risk overlooking the role that a modern college education plays as a means for both geographic and class mobility. Assuming that upwardly mobile individuals will strive to accommodate to the norms of their new status, at what point does this accommodation occur, and by what means? Is it a purely mechanistic effect of attending an elite institution and being exposed to other dialects, or a conscious aspirational change that happens early? The research to be presented here, along with recent results from the Impact of Higher Education on Local Phonology project (IHELP; Labov et al. 2013) implies the latter; notably, the IHELP project finds the same marked changes to the Philadelphia dialect as those to be presented here in Chapter 3, but in students who have only just *started* college. Such students presumably have not yet had sufficient exposure to their new environment to display automatic convergence to a new norm. Thus, these changes may be attributed to the level of educa-

tion these students *aspire* to attain, rather than that which they have actually completed. While the studies presented here will focus on higher education as the variable of note, as it marks a clear end point for educational attainment, it is clear from emerging research that these patterns can be formed well before an individual sets foot on a college campus.

Education then is a perhaps a better reflection of an individual's overall social trajectory than other measures of social class. However, the question still remains as to what specific social role education plays in effecting these changes—why would a certain type of education influence an individual to diverge from local linguistic norms? To explore this question we can turn to sociological theory, which offers a variety of ideas on the subject. For instance, the *socialization model* sees the role of education as endowing individuals with personal values, knowledge, and attitudes, while *allocation theory* sees schooling as conferring a particular status to individuals, allocating students into pre-defined roles (see discussion in Meyer 1977). Meyer (1977) favors a different interpretation, that of *legitimation theory*, in which education actually creates and legitimates new elite positions and creates a sense of national culture: "Education is, as has often been noted, a secular religion in modern societies: as religions do, it provides a legitimating account of the competence of citizens, the authority of elites, and the sources of the adequacy of the social system to maintain itself in the face of uncertainty" (Meyer 1977:72). While these theories differ in their particulars, they share the common theme that one of the goals of education is to prepare students for their particular role in life. It would follow then that one of the inevitable effects of this role, especially for upwardly mobile students, is that students are exposed to a set of new linguistic norms. Whether we view schools as socializing students into a particular set of linguistic attitudes, preparing them for the style of language employed in their future role, or matriculating them into the use of the national value known as "Standard American English", education has clear implications for how individuals employ language.

This, then, is *why* sociolinguists study education. Given the importance of education as a social variable, *how* have sociolinguists gone about studying it? There are two main traditions of relevance: large-scale quantitative corpus studies, and small-scale studies with a more qualitative or ethnographic focus. It has frequently been the case that studies in the former tradition aim to take a wide view of overall trends, and therefore simply count years of education completed as one among many social variables, or as one of several indicators comprising a socio-economic index (SEI), rather than studying the role of education as a variable unto itself (e.g., Labov 1966, Labov et al. 1972, Conn 2005, Labov et al. 2006; see also Kerswill 2006). Conversely, the studies which *have* focused specifically on the effect of education tend to be smaller, concerned with the consequences for a narrowly-defined community or school (e.g., Wagner 2008, Bigham 2010, De Decker 2006). In consequence, while we know much about the synchronic patterns which may result from educational differences, we know surprisingly little about the way education may directly interact with linguistic change over time.

## 1.1 The sociolinguistic study of education

The seminal study considered here which makes use of education as part of an SEI is the LCV study which took place in Philadelphia during the 1970s. This study used a composite SEI based on scores for education, occupation, and residence value, with the following distinctions made for education: professional school, college graduate, some college, high school graduate, some high school, grade school (Labov 2001:61). The analysis of the LCV data presented in Labov (2001) treated education as one component of a three-part SEI because it was primarily interested in the effect of social class on the variables of study, and recognized that social class is derived from a variety of sources. This study might nevertheless have devoted more analysis to the independent effect of education, if

it were not for the fact that in the regression analyses of local changes in progress, the education term consistently failed to reach statistical significance, and contributed the least of the three factors to the explanation of variance (2001:181). Education proved to be a significant factor in only two of the regression analyses of stable socially-evaluated variables (negative concord in casual speech, and (ing) in careful speech; 2001:117). These results would seem to indicate that education did not play a role in Philadelphia changes in progress during the 1970s.

However, Gorman (2010) finds that this lack of significance is likely due to multicollinearity among the predictors submitted to regression analysis. He selects one of the LCV variables, negative concord, for reanalysis. Employing residualization of the correlated predictors and mixed-effects modeling, Gorman finds that education is in fact a significant predictor ($p < .001$): higher education levels result in less use of negative concord in the LCV data. On the basis of this finding, it is worthwhile to reconsider the significance of education in the phonetic changes ongoing in Philadelphia as well.

Indeed, more recent results from a large-scale analysis of the Philadelphia Neighborhood Corpus (2011, $n = 379$ speakers) have shown a significant effect of years of education received for several vowel variables (Labov et al. 2013). Figures 1.1 and 1.2 below, taken from Labov et al. 2013, give an example of these findings, showing the difference between white adult Philadelphians with twelve years or less of education, and those with more. In both cases there is a significant difference between the two education groups, as speakers with a high school education or less have consistently more advanced (i.e., raised along the front diagonal of the vowel space) forms over time than speakers with more than twelve years of education. The work presented in Chapter 3 examines whether this conservative ">12" group, which is less extreme in its participation in the local phonology, can fruitfully be broken down further by type of college education received.

In recent years there has been increased interest in studying the effects of going to

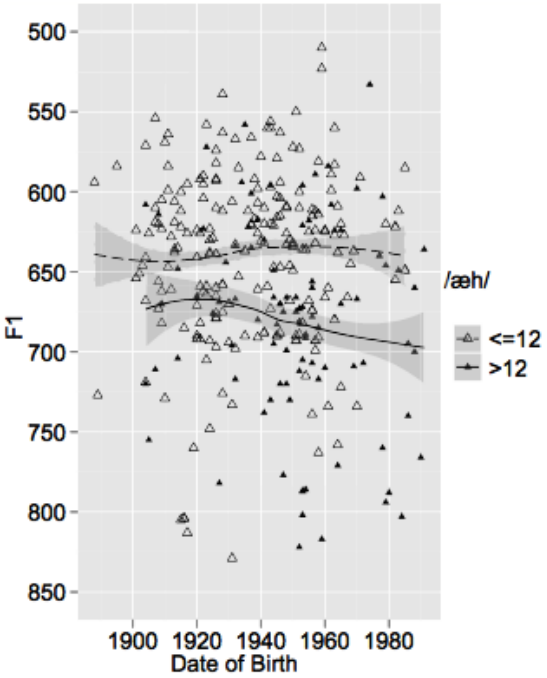


Figure 1.1: Change in (æh) over time.

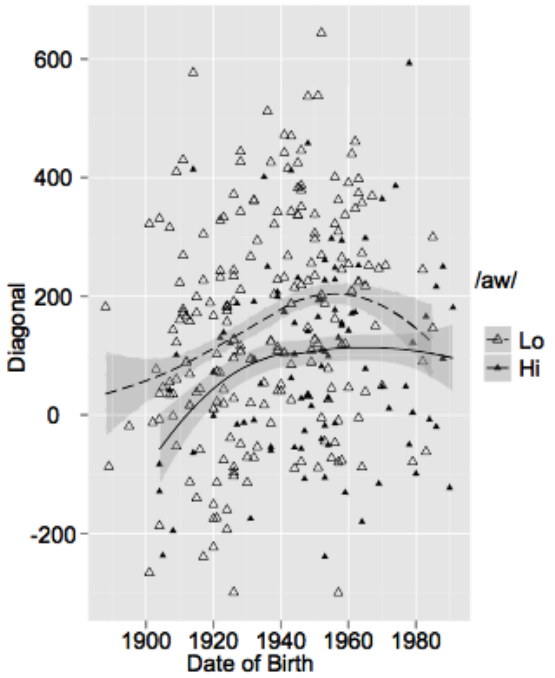


Figure 1.2: Change in (aw) over time.

college on adolescents' use of local dialect features, typically framed as speakers' accommodation to changing norms. Of particular note are three studies which focus on the transition between high school and college: De Decker 2006, Wagner 2008, Bigham 2010.

De Decker (2006) interviews four students from rural Ontario twice—before and after attending an urban college within the same dialect area ("dialect zone internal migration"). This group had shown an intriguing pattern with regards to the supralocal change in /æ/-retraction while in high school: they patterned with conservative rural adults in retraction-inhibiting environments, but with innovative urban youth instead in retraction-promoting environments. De Decker (2006:74) offers the following explanation for this finding: "They phonetically marked their status as upwardly mobile, university-bound students while at the same time, marking their ties with adult members of the community and their positive experiences with local practices"—a case of "having their cake and eating it too," we might say. Upon re-interview, three of the four students in this group showed increased retraction in inhibiting environment, presumably as a result of weaken-

ing community ties and the adoption of the new urban norm. The fourth student showed no change in her /æ/-retraction, but was also described as being less engaged in socializing in the urban setting than her peers. De Decker thus demonstrates that orientation towards the community and local values can play a role in how speakers adapt their speech to changing norms.

Wagner's 2008 study of nine Philadelphia teens during the transition from high school to college examines the other side of the coin; she investigated how college attendance would influence students' participation in *local* sound changes. She found that by and large the students' use of the local features remained stable, but that the students who *do* actively increment community changes after high school are those who maintain strong community ties, and crucially, who continue to socialize with local peers. This echoes De Decker's finding: students' continued involvement in their local community plays a large role in determining the extent to which they either adapt to new norms, or continue to participate in changes back home.

Finally, Bigham's 2010 work on dialect contact at Southern Illinois University has interesting implications for this line of research. Bigham studies seven Midlands speakers who have come in contact with Northern Cities speakers in a college setting, and concludes that the result of this contact is accommodation, *as well as* continued participation in local change. He proposes that this is possible because the accommodation occurs "not through the wholesale adoption of new forms but rather through an expansion or reduction of the range of previously existing forms."

He further offers two different phonetic mechanisms to explain how this accommodation is implemented in a speaker's vowel system. In "accommodation via expansion," the mean for a particular vowel moves in the direction of the accommodation, but the speaker maintains a wide range of variants; thus the range of variation is expanded, rather than decreased. A speaker exhibiting this type of accommodation can be thought of as "having

their cake and eating it too" in the same way as DeDecker's speakers, since their expanded repertoire allows them to adapt their speech to either norm. By contrast, "accommodation via reduction" involves a reduction in the range of variants produced. Rather than incorporating variants from both their native dialect and the dialect they are accommodating towards, speakers exhibiting this type of accommodation "meet in the middle" between the two extremes. These two types of phonetic accommodation are explored in Philadelphia in Prichard 2012 and Prichard and Tamminga 2012.

## 1.2 Education in the United States

While these sociolinguistic studies shed light on the effect of specific educational environments on particular sociolinguistic variables, they don't fully capture the ways in which the social meaning of education itself may have changed over time, or provide insight into how these changes affect the relationship between education and sociolinguistic markers. Synchronic studies like De Decker's give us detailed snapshots of the social meaning of education in a particular place and time; diachronic studies like Labov et al. 2013 have the potential to give us deeper insights into changes over time—especially if they also take into account the possibility that the social meaning of the variables may change over time. This is especially important for the sociolinguistic study of education in the U.S., as both the quantity and quality of the education most people receive has changed dramatically over the course of the last century alone.

For example, to illustrate the extent to which there has been a shift in educational attainment in recent decades, Jeff Conn points out in his 2005 dissertation that the 1970s census data upon which the study of Linguistic Change and Variation in Philadelphia (LCV, 1973-77) socioeconomic index was based listed the median education attainment in Philadelphia was 10.6 years, or less than high school. By 2005, the median educational at-

tainment includes high school graduation. According to the most recent census estimates available,[1] nearly half (47%) of Philadelphians have some amount of higher education; 24% have at least a Bachelor's degree. Table 1.1 shows this change in educational attainment from the 1970 census to the present.

| | 1970 census | | 2000 census | | 2014 estimate | |
|---|---|---|---|---|---|---|
| Education completed | Phila | U.S. | Phila | U.S. | Phila | U.S. |
| Less than High School | 60% | 47% | 29% | 20% | 18% | 14% |
| High School | 28% | 31% | 33% | 29% | 34% | 28% |
| Some College | 5% | 11% | 20% | 27% | 23% | 29% |
| College (4-year) | 4% | 6% | 10% | 16% | 14% | 18% |
| Further degrees | 3% | 5% | 8% | 9% | 10% | 11% |

Table 1.1: Change in education between 1970 and 2014, U.S. Census Bureau.

As a larger proportion of the population attends college, is it possible that the *type* of college attended will become a relevant social factor? The previous work on higher education discussed above has addressed the question of whether students alter their speech to accommodate to new norms upon attending college, but thus far there are no studies which systematically investigate whether students pursuing higher education at different types of institutions realize this accommodation to the same extent. Therefore the primary goal of this research will be to determine whether there is a quantitative difference in the effects of different types of education on speakers' participation in and perception of community changes and norms.

For insight into the ways in which the meaning of education has changed over time, we will now turn to the rich body of existing literature in sociology. The cornerstone

[1] Which is the 2014 U.S. Census Bureau American Community Survey Estimate: http://factfinder.census.gov/faces/nav/jsf/pages/programs.xhtml?program=acs

framework which informs the view of education developed here comes from a seminal figure in the sociology of education, Martin Trow. In the 1960s, Trow revolutionized sociological thinking on education by arguing that the American education system was undergoing a fundamental transition, from what he described as an *elite* model to a *mass* model. He saw this transition as already completed for the public high school system, a change which had its roots in the social and economic transformation after the Civil War (Trow 2010d:56). Prior to the Civil War, high school was characterized as a classical liberal education for mid- to upper-middle-class boys, most of whom then went on to college (Trow 2010d:57f). Trow cited the fact that in 1870, only 2% of the country graduated high school, whereas after 1870 high school became increasingly terminal and vocational, due largely to changes in the occupational structure, especially the rise of bureaucracy and white-collar jobs (2010d:58). During the 20th century, education in general was increasingly seen as an "avenue of mobility" (Trow 2010d:59) rather than acting as finishing school for the elite. Before 1940, high school graduation was the vehicle for social mobility (Trow 2010a:221), while the second half of the 20th century saw college graduation fulfilling this function.

Trow identified three phases in the development of the American education system:

1. 1870-1910, education was limited to an elite minority.
2. 1910-1940, mass terminal secondary education, increase in vocational education.
3. Post-WWII, terminal secondary education shifts to a college preparatory system, while higher education becomes a mass system. This transition is fueled by demand for highly educated workers (Trow 2010d:63).

Statistics on college enrollment reflect this systemic shift—the rate of increase of college enrollments between 1940 and 1960 was 1.3% per year, whereas it had been only 0.35% per year between 1920 and 1940 (Trow 2010d:62). In other words, "WWII was the watershed

event for higher education in modern democratic societies" (Trow 2010c:557).[2]

Having thus identified the major transition points in the modern education system, how do these stages differ in quality? Trow said that an elite education is characterized by a close relationship between teacher and student which goes beyond a simple transmission of knowledge or skills (2010a:148). Crucially, an elite education teaches students how to live a certain type of life, not how to be an expert in something, with the goal being to "infuse a moral and cultural outlook, in contrast with the provision of training" (Trow 2010a:150). Because of this emphasis on nurturing relationships, elite institutions are more likely to be residential, and nurture ambition in their students (Trow 2010a:151).

This definition of the elite model creates an implicit contrast with the more pragmatic goal of a mass educational system: to provide training or expertise to its students. Similar to the earlier shift towards mass high school education, the shift to mass higher education involves a substantial increase in enrollment, and a more clearly career-oriented or vocational focus. Both systems can be found in American higher education still; Trow observed the elite tradition is carried on "in the graduate departments and some of the professional schools of American universities, in the undergraduate courses of study at the Massachusetts Institute of Technology as well as in the undergraduate colleges of Harvard and Chicago universities, in the leading American liberal art colleges [...]" (Trow 2010a:149). Furthermore, mass and elite education can coexist even within one institution (e.g., a mostly mass state school can have elite programs, honors colleges, etc.) (Trow 2010a:163ff). This idea of opposition between elite and mass education existed in sociology before Trow formalized it in this way. As he noted, "Max Weber regarded this distinction between the education of the cultivated man and of the expert as the source of the main conflict emerging in higher education" (Trow 2010a:148).

Beyond the tensions involved in the transition to mass education, Trow saw a crisis

[2]It is also a frequent inflection point for dialect change, see e.g., Labov et al. 2013:60.

of higher education emerging in the U.S. from a pressure to go a step further and provide truly *universal* access; this initiative is accompanied by a power shift from academics to administration and market forces (Trow 2010b:518). Trow also pointed out the concurrent diversification in types of higher education available, stating that, "The only major structural change in American higher education over the past century has been the invention and then the spread of the community colleges" (Trow 2010b:528).

To summarize, during the 1960s Trow identified a shift from an elite to a mass system of higher education, and predicted that this would soon be followed by a shift to a universal higher education system. He provided rough guidelines for how to tell which stage any given education system finds itself in: once the percent of an age cohort attending college exceeds 15%, it is a mass system, and when that percent exceeds 30%, it is a universal system. Accompanying this numerical increase in educational attainment there is a commensurate shift in the public perception of college, from a privilege reserved for elite students of talent and status, to a right afforded to all citizens, and finally to an obligation for the middle class (Trow 2010c:571). Along with these changes in the perception of and participation in higher education, the purpose of a college education shifts from a focus on instilling elite students with general moral and cultural knowledge to a more utilitarian preparation for a specific career path.

Recent discussions surrounding the American higher education system show Trow's predictions about the future of American higher education to be well-founded. Current political rhetoric continues to emphasize access for all over other educational concerns, as seen for example in President Obama's universal access initiatives. Unveiling an initiative to provide free community college courses recently, Obama stated, "I want to spread that idea all across America, so that two years of college becomes as free and universal in America as high school is today" (Mason 2015). Trow's prediction is right there: *universal* access. Furthermore, according to Catherine Liu, President Obama sees the goal of com-

munity and state colleges as teaching "vocational skills so people can get jobs" (Berrett 2015), a clear indication of this shift in purpose.

A recent article in *The Chronicle of Higher Education* posits that the beginning of this change happened in 1967—specifically, it began with a speech by Ronald Reagan on February 28, 1967 (Berrett 2015). As governor of California, Reagan pushed to balance the state budget by cutting back on "intellectual luxuries", i.e., liberal education. Rather, state taxes should be used for a utilitarian education which will get students jobs. This shift represents a fundamental change in the way Americans view the role of education in a democracy. While an elite or even mass education's value lay in the transmission of the shared values upon which a democracy relies, the current atmosphere places value primarily in education that results in employment. As evidence of this trend, The Chronicle points to the frequent public hand-wringing over unemployed college graduates, and baristas with Ph.D.s. Michael S. Roth is quoted as saying, "Where once these 'incongruities' [between education and employment status] might have been hailed as signs of a healthy republic, today they are more likely to be cited as examples of a 'wasted'—nonmonetized—education."

Further evidence of the shift to a universal higher education system is seen in the bourgeoning of the university administration system in recent years, accompanied by rising costs for students. This trend is in part responsible for the increasingly utilitarian political view of education; as costs rise, in order to provide universal access the government has elected to offset costs for students through federal student loans. This creates a demand for practical education from two directions: students who are saddled with huge debts after graduation want to be guaranteed a steady income with which to repay that debt, while the taxpayers who underwrite those federal loans want to know that their taxes are not being used to fund frivolous degrees. These pressures have contributed to the increased diversification of the university system. The Ivies and prestigious liberal arts colleges continue to provide an elite model of education, while a wealth of more affordable

and career-oriented options have sprung up. Community and regional colleges offering a more vocational focus are multiplying, reflecting the backlash against an expensive, 'impractical' liberal arts education. There are even for-profit colleges now, which hope to capitalize on the increasing commodification of education.

This segmentation of the educational system is studied in an innovative paper by Brint et al. (2006), who employ cluster analysis to analyze the *organizational field* (that is, the ways in which organizations interact with one another) of American higher education. Rather than using strictly external metrics to group universities, the way that the US News rankings are conducted for example, Brint et al. also survey college presidents to understand where they see their institutions fitting into the broader education system. They identify a total of seven clusters, which are organized around three axes of differentiation (Brint et al. 2006:235):

- Elite status (selectivity/wealth)
- Institutionalized role in hierarchy (degrees offered, research vs. teaching emphasis)
- Resource dependence (state vs. private vs. religious)

The clusters identified include:

- Elite private institutions (selective, independent, nonprofit; Carnegie BA1 & R1)
- Large research universities (large, mainly public; Carnegie R1)
- Other doctoral-granting universities (smaller; Carnegie Doctoral 1 & 2, Research 2)
- Public master's granting universities (Carnegie Master's 1 & 2)
- Private master's granting universities (Carnegie Master's 1 & 2)
- Selective baccalaureate-granting colleges (primarily religious; Carnegie BA 1)
- Nonselective, religiously-affiliated baccalaureate colleges (Carnegie BA 2)

The survey data collected was then used to verify that the clusters identified correspond to the college presidents' understanding of the system; this correspondence was especially clear in the top tiers. This study reveals the structure that has fallen out of over a century of widespread and relatively rapid changes in the American education system—we can still find the remnants of the elite education system on the extreme ends of the

three axes, where status, resources, and hierarchical role are concentrated, while the transitions to mass and universal education have filled in the opposing ends of the axes with varying degrees of selectivity, resources, and institutional roles. This work is instrumental in shaping the new approach to the sociolinguistic study of education presented here.

## 1.3 A new approach

Given these changes in the structure and social significance of the American higher education system, it is clear that further thought is needed on how to best quantify education for sociolinguistic study. This section outlines a proposed reformulation of the education variable which is based in work originally coauthored with Meredith Tamminga, published in Prichard and Tamminga 2012, and further developed here by drawing on the sociological findings discussed above. In particular, in refining this education index, we will consider to what extent each institution follows the elite or mass/universal model of Trow, and where it falls in Brint et al.'s organizational field.

In that original 2012 paper, the results of an analysis of eight upper-working-class white Philadelphians, all of whom grew up in the same South Philadelphia neighborhood, were presented. While this sample was by design demographically homogeneous, we found surprising differences in the extent to which these speakers participated in the local dialect—even within the same family, there were noticeable differences. One brother and sister in particular led to the conclusion that these differences were related to differences in education—either actual attainment or aspiration—since to all appearances, the only social characteristic distinguishing these siblings was that the brother was attending the University of Pennsylvania, while the sister attended Drexel University. By impressionistically examining how the speakers in our sample clustered together in their use of Philadelphia dialect features and thinking about how the local colleges differentiate them-

selves, we formulated a four-level education index which distinguished between speakers with a high school, local community college, regional college, and national university education (Prichard and Tamminga 2012:89). By applying this coding scheme, we observed a gradient pattern in the realization of certain local features. The most dramatic difference occurred in the realization of the Philadelphia split short-*a* system. While speakers with a high school education maintained a robust split system, each successive level of education beyond showed a less extreme split, with the two national university speakers showing almost complete overlap between the tense and lax classes. However, these same speakers were at the forefront of other local changes, such as the raising and fronting of (ey), leading to the conclusion that these speakers are not evincing a wholesale rejection of the local dialect, but rather only those features which bear negative social stereotypes.

Since the 2012 study only contained eight speakers, the resulting education index was based on a very limited sample of institutions of higher education. Specifically, the local college was the Community College of Philadelphia, the regional colleges were Drexel University, Shippensburg University, and Peirce College, and the national college was the University of Pennsylvania. Thus in order to render this index generalizable, it is necessary to abstract away from the specific institutions by identifying the key characteristics that distinguish the categories. The US News and World Report annual rankings are somewhat helpful as a first-pass categorization, though their distinction between regional and national universities does not always work for our purposes. Following Brint et al., the key criteria will be selectivity, institutionalized role, and public vs. private. The seven clusters identified in that study may be collapsed as follows into the education index:

1. High School: N/A
2. Local: Religious + nonselective baccalaureate colleges
3. Regional: Other doctoral-granting + public & private master's granting universities
4. National: Elite private institutions + prestigious public research universities

The first case study presented in this dissertation draws on the data in the Philadelphia Neighborhood Corpus to test whether this reformulation of the education index is a significant predictor of differences in use of socially-salient local variables. To illustrate the way that the colleges and universities represented in that corpus fit into this scheme, Table 1.2 provides examples of each of the three college categories and the key features which distinguish them. A full list of the colleges represented in the corpus and their classification is given in the following chapter.

As these examples indicate, national institutions are generally private four-year universities or liberal arts colleges, which have a long history, a selective acceptance rate, and a geographically-diverse student body. Regional institutions are more likely to be public schools, be founded later, have an acceptance rate greater than 50%, and draw their student body mostly from within the state. Finally, local institutions are more likely to be public two-year colleges, be founded in the 20th century, have a 100% acceptance rate, and draw exclusively in-state students.

Over the course of the 20th century, while local dialects have undergone linguistic changes, the social meaning of education has also changed. Where once any college education at all was a marker of elite status and privilege, the social and economic changes of the last century have resulted in a stratified education system in which certain types of college education are still reserved for the wealthy elite, while other institutions have sprung up to serve the more universal career training needs of the rest of the country. The following chapter will explore the ways in which these different education systems interact with the course of linguistic change in Philadelphia.

| | |
|---|---|
| **National**: | |
| University of Pennsylvania (Philadelphia, PA) | |
| Elite status: | Founded 1740, 12.2% acceptance, 16% in-state |
| Resource dependence: | Private 4-year, $47k tuition |
| Role: | US News: #8 National Universities |
| | Carnegie: Research Universities |
| Kenyon (Gambier, OH) | |
| Elite status: | Founded 1824, 38.4% acceptance, 14% in-state |
| Resource dependence: | Private 4-year, $47k tuition |
| Role: | US News: #30 National Liberal Arts Colleges |
| | Carnegie: Baccalaureate Colleges–Arts & Sciences |
| **Regional**: | |
| Penn State (State College, PA) | |
| Elite status: | Founded 1855, 55.5% acceptance, 57% in-state |
| Resource dependence: | Public 4-year, $17k/$30k tuition |
| Role: | US News: #48 National Universities |
| | Carnegie: Research Universities |
| Temple University (Philadelphia, PA) | |
| Elite status: | Founded 1888, 63.9% acceptance, 79% in-state |
| Resource dependence: | Public 4-year, $14k/$25k tuition |
| Role: | US News: #121 National Universities |
| | Carnegie: Research Universities |
| **Local**: | |
| Bucks Co. Community College (Newtown, PA) | |
| Elite status: | Founded 1964, open admissions, 93% in-state |
| Resource dependence: | Public 2-year, $6k/$10k tuition |
| Role: | US News: Not Ranked |
| | Carnegie: Associate's |
| Community College of Philadelphia (Philadelphia, PA) | |
| Elite status: | Founded 1965, open admissions, 99% in-state |
| Resource dependence: | Public 2-year, $8k/$12k tuition |
| Role: | US News: Not Ranked |
| | Carnegie: Associate's |

Table 1.2: Example institutions in each category.

## 1.4 Structure of the dissertation

Chapter 2 describes the corpus data and quantitative methods used throughout this dissertation, while in Chapter 3 this new way of measuring education will be used in an analysis of sound change in Philadelphia, Pennsylvania. We will see that in the latter half of the 20th century, speakers with a particular educational profile are leading changes away from some of the most socially-salient and negatively-evaluated local features, while still participating in local changes occurring below the level of community awareness.

Chapter 4 will build on these findings to see if this stratification of local features by education is unique to Philadelphia, or may also be found in the Southern dialect, which is more widely, and negatively, stereotyped. Corpus data from Raleigh, North Carolina, is analyzed to examine the role education plays in the ongoing reversal of the Southern Vowel Shift. Chapter 5 concludes the dissertation by drawing together the findings presented and arguing for the role of salience in the sound changes presented.

# Chapter 2

# Data and Methods

This dissertation centers upon the results of two case studies that make use of existing corpora of sociolinguistic interviews: the Philadelphia Neighborhood Corpus (Labov and Rosenfelder 2011), and the Raleigh Corpus (Dodsworth and Kohn 2012). These corpora provide data from two very different speech communities, which provide complementary insights into the role of higher education in sound change. This chapter describes the data contained in these corpora, and the quantitative methods used for analysis.

## 2.1 Philadelphia Data

The data investigated in Chapter 3 is a subset of the Philadelphia Neighborhood Corpus data reported in Labov et al. 2013. This is supplemented with data from 12 speakers gathered during the current NSF-funded project entitled the *Impact of Higher Education on Local Phonology* (IHELP).[1] The entire PNC consists of data collected from 1972 to 2012, which includes over 150 hours of speech from 379 different speakers, and yields more than half a million vowel tokens. Of these speakers, 217 are included in this study, which

[1]This material is based upon work supported by the National Science Foundation under Grant No. BCS-1251437. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

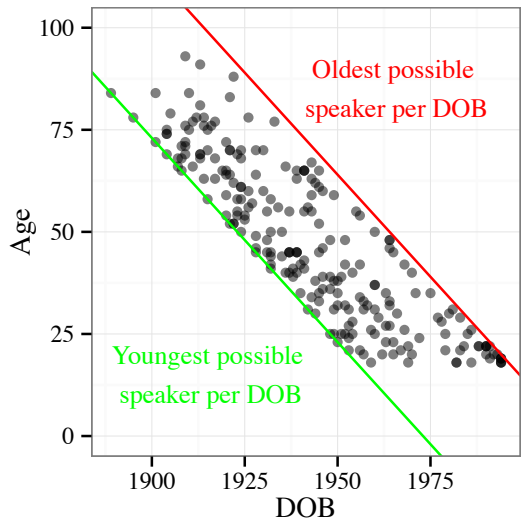


Figure 2.1: Age by DOB range.

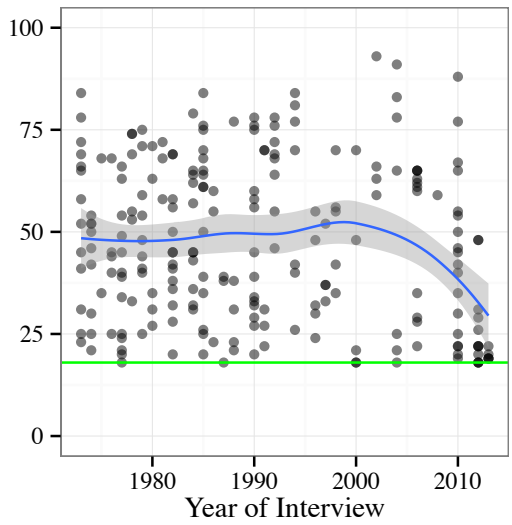


Figure 2.2: Mean age over time.

represents the total number of white, adult, native Philadelphians for whom detailed education information (from interview reports and transcripts) was readily available. Fifty of these speakers were among the 112 speakers interviewed during the LCV project.

This study is restricted to white speakers only since, as Labov 2014 reminds us, African American speakers in Philadelphia follow a very different pattern of change. Other minorities are not sufficiently represented in the corpus for study at this time. Following Labov et al. 2013, only speakers eighteen years of age and older are included, so as to avoid overestimating the pattern of the adult community due to any adolescent peak effects. To summarize, speakers included in this analysis must be:

1. Born and raised in the greater Philadelphia area
2. White, and least 18 years of age at time of interview
3. Specific about what type of college they attended, if applicable

This sample is reasonably evenly divided between the sexes with slightly more women represented, at 54% of the sample, and includes a broad range of birth dates, with speakers born from 1889 to 1994, and aged 18 to 93. Given that the PNC is a judgement sample of the Philadelphia speech community, gathered between 1973 and 2014, the range of data

is actually well-matched to the theoretically possible range. Figure 2.1 demonstrates the range of attested data relative to the theoretical limits of the data, given that data collection is bounded by 1973 and 2014, and speakers had to be eighteen or older to be included in this sample. Figure 2.2 shows that while the age range collected before about 2000 was stable, with a mean age around fifty, more recent studies have skewed younger—this is partially due to the addition of the IHELP data.

These speakers are divided into four categories based on level and type of education received, resulting in the distribution shown in Table 2.1. Figure 2.3 meanwhile shows the date of birth density distribution for each of these education groups, which is unfortunately skewed such that the highest category is much younger than the lowest. Some of this imbalance is certainly due to the different sampling methods represented within the corpus: the recent IHELP study deliberately targets college students, whereas the older PNC studies deliberately targeted upper-working-class Philadelphians who were less likely to have a college education. However, some of this imbalance is also the natural result of the shift in higher education that occurred on a national level over the course of the past century, which was discussed in detail in the previous chapter.

| Education | *n* | % |
|---|---|---|
| 1: HS or less | 152 | 66% |
| 2: Local college | 25 | 11% |
| 3: Regional college | 31 | 14% |
| 4: National college | 21 | 9% |
| | 229 total | |

Table 2.1: Education distribution.


Figure 2.3: Speaker density by DOB.

While I attempted to categorize these colleges using objective criteria as much as possible, my subjective perception of each institution undeniably had a role in the decision-making. This certainly poses a problem for replicability, and perhaps the extension of this measure to other speech communities; however, for the methodological reasons outlined in Chapter 1, I believe it is neither avoidable nor desirable to use a completely objective measure in this type of study. After all, if a measure as objective as raw years of education were able to fully capture the social meanings of education, there would be no need for this dissertation. Furthermore, I do not think that this classification scheme *should* necessarily be replicated exactly in other speech communities. Rather, the goal is to offer an alternative framework for investigation, which should be adapted to the local community.

To categorize the institutions represented in these corpora, I drew on two primary data sources: the US News & World Report rankings and college profiles (USN 2016), and the National Center for Education Statistics's College Navigator profiles (NCE 2016). Schools were categorized according to the principles described in Chapter 1, primarily grouping by degrees offered, selectivity in admissions, tuition, and proportion of in-state students. Table 2.2 shows the detailed result of this categorization.

| Local | Regional | National |
|---|---|---|
| Community College of Philadelphia (3) | Temple University (17) | University of Pennsylvania (12) |
| La Salle University (1) | Drexel University (4) | Cornell University (1) |
| Pierce College (1) | Pennsylvania State U. (4) | Kenyon College (1) |
| Shippensburg U. of Pennsylvania (1) | St. Joseph's University (2) | M.I.T. (1) |
| Buck's County Community College (1) | University of the Arts (1) | George Washington U. (1) |
| not specified (15) | Duquesne University (1) | U. of Southern California (1) |
| | Ursinus College (1) | Harvard University (1) |
| | Beaver College (1) | Yale University (1) |
| | Westchester University (1) | McGill University (1) |
| | University of Pittsburgh (1) | Tulane University (1) |
| | Philadelphia University (1) | |

Table 2.2: Institutions of higher education represented in the PNC.

## 2.2 Raleigh Data

The Raleigh Corpus (Dodsworth and Kohn 2012) is the result of an ongoing project led by Robin Dodsworth at North Carolina State University. The goal is to collect a representative sample of Raleigh speech through sociolinguistic interviews in order to study the way that the rapid influx of outsiders during Raleigh's technology boom has affected the local Southern dialect. The corpus covers 70 years in apparent time, containing interviews from speakers born between 1923 and 1993. While formant measurements are currently available from a total of 152 speakers, at present there is only front vowel (*iy, i, ey, e, æ, o*) data available for the full 152 Raleigh speakers. As for the other vowels, 123 speakers have (ay) measurements, 54 have (aw, ow, uw), and 60 have (oh). Results are presented for all of these vowels, with the caveat that the back vowel results may not be as reliable as the front vowel results due to the smaller sample size.

| Education Index | *n* | % |
|---|---|---|
| 1: HS or less | 18 | 12% |
| 2: Local college | 18 | 8% |
| 3: Regional college | 85 | 27% |
| 4: National college | 40 | 17% |
| | 151 total | |

Table 2.3: Education distribution.

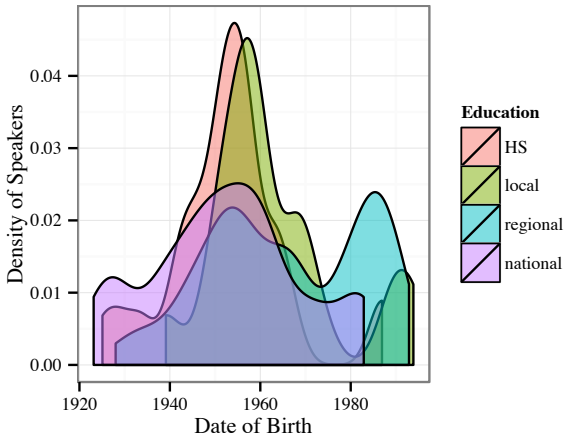


Figure 2.4: Speaker density by DOB.

Table 2.3 shows the number of speakers in each of the four education categories, while Figure 2.4 shows their distribution over time. We can see that compared to the Philadelphia data given in Table 2.1 and Figure 2.3, the Raleigh data is a bit more evenly distributed between education groups, and the education groups are somewhat more evenly distributed across time. Like Philadelphia, there are few speakers in the high school cat-

egory after 1960; unlike Philadelphia, the sampling strategy in Raleigh has led to the youngest speakers in the corpus falling predominantly in the regional category, with few of the speakers born after 1980 falling in the national category. So while we may be less concerned about a potential confound in general, we may run into the problem in which we may be unable to observe any education stratification present in *very* recent changes. The full list of schools in each category is given in Table 2.4.

| Local | Regional | National |
|---|---|---|
| Wake Tech. Community College (7) | NC State (43) | UNC Chapel Hill (21) |
| Oklahoma A&M (1) | Guilford College (6) | Georgetown University (6) |
| St. Mary's College (1) | East Carolina University (6) | Emory University (3) |
| UNC Asheville (1) | Meredith College (5) | Duke University (3) |
| Columbia International U. (1) | Appalachian State U. (5) | William and Mary (2) |
| ECPI University (1) | UNC Greensboro (4) | McGill University (2) |
| Georgia Christian U. (1) | Lenoir-Rhyne University (2) | University of Rochester (1) |
| Sandhills Community College (1) | Hampden-Sydney College (2) | U. of Texas at Austin (1) |
| Louisburg College (1) | Elon University (1) | Wesleyan University (1) |
| not specified (7) | Campbell University (1) | Wake Forest University (1) |
| | NC Central (1) | |
| | University of Tennessee (1) | |
| | University of Mississippi (1) | |
| | Warren Wilson College (1) | |
| | Western Carolina University (1) | |

Table 2.4: Institutions of higher education represented in the Raleigh Corpus.

## 2.3 Methods

### 2.3.1 Philadelphia

Vowel tokens from the 229 Philadelphia speakers were aligned and extracted using a modified version of the FAVE suite (Rosenfelder et al. 2014). The modified version improves on the standard FAVE short-*a* coding by incorporating a syllabification algorithm into the

coding process (see Gorman and Prichard 2014 for further details). This results in fewer coding errors in cases where tautosyllabicity or stem identity is important. The new module for coding short-*a* also differs slightly from traditional descriptions of the system on a few lexical exceptions, as it is based on extensive analysis of the currently-available corpus data. For instance, this data-driven approach[2] classifies *ran* and *swam* as lax, while *began* is highly variable and therefore excluded from analysis here. The data was visualized and analyzed in R, using the packages listed in Appendix A.1.

The plots throughout the following chapters display Lobanov-normalized (z-scored) speaker mean values. Front vowels are plotted along a "diagonal" dimension rather than F1 and F2; this measure is calculated as F2−F1 and allows visualization of the overall tendency in the movement of a vowel in both dimensions simultaneously, rather than restricting visualization to either the front-back (F2) or low-high (F1) dimension (see Labov et al. 2013 for more detailed information about this measure). Speaker means which were calculated on less than 10 tokens were removed, in order to reduce the number of potential outliers due to measurement errors.

While the fixed effects presented for each linear mixed effects regression model presented here vary from vowel to vowel, there are some consistent methodological choices to note. Since automatic alignment and formant extraction were used, and there are far too many tokens to hand-correct, each of the vowel classes was submitted to outlier analysis in order to identify possible measurement errors or incorrect vowel class assignment. Extreme outliers in a box plot, and points with high influence as measured by Cook's distance, were removed. The final number of analyzed tokens and removed tokens for each vowel is given in Appendix A.2. All models discussed throughout this dissertation are fit over tokens, in order to include contextual effects, but for ease of interpretation, all plots

[2]To be described in detail in Prichard and Gorman (in prep.), but similar in spirit to that taken by Labov 1989. More information on which tokens were excluded from analysis is currently available in our code repository on GitHub: https://github.com/hilaryp/Phila-short-a/blob/master/FAVE-extract/bin/shorta.py

show speaker means. The initial plot of each vowel's data will show linear regression lines, which are used purely as a visual aid in confirming the trends previously reported in Labov et al. 2013, and to identify any additional trends revealed by the addition of the education variable; they should not be used for statistical inference or interpreted as the best fit for the data. Where modeling indicates it is appropriate, quadratic lines are plotted as well; locally-weighted smoothing, such as the LOESS curves used in Labov et al. 2013, has not been used for the Philadelphia data due to the likelihood of overfitting the education groups with small speaker counts.

For modeling purposes, the date of birth variable has been centered and rescaled, and the token duration variable is given in log milliseconds. Speaker sex is coded as a two level factor with *female* as the reference level. There are two different coding schemes used for education, with differing interpretations. When there is an interaction involving education, it is given in simple contrast coding with *high school* as the reference level, for ease of interpretation. When there is no interaction present, education is *forward difference* coded, such that each coefficient represents the difference between the means of the named level and the level above it; this coding more accurately represents the hypothesized relationship between these levels in the real world, but becomes difficult to interpret in interactions. Several models also contain variables which encode the place or manner of the following segment; these are always simple contrast coded, with *no following segment* as the reference level unless otherwise indicated. All of the models have two random intercepts, one for speaker and one for word. This random effect structure will be assumed going forward, and will not be listed in each specific model equation. Finally, all models are fit by maximum likelihood estimation, while $p$-values are derived from log-likelihood ratio tests in which the random effects structure is held constant, and one fixed effect is dropped.

### 2.3.2 Raleigh

Compared to the Philadelphia methods, there are only two key differences in data processing and analysis. First, the Raleigh corpus formant measurements have been hand-checked by Robin Dodsworth, so no outlier detection is needed. A slightly different approach to modelling the Raleigh vowels was also needed, namely the inclusion of duration as a by-speaker random slope. This is based on the fact that Southern speakers differ from non-Southern speakers in vowel duration as well as quality—using a repeated measures ANOVA, Clopper et al. (2005:1664f.) found that Southerners had significantly longer lax vowel durations than speakers from other U.S. dialect regions. Fridland et al. (2014:6) replicate this finding, showing that Southerners have significantly longer (e) and (i) than other speakers. By extension, it is likely that older or more conservative Raleigh speakers differ in vowel duration from younger or less Southern Raleigh speakers. The full random effects structure which is used in the models below is therefore: (log(duration) | speaker) + (1 | word). This random effects structure was verified while fitting the model for (ay). The addition of both random slopes for duration and random intercepts for word produced a decrease in both AIC and BIC:

- Model with speaker intercepts only: AIC 37463, BIC 37584
- Addition of only duration slopes: AIC 37039, BIC 37175
- Addition of only word intercepts: AIC 35971, BIC 36099
- With both duration and word effects: AIC 35715, BIC 35859

The model with all three effects minimizes the estimated information loss, and is therefore the best fit of the models considered. This random effects structure is carried forward throughout the models in Chapter 4. Finally, the visualization of the Raleigh data is slightly different. Since the education groups are more balanced than in the Philadelphia data, LOESS curves are used with a smoothing span of 1 in all plots. The usual caveats apply: some points may be overfit, and smooths should not be used for statistical inference.

# Chapter 3

# Philadelphia

## 3.1 The Philadelphia dialect

Geographically, Philadelphia falls within the Midland dialect region, and as such has not participated in the Northern Cities or Southern shifts. The Philadelphia dialect can be distinguished by several unique lexical and syntactic features, but this study will focus on its characteristic vowel features. For instance, as in other parts of the country, there is a phonemic distinction between the tense (æh) and lax (æ) that form the traditional short-*a* system; however this system is marked by different phonological, lexical, and morphological conditions than are found elsewhere (Ferguson 1972). Philadelphia has also resisted the merger of the low-back vowels: (oh) (as in THOUGHT) is strongly raised and peripheral in comparison to (o) (as in LOT). The following sections will summarize a few key studies in order to elucidate the local vowel system and the changes which have occurred within it over the past century.

### 3.1.1 Ferguson 1972: 'Short *A* in Philadelphia English'

Our understanding of the rules underlying the traditional Philadelphia short-*a* system is rooted in Ferguson's original research on the subject, which was carried out from 1940 to 1960. Ferguson begins by identifying the phonetic contrast between the two phonemes, noting that (æ) is low, front, unrounded, monophthongal, and of the same quality as most other varieties of English, while (æh) by contrast is diphthongal, and can be raised to [ɛə] or even [eə]. As to the general rule governing which phoneme surfaces, Ferguson gives:

(1) The 'Normal' Pattern (after Ferguson 1972:262):

$$(æ) \longrightarrow (æh) \;/\; \_\_ \begin{Bmatrix} m \\ n \\ f \\ \theta \\ s \end{Bmatrix} \begin{Bmatrix} C \\ \# \end{Bmatrix}$$

The relationship here is not purely allophonic however, due to the wide variety of exceptions to this rule. For instance, the verbs *am, can, ran, began, hast*, and *hath* have the lax phoneme rather than the tense phoneme predicted by (1) (264).[1] Conversely, the 'adjectives of emotion' *mad, bad, glad*, have the tense phoneme even though following [d] is not a regular tensing environment (263). In addition to these lexical exceptions, there are exceptions conditioned by morphophonological processes, such as tensing in inflected words like *passing, classes*, which Ferguson calls "preservation of stem identity", and a lack of tensing in spite of truncation or elision in *math* or *camera*. Ferguson discusses further complexities in this system, but these examples suffice to illustrate the general pattern.

[1]Note that although not originally observed in Ferguson, *swam* and the idiosyncratic Philadelphia preterits *wan* (won), *dram* (dreamt) should be included in this list (Labov 1989:32).

In addition to his detailed description of the short-*a* system, Ferguson offers another detail which is instructive for this work. Some of Ferguson's data was drawn from native speaker intuitions, which were collected from "four white, middle-class males in their 20's and 30's, University of Pennsylvania students or graduates, who had spent their entire lives in Philadelphia" (1972:260). This is crucial information because the corpus data analyzed later in this chapter is sorely lacking in college-educated speakers from this time period. Thanks to Ferguson's study, we know that speakers who were born in perhaps the 1920s or 1930s, and attended the University of Pennsylvania, our prototypical national university in Philadelphia, fully participated in the traditional short-*a* system. This fact will be important later on in establishing that national university speakers are in fact moving away from the Philadelphia local norm, since it eliminates the possibility that they simply never participated in it at all.

### 3.1.2 Linguistic Change and Variation in Philadelphia

Labov (2001:128ff.) discusses three additional older records of the Philadelphia dialect—Kurath and McDavid 1961, De Camp 1933, and Tucker 1944—as a point of comparison with the Linguistic Change and Variation (LCV) study, to identify sound changes in progress during the 1970s. The LCV project was carried out from 1973 to 1977 and consisted of an in depth study of five neighborhoods of differing social class composition, complemented by a random survey of the whole city conducted by telephone (Labov 2001: Chapter 2).

In his summary of the three aforementioned studies, Labov notes that the Philadelphia dialect of the 1930s included: the fronting of (aw), the raising and backing of (ahr), the lowering of (ey) in free position, the raising of (oh) and (ohr), the fronting and unrounding of (uw) and (ow), and the lowering of (iy) in free position (132). With these features as its starting point, the LCV study identified a number of changes which had occurred in the Philadelphia system between the 1930s and the 1970s, and categorized them into five

stages of change. These changes are summarized in Table 3.1 using the original Labovian vowel notation, where capital letters and numbers indicate the quality of the following environment: S=voiceless fricative, N=nasal, $=[d], C=checked, F=free, 0=voiceless.

| | |
|---|---|
| Completed: | (ahr) backing & raising |
| Nearing completion: | (ohr) backing & raising<br>(æhS, æhN) raising & fronting<br>(owF, uwF) fronting |
| Mid-range: | (æh$) raising & fronting<br>(owC, uwC) fronting |
| "New & vigorous": | (aw, eyC) raising & fronting<br>(ay0) raising |
| Incipient: | (ɛ) raising & backing<br>(iyC) raising & fronting<br>(æ, i, e) lowering |

Table 3.1: Philadelphia vowels in the 1970s (Labov 1994:65).

Four of these changes—(aw), (eyC), (owC), (uwC)—were led by women, and also displayed the curvilinear pattern (Labov 2001:171). (æh) was identified as socially stigmatized, and so it is not surprising that the realization of this vowel showed a monotonic stratification by social class, with upper-class speakers favoring a less tense production. An entirely different pattern was found for (ay0) raising, which was led by men and showed no overall social class stratification; however, an interaction between gender and social class was found, such that men showed no class differentiation, but upper-class women had less-raised (ay0) than lower-class women.

### 3.1.3 Later studies

Since these seminal studies, several papers have reported new findings on the Philadelphia short-*a* system. In her 1980 King of Prussia study, Payne describes acquisition of Philadelphia features by children born out-of-state. She finds that while children usually succeed

in acquiring the purely phonetic local features, they fail to acquire the phonemic short-*a* split. Later work by Labov (1989, 1994) adds to Ferguson's original description using data from LCV. Labov specifies that the tensing consonants identified by Ferguson in (1) must be tautosyllabic, and identifies several contexts in which short-*a* tensing is variable in the LCV data: when followed by /st/ clusters (*master, plaster*), a nasal + vowel (*planet*), or a lateral + vowel (*personality*). Dinkin (2013) has recently followed up on the pre-lateral environment, concluding that the apparent tensing found previously in this environment is not the result of the tensing rule extending to the lateral environment. Rather, Dinkin argues, short-*a* before /l/ has become phonologically identified with (aw) in Philadelphia, due to the influence of /l/-vocalization.

Conn (2005) conducted a restudy of the LCV neighborhoods, interviewing 73 subjects in order to identify any changes in the production and perception of three of the Philadelphia vowels since the 1970s. He finds that (ay0) is raising in real and apparent time, is changing faster in the working class than the middle class, and that the change is no longer led by men as found in LCV; there is no sex differentiation in Conn's data. (aw) is also changing in real and apparent time, with young middle-class women leading a retreat from its former fronted position. Finally, Conn considers the fronting of (eyC), finding that this change is still progressing, and shows no sex or social class stratification in apparent time.

In a study of South Philadelphia Catholic high schoolers during the transition from adolescence to adulthood, Wagner (2008) adds to the literature on (aw) and (ay0), as well as the relatively understudied (e) variable. Wagner reports that at the beginning of her study, the students showed a lower (e) and a backer (aw) than the LCV subjects. She finds that while the students who were re-studied after graduation generally decreased their participation in the (aw) and (ay0) changes, likely due to their social salience, they continued to participate in the non-salient (e) change. This fits with her finding that the

more middle class students also decreased their use of the non-standard (ing) and (dh) variables, supporting the analysis that socially-salient variables are subject to age grading.

### 3.1.4 The 100 Years study

A recent large-scale analysis of the Philadelphia Neighborhood Corpus (PNC, 379 speakers) by Labov et al. (2013) follows up on the LCV findings to bring our picture of the Philadelphia vowel system more up to date. Table 3.2 summarizes the current status of these vowels, based on their findings:

| | |
|---|---|
| Continued incrementation: | (eyC) raising & fronting<br>(ay0) raising<br>(Tuw) fronting |
| Reversal: | (aw) now lowering<br>(ow, Kuw) now backing<br>(æh, oh) withdrawal |
| Not reported: | (iyC, ahr, ohr, ɛ, æ, i, e) |

Table 3.2: Philadelphia vowel changes since the 1970s (Labov et al. 2013).

This study does find a significant effect of education for several variables. For example, for (æh), (oh), and (aw) there is a significant difference between white adult Philadelphians with twelve years or less of education and those with more, as speakers with a high school education or less have consistently more advanced (i.e., raised) forms over time than speakers with more than twelve years of education. There are also significant gender effects for most of the variables, with women leading the incrementation of (eyC), the reversal of (ow), (Kuw), and (aw), and showing a steeper decline than men for (æh) and (oh). Unfortunately this paper does not examine any social factors for (ay0), so it is as yet unknown whether this continued incrementation is still led by men, as the LCV study found, or whether women have caught up, as suggested in Conn (2005).

Labov et al. (2013) attribute the withdrawal from the traditional short-*a* and low-back patterns to the local salience of these variables, and their potential association with the negatively-stereotyped New York pattern. This is certainly a reasonable explanation given how widely-recognizable these New York features are; in fact this explanation was previously proposed by Prichard and Tamminga (2012) in their examination of the effect of college education on the Philadelphia system.

## 3.2 Results

This section lays out the data visualization and statistical analysis of the Philadelphia vowel variables, following the methodology described above.

### 3.2.1 The split short-*a* system

Figure 3.1 is a preliminary plot of the diagonal measure for (æh) against date of birth, with separate linear regression lines used to visually highlight the trend for each education group. This vowel shows an education-stratified change over time. The trend for speakers with a high school education has been to continue raising and fronting (æh) according to the traditional Philadelphia pattern. However, speakers who were born after about 1940 who continued on to higher education began to reverse that trend. Furthermore, there appears to be a gradient relationship between the education groups; regional and national speakers lead the lowering of this class, with some speakers producing tokens of (æh) which are phonetically indistinguishable from (æ), plotted in Figure 3.2. Compared to (æh), the lax (æ) shows little to no change over time.

In Figure 3.1, vowel tokens were sorted into tense (æh) as opposed to the lax (æ) class according to the rules of the Philadelphia short-*a* system, and thus shows an apparent lowering of the traditionally-tense (æh) class. The hypothesis tied to this visualization

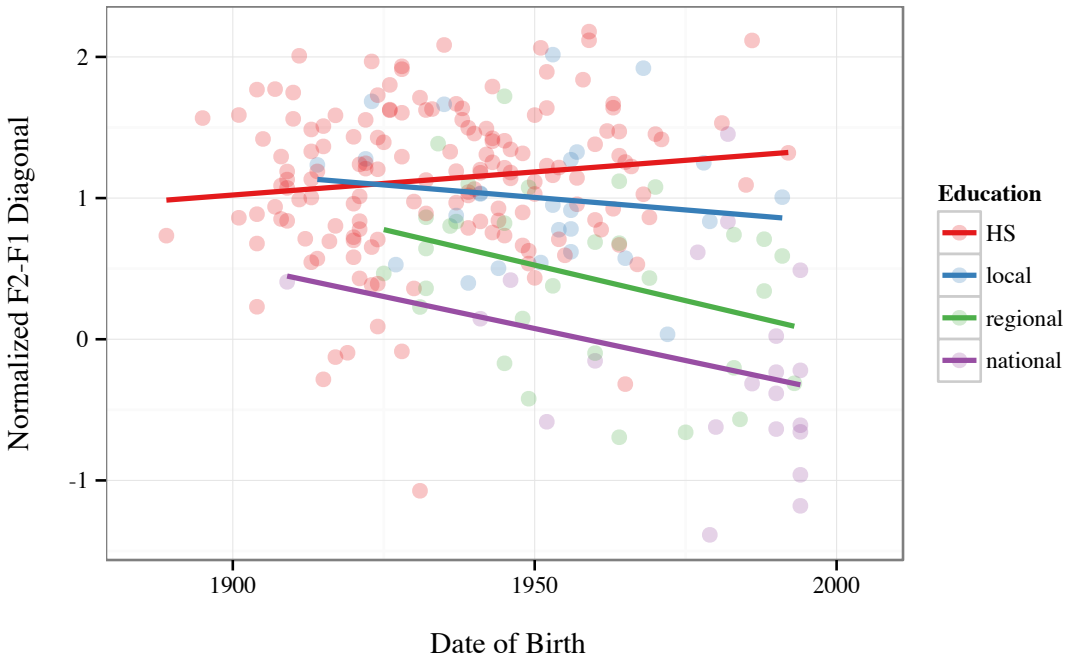


Figure 3.1: Tense (æh) by education.

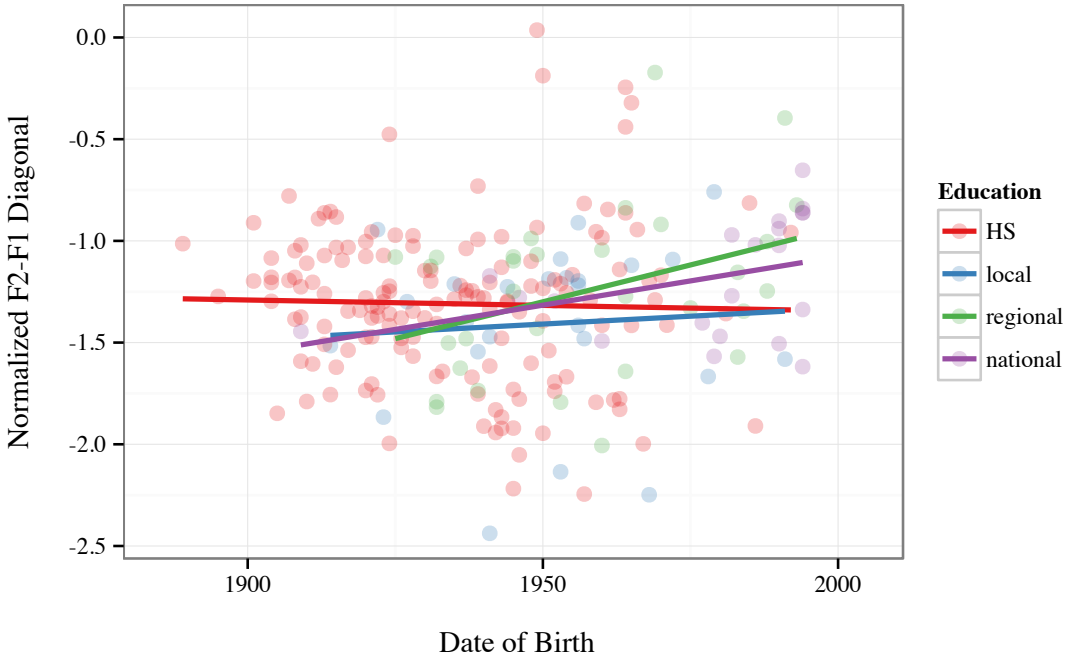


Figure 3.2: Lax (æ) by education.

is that a speaker who is correcting away from the Philadelphia system will simply have more lax realizations of (æh) than their traditional counterparts. However, Labov et al. (2013) identify a more complex pattern of correction. In an analysis of nine current college students, they find that rather than lowering (æh) across the board, speakers with higher education have moved to a nasal short-*a* system (wherein (æh) occurs in pre-nasal environments, and (æ) occurs elsewhere). If this is the case, then it is only the tokens which are tense in the Philadelphia system but not the nasal system which are subject to lowering. To the extent that this pattern is found among the speakers of the PNC, it is possible that the trends displayed in Figure 3.1 actually underestimate the magnitude of the reversal by speakers with higher education; they may not be engaging in a wholesale shift away from the phonetic quality of the vowel, but rather reorganizing the structure of the short-*a* system. Figure 3.3 therefore breaks the tense (æh) class down by manner of following segment (nasal vs. other) in order to see if this reorganization of the short-*a* system is reflected in the wider community.

Both high school and local college speakers demonstrate a consistent phonetic effect, where (æh) is slightly more tense when followed by a nasal consonant than it is when followed by a stop or fricative. This effect is constant over time. By contrast, the regional and national college speakers show a widening gap between the two contexts. For these speakers, (æh) before a nasal has remained stably tense over time, but (æh) elsewhere has lowered. The reverse is also demonstrated for the (æ) class in Figure 3.4; (æ) before stops and fricatives has remained lax, while national speakers at least have raised (æ) before the three pre-nasal environments which are traditionally lax (the velar nasal, irregular verbs, and all nasals onsets).

Based on these visualizations, we expect to find an interaction between date of birth and education, because high school speakers have raised (æh) over time while college-educated speakers have lowered it, and also between education and manner of following

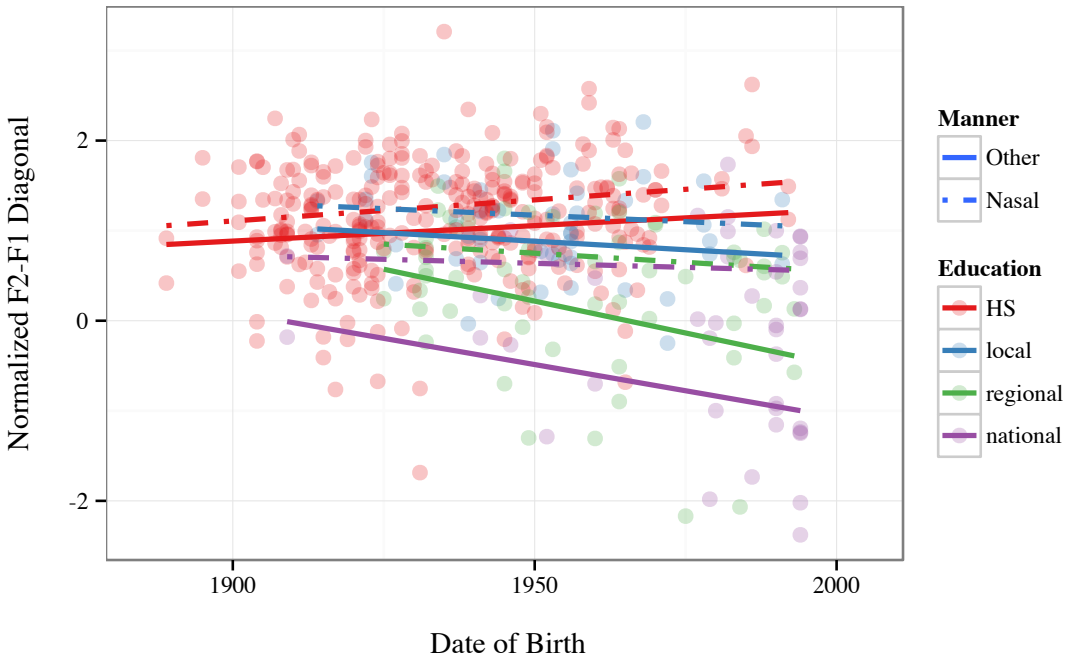


Figure 3.3: Tense (æh) by education and manner of following segment.

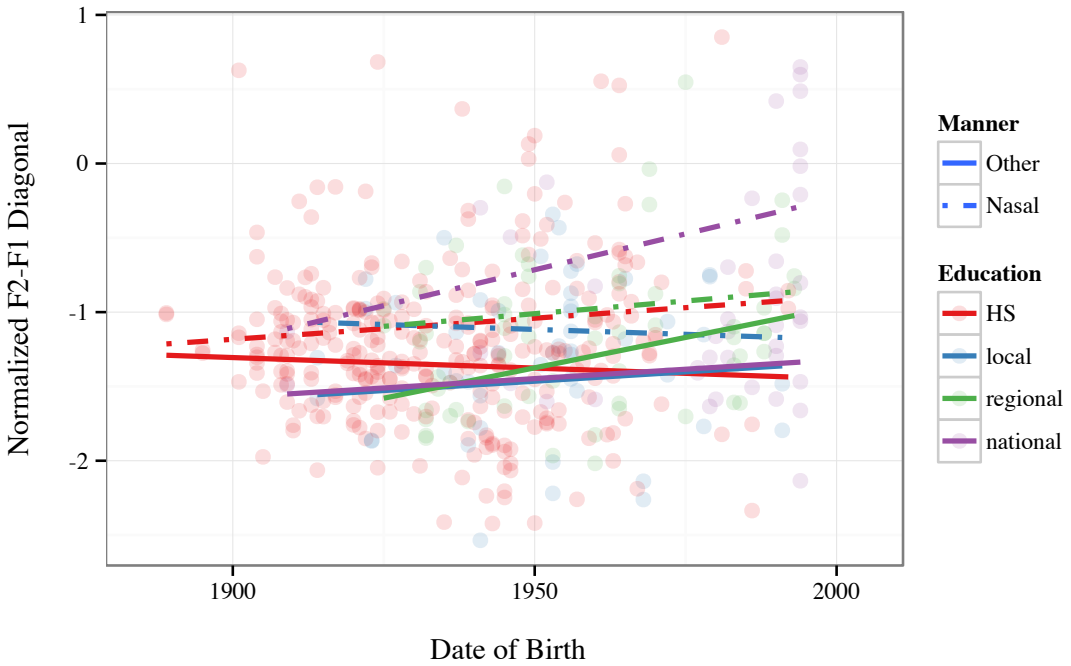


Figure 3.4: Lax (æ) by education and manner of following segment.

segment (henceforth just *manner*).

The short-*a* analysis of Labov et al. 2013 also suggests that it may be worthwhile to look for an interaction between education and speaker sex. While this interaction is not explicitly explored in their analysis, they find that female speakers start out with a more tense (æh) than males at the beginning of the 20th century, but also show a steeper reversal over time than males. Since they also find that speakers with a college education are leading this reversal, it makes sense to check for an interaction. Figure 3.5 is a visualization of all of the potential interactions for (æh) identified thus far, which we will explore statistically next. Each facet contains one level of the education index, and within each facet, the data is broken down by sex and manner of following segment. Plotted in this way, the data clearly shows a transition from the Philadelphia short-*a* system on the left, to a nasal system on the right, which seems to be led by women with a national college education.

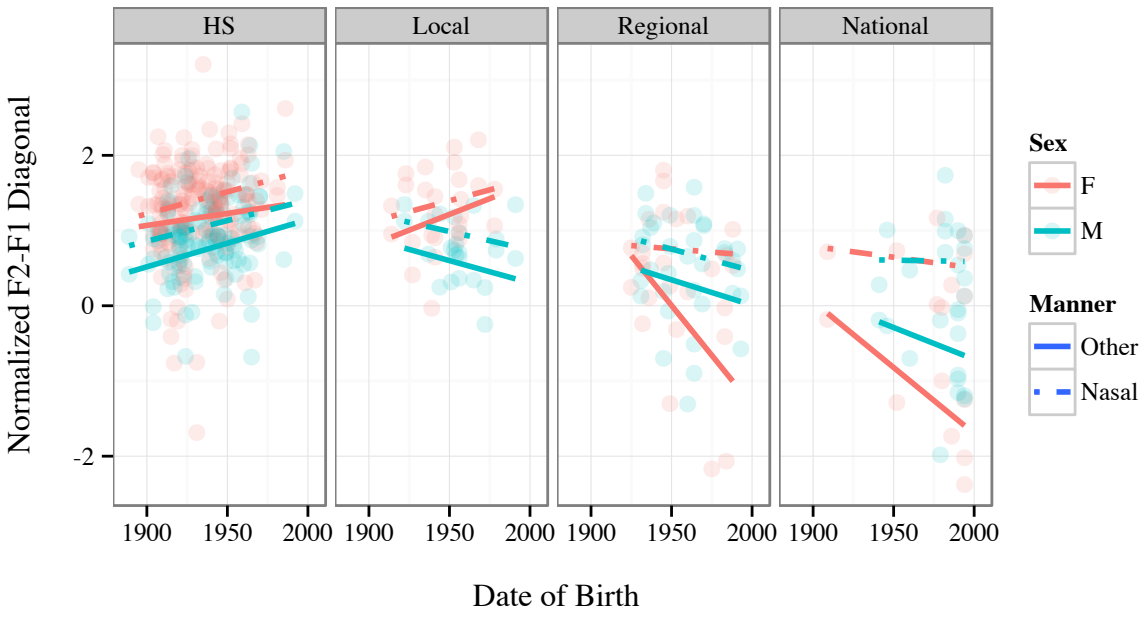


Figure 3.5: Plot of all potential interactions for (æh).

In the models discussed below, the dependent variable is the z-scored/Lobanov normalized diagonal measurement of (æh), and *Nasal* is a dummy-coded variable indicating whether or not the token is followed by a nasal segment. The base model without interactions given in Table 3.3 finds significant effects of all predictors except date of birth and duration.[2] The coefficients show that men have a less tense (æh) than women, pre-nasal tokens are more tense, and each level of education is less tense than the previous.[3] Post-hoc multiple comparisons using Tukey's test reveal that the only levels of the education index which are not significantly different from each other are high school and local. The full output of the post-hoc multiple comparisons are given in Appendix A.4, Table A.3.

| | Estimate | S.E. | $p$-value | |
|---|---|---|---|---|
| (Intercept) | 0.23 | 0.14 | | |
| Duration | −0.02 | 0.02 | .416 | |
| Nasal | 0.74 | 0.07 | < .001 | *** |
| DOB | 0.02 | 0.05 | .608 | |
| Male | −0.26 | 0.07 | < .001 | *** |
| Education: | | | < .001 | *** |
| HS−Local | 0.12 | 0.11 | | |
| Local−Regional | 0.50 | 0.14 | | |
| Regional−National | 0.59 | 0.15 | | |
| AIC: 21398, BIC: 21475, log $\mathcal{L}$: −10688 | | | | |

Table 3.3: (æh) F2−F1 ∼ scaled DOB + Sex + Manner + Education + log Duration

The next model tests the potential interactions between date of birth and education, education and manner, and education and sex. This model provides a significantly better fit than the base model ($\chi^2_{df=3} = 20.37, p < .001$). For ease of interpretation, the Education variable shown in Table 3.4 uses a simple contrast coding with high school as the reference level, rather than forward difference coding. Due to the non-significance of the DOB main

[2]Recall that $p$-values are derived from log-likelihood ratio tests, and thus represent the significance of including the entire factor in the model, rather than the significance of any one level.

[3]Because of the forward difference coding, a positive coefficient here means that the level is more tense than that above it; thus high school is more tense than local, which is more tense than regional, and so forth.

effect in the base model and the fact that plotting showed that the high school and college groups are moving in opposite directions, we can hypothesize that DOB has no effect above and beyond its interaction with education, and thus it has not been separately fit as a main effect in this model.

| | Estimate | S.E. | $p$-value | |
|---|---|---|---|---|
| (Intercept) | 0.74 | 0.14 | | |
| Duration | 0.02 | 0.02 | .333 | |
| Nasal | 0.48 | 0.07 | | |
| Male | −0.40 | 0.08 | | |
| Education: | | | | |
| Local | −0.10 | 0.15 | | |
| Regional | −1.14 | 0.15 | | |
| National | −1.93 | 0.21 | | |
| Education × DOB: | | | .011 | * |
| HS:DOB | 0.12 | 0.05 | | |
| Local:DOB | −0.03 | 0.15 | | |
| Regional:DOB | −0.26 | 0.11 | | |
| National:DOB | −0.22 | 0.13 | | |
| Education × Manner: | | | < .001 | *** |
| Local:Nasal | −0.06 | 0.06 | | |
| Regional:Nasal | 0.52 | 0.05 | | |
| National:Nasal | 1.01 | 0.05 | | |
| Education × Sex: | | | < .001 | *** |
| Local:Male | −0.05 | 0.21 | | |
| Regional:Male | 0.61 | 0.19 | | |
| National:Male | 0.81 | 0.22 | | |
| AIC: 20914, BIC: 21055, log $\mathcal{L}$: −10437 | | | | |

Table 3.4: (æh) F2−F1 ∼ Ed × scaled DOB + Ed × Manner + Ed × Sex + log Duration

This model shows significant interactions of education and date of birth ($p = .011$), education and manner ($p < .001$), and education and sex ($p < .001$). The effects are in the direction we would predict based on the visualization of the data. For the interaction of education and date of birth, the coefficients indicate that as date of birth increases, high

school speakers' (æh) becomes more tense, while the other speakers become more lax. The interaction of education and nasal manner indicates that regional and national speakers have a much stronger contrast between contexts than local and high school speakers, with the nasal context being more tense. In addition, the significant interaction between education and sex means that for high school and local speakers, women have more tense realizations of (æh) than men, while for regional and national speakers, women have *less* tense realizations. These results lead to the conclusion that in Philadelphia, women are the leaders of change in short-*a* in two different directions: locally-oriented women are leading the continued tensing of the traditional short-*a* class, while more nationally-oriented women are leading their peers in the transition to a nasal short-*a* system.

### 3.2.2 The low-back vowels

Extremely raised (oh) is a recognizable and negatively-evaluated stereotype of New York City speech (Becker 2011, 2014), but it has not yet been demonstrated whether the same is true of Philadelphia. Figure 3.6 displays the speaker means for the low-back vowel (oh) while Figure 3.7 shows (o), plotted by date of birth and normalized F1. The pattern is similar to that seen for the split short-*a* system: there is relatively little change in (o) over time, while there has been a tendency to lower (oh) over time among all groups, with the national and regional speakers strongly lowering this vowel. These two groups may also be raising the (o) vowel, suggesting movement towards a merger of these two vowels. Here we see clearly that the high school and local speakers are not well differentiated.

Statistical modeling confirms these patterns. Education index is a significant predictor of F1 of (oh), and post-hoc multiple comparisons find that all levels of education are significantly different except for high school and local. Furthermore there is a significant interaction between education and date of birth, such that regional and national speakers have steeper slopes over time than local and high school speakers; i.e., those two groups

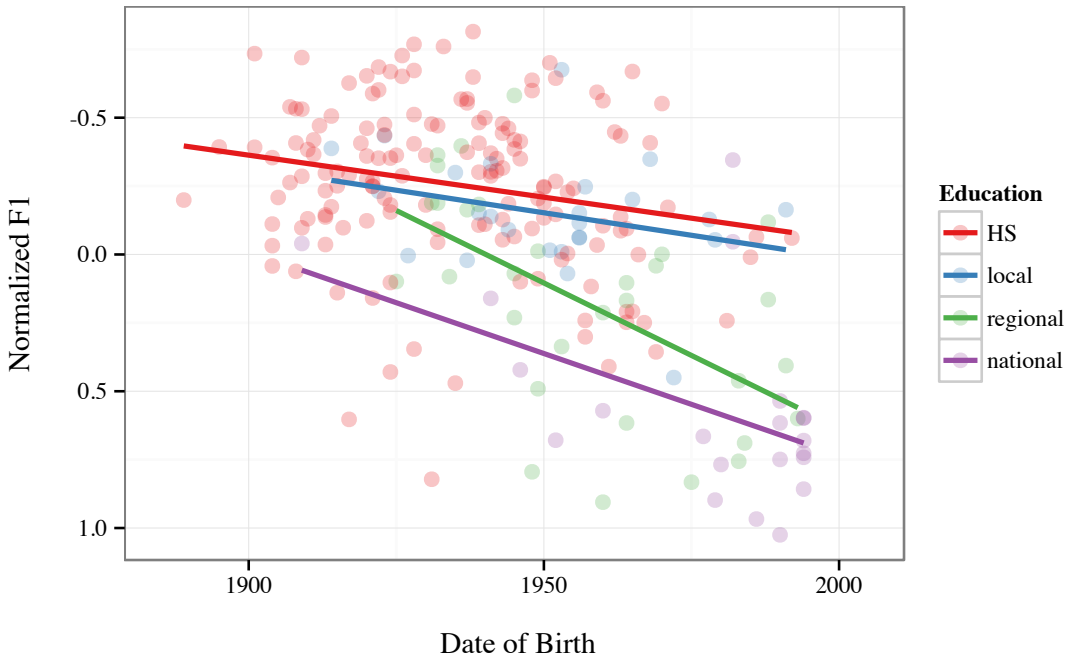


Figure 3.6: (oh) by education.

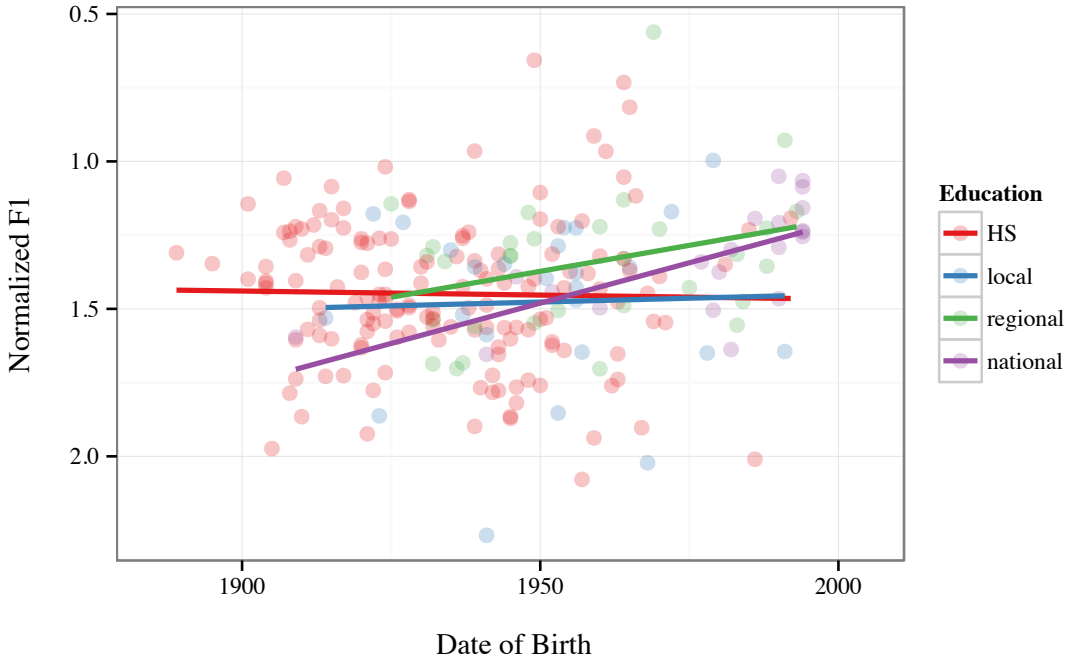


Figure 3.7: (o) by education.

are lowering (oh) faster. As seen in Table 3.5, there are also significant effects of manner and place of following segment; however there are no compelling patterns to be found in the coefficients for individual levels of these variables, with high standard error for all individual factor levels, so they are treated as nuisance variables and not broken out in this table or interpreted further.

| | Estimate | S.E. | $p$-value | |
|---|---|---|---|---|
| (Intercept) | −0.2316 | 0.1297 | | |
| Duration | 0.0432 | 0.0103 | < .001 | *** |
| Manner | | | < .001 | *** |
| Place | | | < .001 | *** |
| DOB | 0.0769 | 0.0291 | | |
| Male | 0.0688 | 0.0367 | 0.062 | |
| Education: | | | | |
| Local | 0.0558 | 0.0618 | | |
| Regional | 0.2585 | 0.0628 | | |
| National | 0.5216 | 0.1075 | | |
| Education × DOB: | | | 0.038 | * |
| Local:DOB | 0.0003 | 0.0839 | | |
| Regional:DOB | 0.1848 | 0.0705 | | |
| National:DOB | 0.1223 | 0.0772 | | |
| AIC: 20559, BIC: 20733, log $\mathcal{L}$: −10257 | | | | |

Table 3.5: (oh) F1 ∼ Education × scaled DOB + Sex + log Duration + Manner + Place

### 3.2.3 (aw) fronting

This vowel class requires closer scrutiny than the previous two discussed here, as the overall pattern is reflective of a complex set of interactions between the social variables. Labov et al. (2013) report that before 1950, this vowel shows a gradual raising along the front diagonal, followed by a "dramatic reversal" after the 1950s. This finding is demonstrated in Figure 3.8, which plots the means for all speakers, color-coded by education group, with

a quadratic fit derived from a simple linear model of the effect of date of birth on the (aw) diagonal measurement.

This fit agrees with Labov et al.'s finding that the direction of change for (aw) reversed mid-century. However, this fit does not take into account the shift in education which also occurred in the middle of the 20th century. Figure 3.9 shows the same data as Figure 3.8, but this time the model used for the quadratic fit includes education group as a fixed effect, resulting in a different intercept for each education group. We can now see that speakers with differing education have not been participating in this pattern to the same extent; notably, the regional and national college speakers have considerably lower means for (aw) than the rest of the community, throughout the visible time span.

This consistent difference in means could in fact be solely responsible for the overall pattern Labov et al. identify. Recall that in Figure 2.3 it was shown that after about 1975, national college speakers far outweigh the other categories in density of data. Thus the apparent reversal in the 1950s could simply be a reflection of the dramatic category shift present in the data. For example, there are only four speakers in the high school education group born after 1975, and their means do not conclusively indicate a lowering of (aw), falling squarely within the range already established for that group. We would therefore need to collect more data from members of the high school education group born after 1975 to balance the sample, before we could claim that the community as a whole has undergone a reversal in (aw) raising.

Of course even Figure 3.9 represents a simplification of the factors affecting (aw) raising. Table 3.6 shows the full mixed-effects model results for this vowel. The best-fitting mixed effects model for this vowel is actually identical to that selected for (æh). There are three interactions; in addition to the different intercepts for education level shown in Figure 3.9, the interaction with date of birth indicates that the education groups also have different slopes. The other two interactions are added to this in Figure 3.10: the

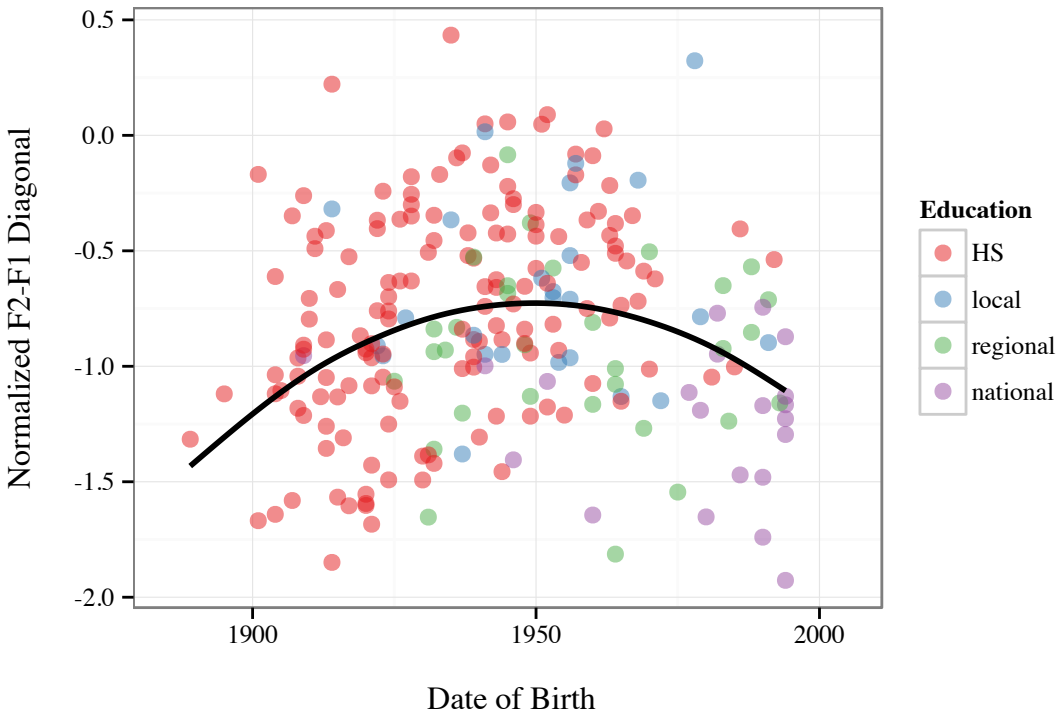


Figure 3.8: (aw): Quadratic fit for date of birth.

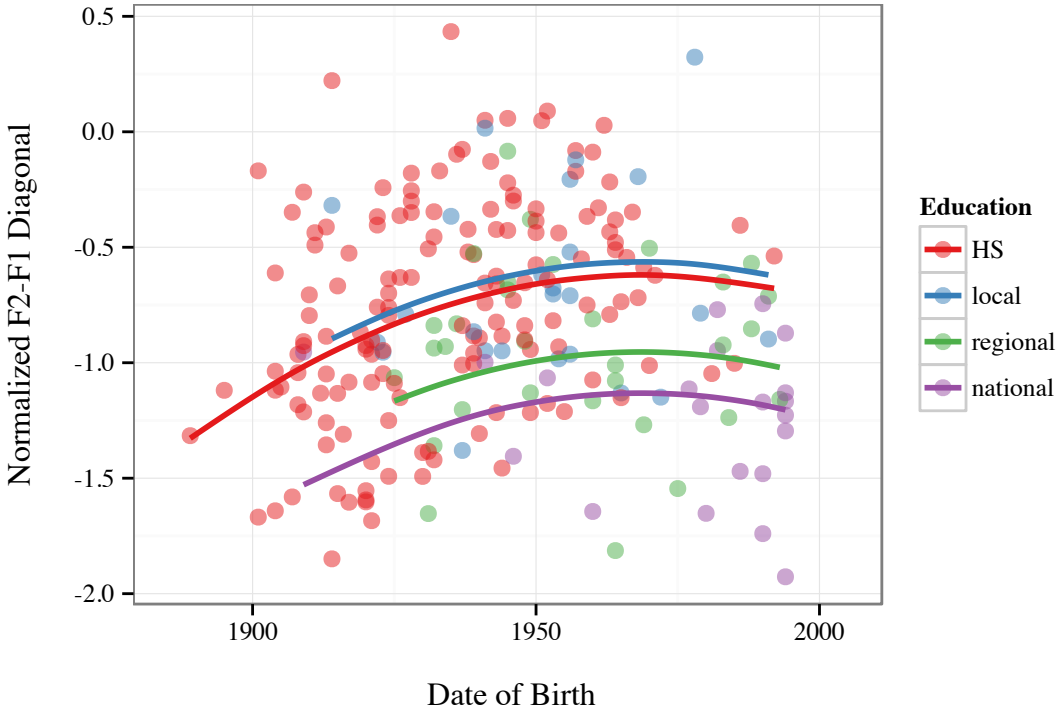


Figure 3.9: (aw): Quadratic fit for date of birth + education.

effect of both sex and a following nasal varies according to education level. The effect of a following nasal here is the opposite of that found in (æh), however; it is the high school speakers who have the most strongly raised and fronted (aw) before nasals. It is also worth noting that although the overall distribution of the data over time shown in Figure 3.8 is clearly nonlinear (as indeed Labov et al. 2013, Figure 12 demonstrates), when education is included in the model, the addition of a polynomial term for date of birth does not produce a significant improvement ($\chi^2_{df=4} = 6.3, p = .18$).

| | Estimate | S.E. | $p$-value | |
|---|---|---|---|---|
| (Intercept) | −1.44 | 0.09 | | |
| Duration | 0.12 | 0.01 | < .001 | *** |
| Nasal | 0.61 | 0.06 | | |
| Male | −0.54 | 0.05 | | |
| Education: | | | | |
| Local | 0.03 | 0.10 | | |
| Regional | −0.41 | 0.10 | | |
| National | −0.74 | 0.15 | | |
| Education × DOB: | | | < .001 | *** |
| HS:DOB | 0.25 | 0.03 | | |
| Local:DOB | 0.17 | 0.10 | | |
| Regional:DOB | 0.03 | 0.08 | | |
| National:DOB | −0.06 | 0.09 | | |
| Education × Sex: | | | < .001 | *** |
| Local:Male | 0.04 | 0.15 | | |
| Regional:Male | 0.36 | 0.13 | | |
| National:Male | 0.69 | 0.16 | | |
| Education × Following Nasal | | | < .001 | *** |
| Local:Nasal | −0.16 | 0.04 | | |
| Regional:Nasal | 0.01 | 0.04 | | |
| National:Nasal | −0.11 | 0.04 | | |
| AIC: 35656, BIC: 35811, log $\mathcal{L}$: −17808 | | | | |

Table 3.6: (aw) F2−F1 ∼ Education × scaled DOB + Education × Sex + log Duration + Education × Nasal

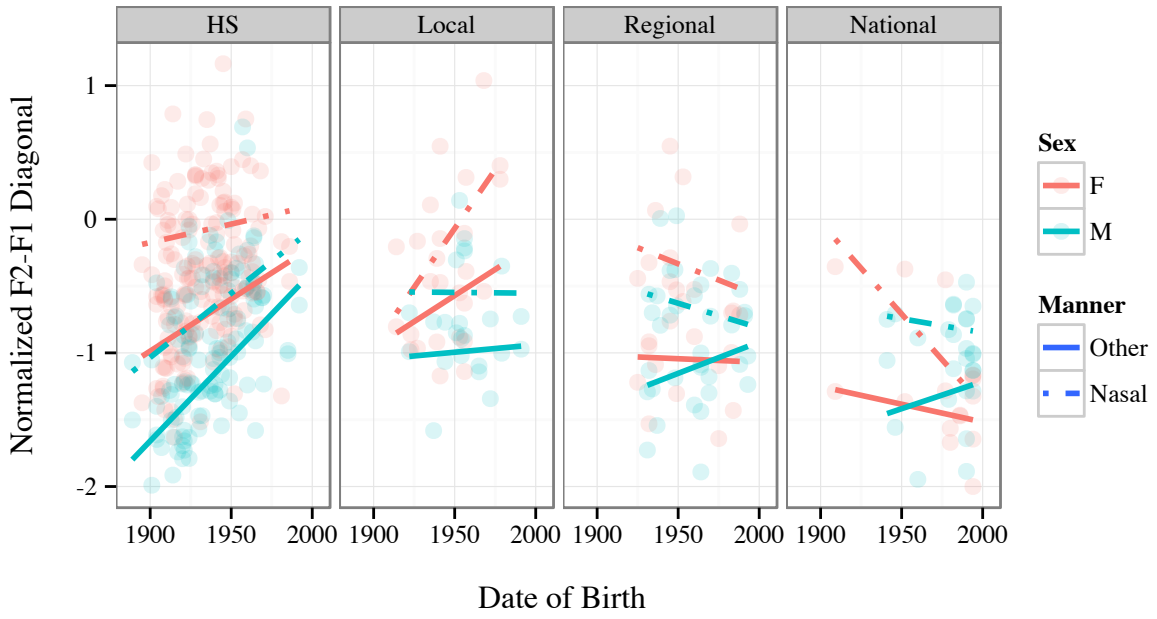


Figure 3.10: Four predictors of (aw).

### 3.2.4 (ow) fronting

The LCV study reported that fronting of (ow) in checked position was a mid-range change ongoing in the 1970s which was being led by women, while (owF)-fronting was nearing completion. Since then, both changes have evidently reversed, as Labov et al. (2013) report that this vowel is backing for speakers born after 1940, a change which is also led by women. For the sake of brevity, this section will only report on results for (owC) as the pattern for (owF) is nearly identical, simply more fronted. The data presented here look rather similar to the data for (aw)-fronting presented above: while the overall shape of change reported by Labov et al. (2013) appears to be one of fronting up until the 1950s, followed by reversal, when the data is broken down by education group, as in Figure 3.11, we again see that high school speakers have a different trajectory of change than college-educated speakers, and the apparent community reversal may in fact be the result of the imbalance of education across the two temporal halves of the corpus.

The previous results regarding the role of women in this change are borne out, how-

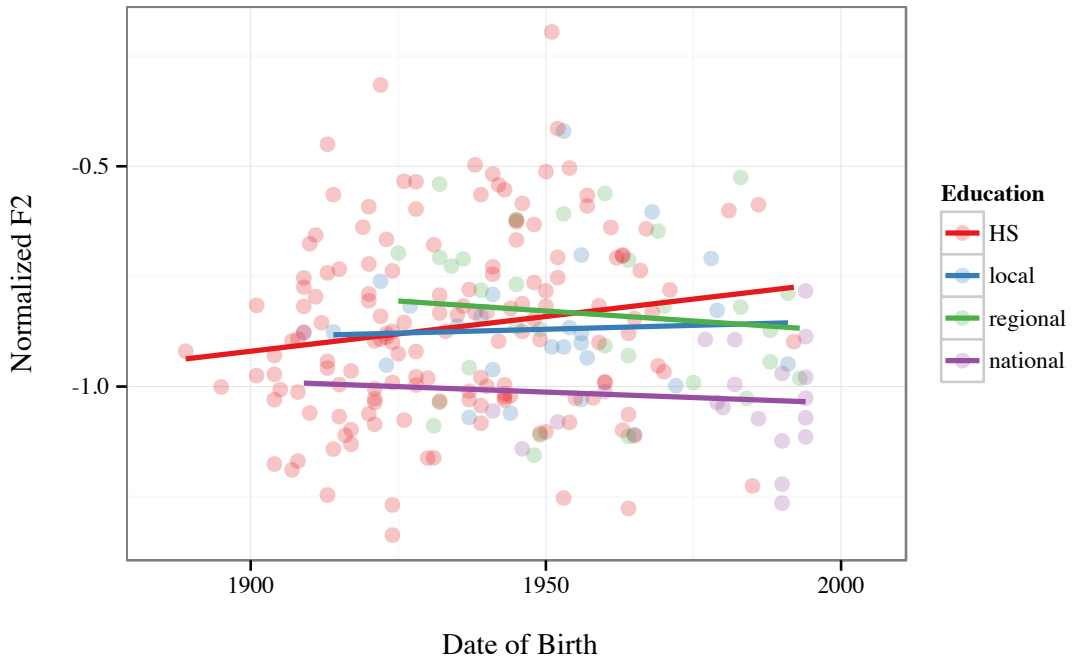


Figure 3.11: (owC) by education.

ever. Figure 3.12 shows that essentially all apparent change and social stratification in this vowel is driven by women. While men show relatively little differentiation, women show a divergence circa 1950, after which point women with high school and local education have much more fronted realizations of (ow) in checked position than women with regional and national education.

Figure 3.12 stands on its own; however, this three-way interaction between education, date of birth, and sex may also be confirmed statistically (see Table 3.7). It is of interest to note that the separate interaction of date of birth and education appears to have less effect on this vowel than the interaction of sex and education. The strongest effect is clearly that of women attending regional colleges, followed by national colleges. Unfortunately it is impossible to tell whether the stronger effect of regional college is simply due to low Ns in the national category, or if there may be an interesting curvilinear pattern at play.

| | Estimate | S.E. | $p$-value | |
|---|---|---|---|---|
| (Intercept) | -1.026 | 0.049 | | |
| Duration | 0.004 | 0.009 | .629 | |
| DOB | -0.020 | 0.024 | | |
| Female | 0.246 | 0.028 | | |
| Education: | | | | |
| Local | 0.047 | 0.055 | | |
| Regional | 0.082 | 0.049 | | |
| National | -0.072 | 0.099 | | |
| DOB × Education: | | | | |
| DOB:Local | 0.027 | 0.069 | | |
| DOB:Regional | 0.048 | 0.054 | | |
| DOB:National | 0.018 | 0.072 | | |
| DOB × Female | 0.114 | 0.033 | | |
| Education × Sex: | | | | |
| Local:Female | -0.082 | 0.072 | | |
| Regional:Female | -0.150 | 0.071 | | |
| National:Female | -0.192 | 0.126 | | |
| DOB × Education × Sex: | | | .003 | ** |
| DOB:Local:Female | -0.002 | 0.097 | | |
| DOB:Regional:Female | -0.284 | 0.080 | | |
| DOB:National:Female | -0.155 | 0.090 | | |
| AIC: 22660, BIC: 22815, log $\mathcal{L}$: $-11310$ | | | | |

Table 3.7: (owC) F2 ∼ DOB × Education × Sex + Duration

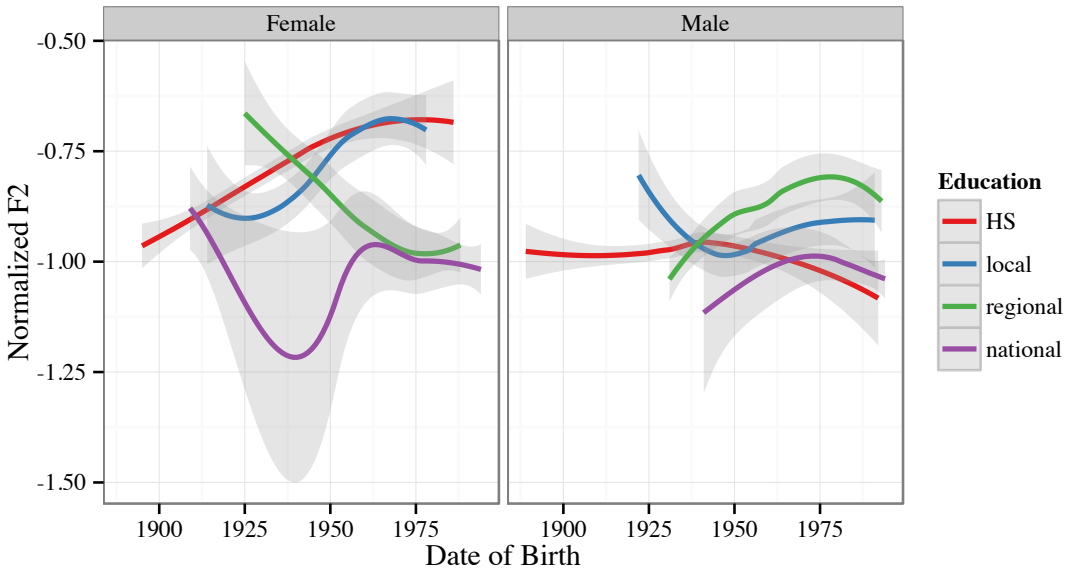


Figure 3.12: (owC) three-way interaction.

### 3.2.5 Canadian raising

The next variable is a change in progress which is still currently below the level of awareness in Philadelphia: the raising of (ay) in pre-voiceless context, or (ay0), also commonly referred to as "Canadian raising." Figure 3.13 shows the dramatic raising in (ay0) over time; note there is little to no difference between the education groups. Speakers with higher education are raising in lockstep with the rest of the community.

Mixed effects modeling (Table 3.8) unsurprisingly shows a significant effect of date of birth, reflecting the strong change over time in this variable. Interestingly enough, there is also a significant interaction of sex and date of birth, indicating that men have a lower realization of (ay0) over time relative to women. This is the reverse of the result found in the LCV study, where (ay0) raising was found to be a male-led change (Labov 2001:171), with no overall social class differentiation, but class stratification for female speakers. However, Conn's 2005 update on this variable showed no clear sex differentiation, so it is possible that this reversal is quite recent. While Conn's data is not included in the PNC, Figure 3.14

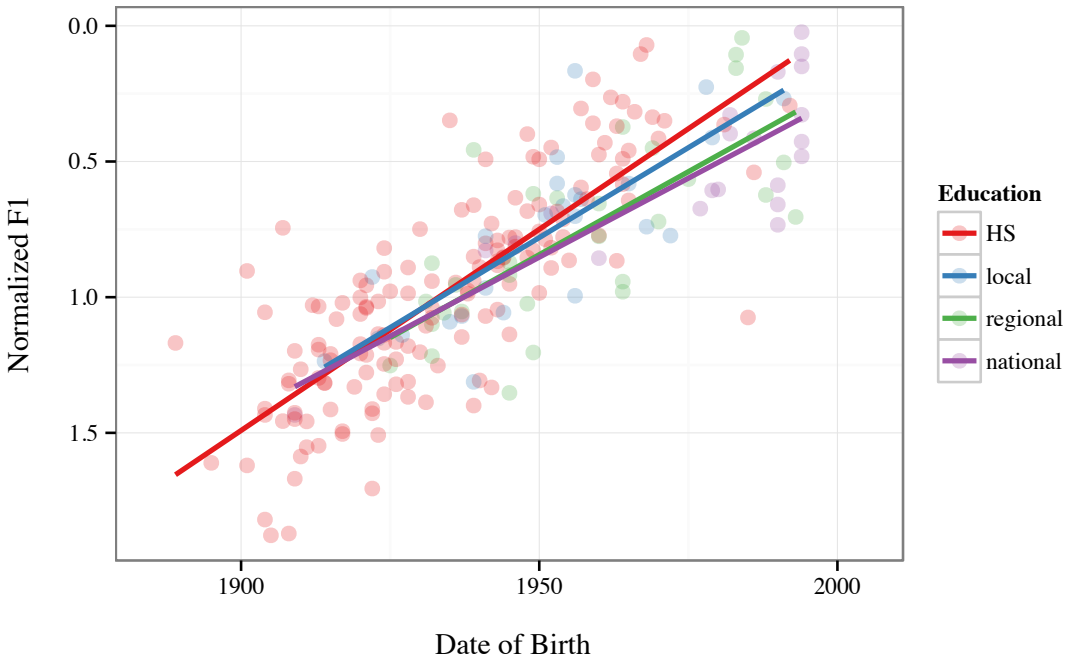


Figure 3.13: (ay0) by education.

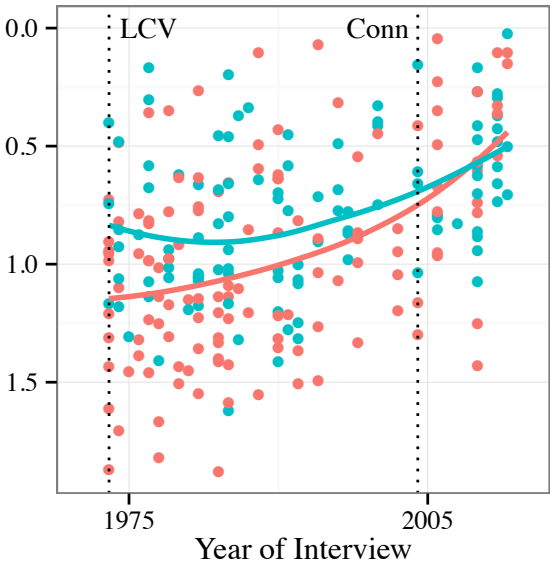


Figure 3.14: (ay0) previous studies.

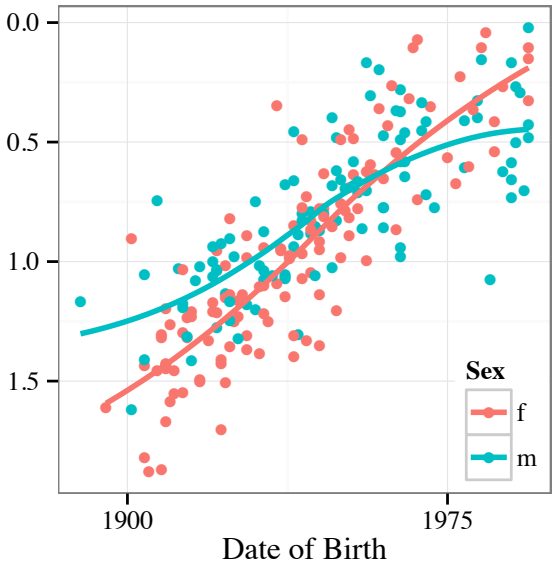


Figure 3.15: (ay0) by DOB and sex.

shows that a synchronic sample of PNC data of the same time period also does not display a large difference in (ay0)-raising between men and women, whereas data from the LCV time period clearly shows men in the lead. Figure 3.15 meanwhile shows that it was speakers born during the 1950s and 60s that neutralized the difference between men and women's realization of this vowel, and that for speakers born after 1975, it may in fact be women who are the most raised.

| | Estimate | S.E. | $p$-value | |
|---|---|---|---|---|
| (Intercept) | −1.36 | 0.06 | | |
| Duration | 0.48 | 0.01 | < .001 | *** |
| DOB | −0.40 | 0.02 | | |
| Male | 0.05 | 0.03 | | |
| Education: | | | .02 | * |
| HS−local | −0.02 | 0.04 | | |
| Local−regional | −0.08 | 0.05 | | |
| Regional−national | −0.02 | 0.05 | | |
| Male × DOB: | 0.14 | 0.03 | < .001 | *** |
| AIC: 22357, BIC: 22442, log $\mathcal{L}$: −11168 | | | | |

Table 3.8: (ay0) F1 ∼ Sex × scaled DOB + Education + log Duration

Duration is significant, with longer tokens having a higher F1. No other linguistic factors were found to improve the model, and thus have not been included here. The education term is also significant; we should take this with a grain of salt however, since the standard error for each level is large compared to its coefficient, and post-hoc multiple comparisons show no significant differences between the levels.

### 3.2.6 (ey) raising

A second change in progress, the raising of (ey) in checked position, shows a very similar pattern to that seen in (ay). (eyC) has raised strongly along the front diagonal, while

(eyF) shows only a small amount of raising. And as seen for (ay0), there is no discernible difference between the education groups, shown in Figure 3.16.

| | Estimate | S.E. | $p$-value | |
|---|---|---|---|---|
| (Intercept) | 1.27 | 0.11 | | |
| Duration | −0.26 | 0.01 | < .001 | *** |
| Environment: | | | | |
| lateral | 0.91 | 0.11 | | |
| elsewhere | 1.12 | 0.09 | | |
| DOB | 0.04 | 0.04 | | |
| Male | −0.06 | 0.03 | .107 | |
| Education: | | | .194 | |
| HS−Local | −0.03 | 0.06 | | |
| Local−Regional | −0.11 | 0.05 | | |
| Regional−National | −0.09 | 0.07 | | |
| Environment × DOB: | | | < .001 | *** |
| lateral:DOB | −0.01 | 0.05 | | |
| elsewhere:DOB | 0.28 | 0.03 | | |
| AIC: 43984, BIC: 44096, log $\mathcal{L}$: −21978 | | | | |

Table 3.9: (eyC) F2−F1 ∼ Manner × scaled DOB + Sex + Education + log Duration

Mixed effects modeling confirms this: education is not a significant predictor of the diagonal measure for (eyC), and neither is sex (Table 3.9). Duration is significant, as well as the interaction between date of birth and a three-level factor which codes for following segment. The coding of this factor, "environment", is based on previous work by Fruehwald (2011), who found that pre-hiatus and pre-lateral tokens of (eyC) behave differently. Indeed, examination of the data (shown in Figure 3.17) and model results shows that pre-hiatus tokens are consistently lower and remain stable over time relative to the strong raising in other environments, while pre-lateral tokens fall somewhere in between these two categories. This model is thus a better fit than a model without the interaction term ($\chi^2_{df=5} = 149.6, p < .001$).

The results for (eyC) are on the whole unsurprising given previous analyses; there are

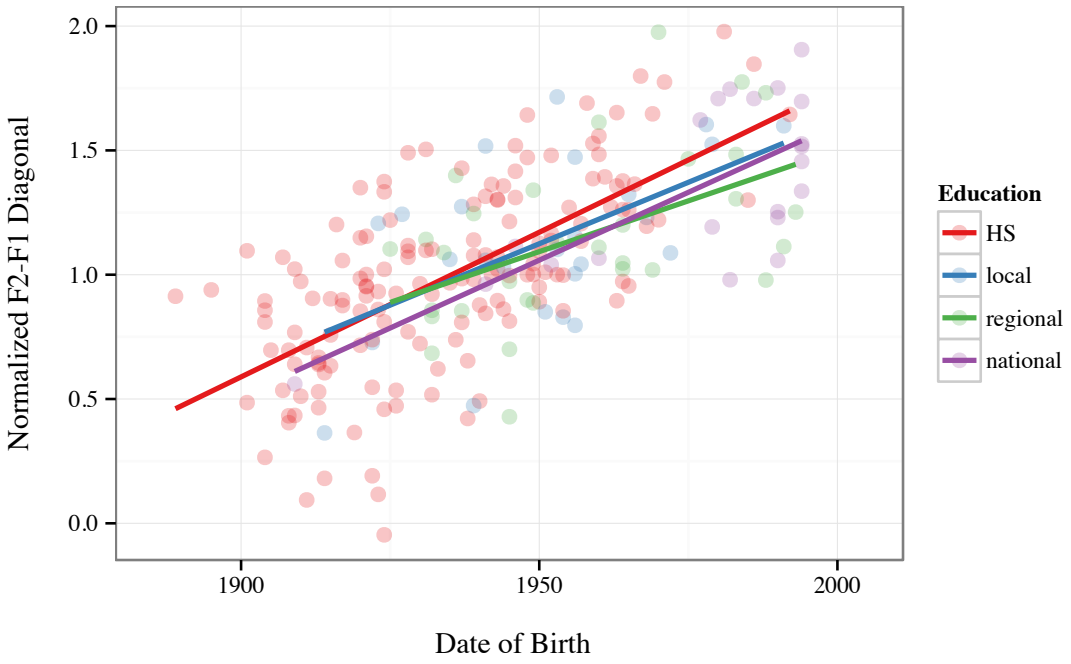


Figure 3.16: (eyC) by education.

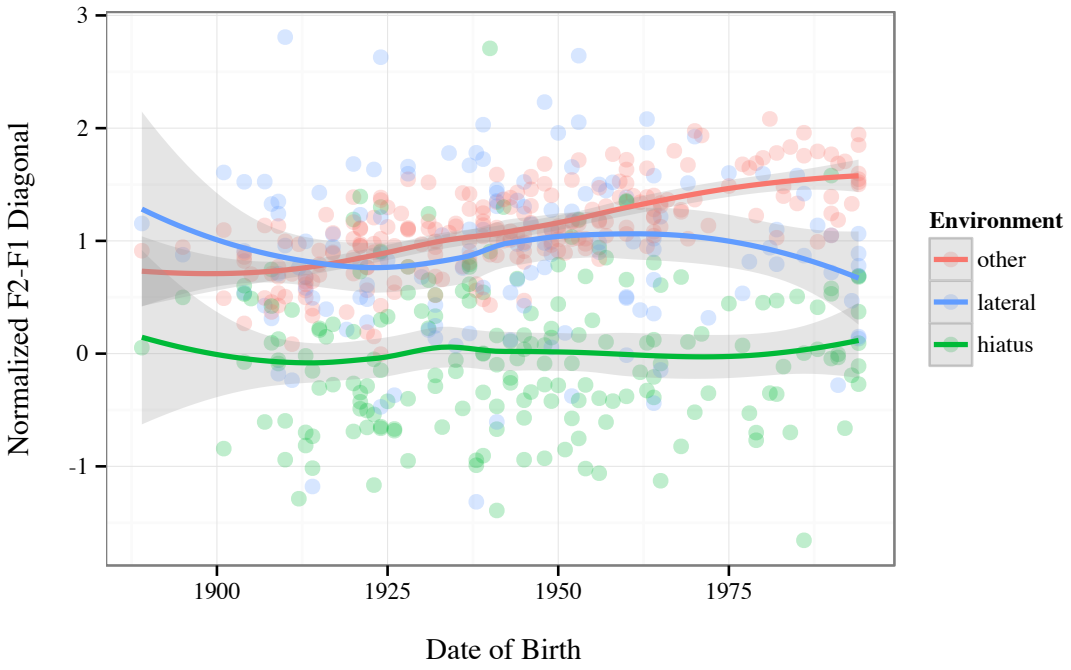


Figure 3.17: (eyC) by environment.

contextual effects, but no social differentiation. The results for (eyF) tell a different story, however. Most previous analysis of this vowel has found it to be stable, and thus focused on the change occurring in the (eyC) class (e.g., Labov 1994, Fruehwald 2011). Labov et al. (2013) report without further comment a "small but significant" raising of (eyF); unfortunately this remark is not accompanied by a description of the model used to obtain these results, and is thus difficult to interpret. Indeed a plot of the overall distribution of (eyF) data appears essentially flat as in Labov et al.'s Figure 10b, and date of birth on its own is not a significant predictor of (eyF) quality. However, Table 3.10 and Figure 3.18 show that there is a significant interaction between date of birth and education, which reveals that while the majority of Philadelphians have indeed remained stable on this variable, speakers with a national college education have begun to raise and front this allophone as well. Post-hoc multiple comparison reveals that the significance of this interaction is almost entirely due to the significant difference between high school and national college speakers ($p < .001$; see Appendix A.4, Table A.4 for full comparisons).[4]

The model shown in Table 3.10 is a significantly better fit than a model without the interaction term ($\chi^2_{df=3} = 18.5, p < .001$). An additional interaction between sex and education offers a slight improvement over this model ($\chi^2_{df=3} = 9.5, p = .02$), but this term does not seem to capture a meaningful pattern in the data. In general men have slightly more raised (eyF) than females; this interaction captures the fact that this pattern is mostly reversed for regional speakers, but the differences present between men and women within each education group are very small.

[4]N.B. the R function used to conduct these multiple comparisons does not handle interaction effects by default; contrast matrices for interactions must be specified manually, and this does not allow the option of using the Tukey HSD method. Thus the comparisons given here differ from those discussed elsewhere in this chapter, and may be relatively anti-conservative. See `http://stats.stackexchange.com/questions/43664` for more details.

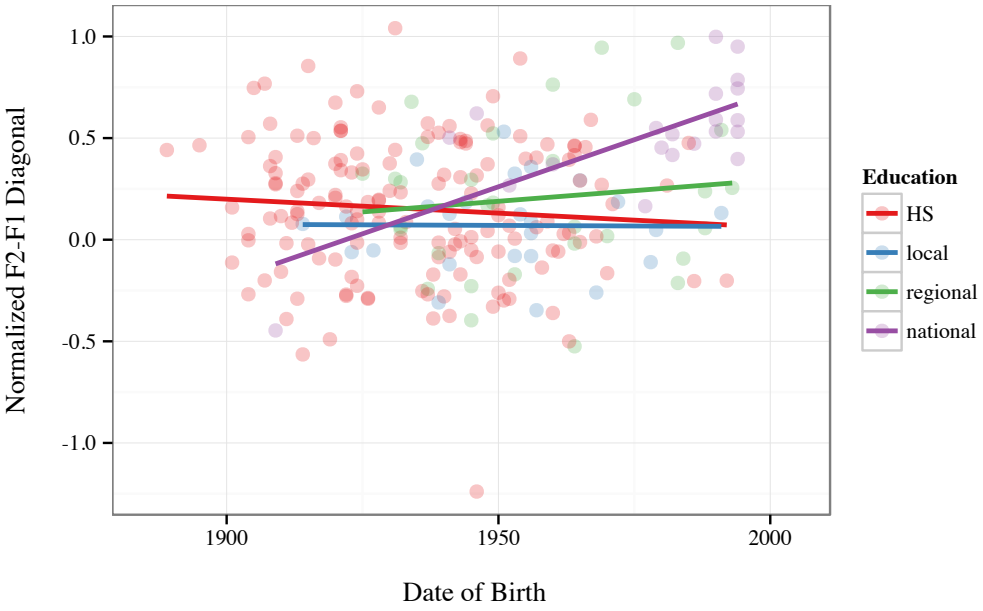


Figure 3.18: (eyF) by education group.

| | Estimate | S.E. | $p$-value | |
|---|---|---|---|---|
| (Intercept) | 3.20 | 0.10 | | |
| Duration | −0.63 | 0.02 | < .001 | *** |
| DOB | −0.09 | 0.03 | | |
| Male | 0.13 | 0.03 | < .001 | *** |
| Education: | | | | |
| Local | −0.09 | 0.06 | | |
| Regional | −0.05 | 0.06 | | |
| National | 0.04 | 0.10 | | |
| Education × DOB | | | < .001 | *** |
| Local:DOB | 0.05 | 0.07 | | |
| Regional:DOB | 0.15 | 0.06 | | |
| National:DOB | 0.28 | 0.07 | | |
| AIC: 16356, BIC: 16446, log $\mathcal{L}$: −8165 | | | | |

Table 3.10: (eyF) F2−F1 ∼ Education × scaled DOB + Sex + log Duration

### 3.2.7 (uw) fronting

The final variable examined here is also a change in progress, but it is a change occurring throughout the United States, not just in Philadelphia. Figure 3.19 plots (uw) after coronal consonants, (Tuw), by education group. When calculating these speaker means, pre-lateral tokens were excluded, since previous research has shown that neither (uw) allophone fronts before /l/ in Philadelphia (Labov 2001:476). There are relatively few tokens for this class (7,460 altogether), and a good deal of variance within each group, so we should not infer much from the regression lines plotted here.

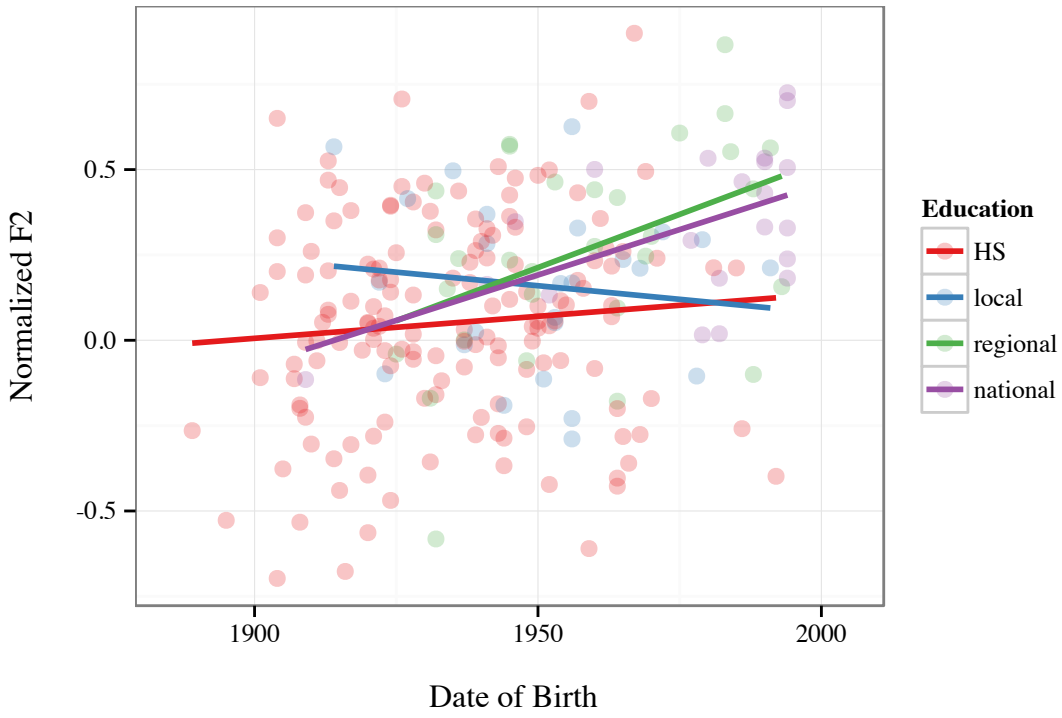


Figure 3.19: (Tuw) by education.

Modeling does confirm this pattern, however. Education is a significant predictor of (Tuw) frontness, and post-hoc multiple comparisons reveal a significant difference between the high school group and the regional and national college groups ($p < .01$), which are more fronted. The model given in Table 3.11 also shows significant effects

| | Estimate | S.E. | $p$-value | |
|---|---|---|---|---|
| (Intercept) | −1.178 | 0.107 | | |
| Duration | 0.185 | 0.015 | < .001 | *** |
| Manner | | | .001 | ** |
| DOB | 0.051 | 0.022 | .02 | * |
| Male | −0.131 | 0.035 | < .001 | *** |
| Education: | | | < .001 | *** |
| HS−Local | 0.063 | 0.057 | | |
| Local−Regional | 0.192 | 0.056 | | |
| Regional−National | 0.229 | 0.069 | | |
| AIC: 13365, BIC: 13476, log $\mathcal{L}$: −6666 | | | | |

Table 3.11: (Tuw) F2 ∼ scaled DOB + Sex + Education + log Duration + Manner

of sex (women have more front (Tuw) than men), duration (longer vowels are more front), and date of birth (becoming more front over time). Unsurprisingly, there is also a significant effect of manner of following segment, with pre-stop tokens relatively more front, and pre-lateral tokens relatively more back (reference level is *no following segment*; *affricate* and *rhotic* environments are not reported due to extremely low token counts). This confirms the earlier finding concerning pre-lateral tokens.

While (Tuw) has been fronting over time, the remainder of this vowel class, referred to as (Kuw), has remained more or less stable, as shown in Figure 3.20. There is no clear overall trend for this class, and while the college speakers may appear to be behaving differently than high school speakers, the linear fits here are poor, and based on even fewer tokens (4,312 in total, less than half of which are divided among the college groups). Mixed effects modeling finds the following significant effects, detailed in Table 3.12: sex, with men less fronted than women; duration, with longer tokens being less front; and manner, with tokens being more back before a following lateral. Interestingly, the best-fitting model also finds a significant effect of a polynomial of degree 2 for date of birth

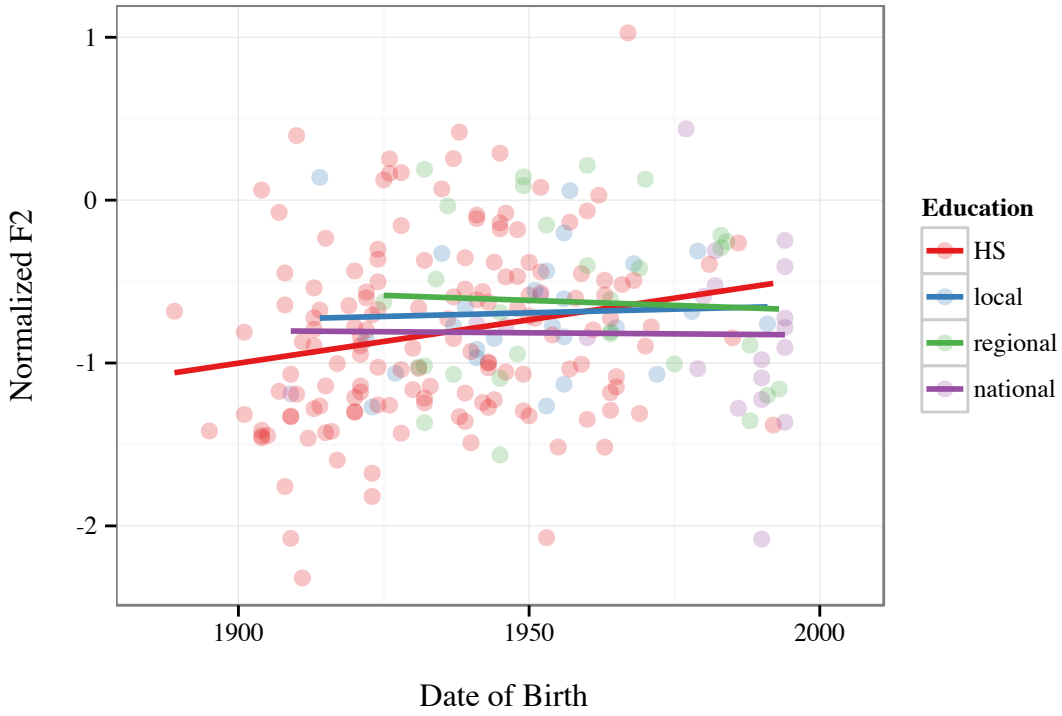


Figure 3.20: (Kuw) by education.

(plotted in Figure 3.21). This quadratic term indicates that there is a non-linear trend over time, in which (Kuw) becomes increasingly fronted until about 1950, and then reverses. The effect size of this reversal is medium ($d = .4$).[5] This fits with the findings of Labov et al. (2013:51), who attribute this reversal to a more general realignment of the Philadelphia system towards a northern pattern.

| | Estimate | S.E. | $p$-value | |
|---|---|---|---|---|
| (Intercept) | −0.003 | 0.136 | | |
| Duration | −0.169 | 0.022 | < .001 | *** |
| Manner | | | < .001 | *** |
| DOB (linear) | 0.843 | 2.204 | .006 | ** |
| DOB (quadratic) | −5.419 | 1.867 | | |
| Male | −0.107 | 0.050 | .032 | * |
| Education | | | .408 | |
| AIC: 8644, BIC: 8745, log $\mathcal{L}$: −4306 | | | | |

Table 3.12: (Kuw) F2 ∼ scaled DOB + Sex + Education + log Duration + Manner

However, there is another possible explanation for this reversal. The model in Table 3.12 and quadratic fit in Figure 3.21 both include pre-lateral tokens. The same model, run without lateral tokens, still shows a significant quadratic fit for date of birth ($p < .001$), but a much less dramatic reversal in the second half of the century. This fit is shown in Figure 3.22. The effect size of this reversal is quite small ($d = .1$).

Why would pre-lateral tokens have such an effect on the speaker means after 1950? There are two reasons. First, of the only 4,312 tokens of (Kuw) in this dataset, almost exactly one-third are in a pre-lateral context. Thus, pre-lateral tokens make up a much larger proportion of the data than they did for (Tuw), where only 1% of tokens were pre-lateral. Second, the effect of following manner on (Kuw) realization has not remained

[5] Effect size here was calculated as the difference between the maximum predicted value and the predicted value for the last date of birth, divided by the standard error of the residuals for that subset of values. This is an adaptation of Cohen's $d$ to model predictions; $d$ normally uses a standard deviation.

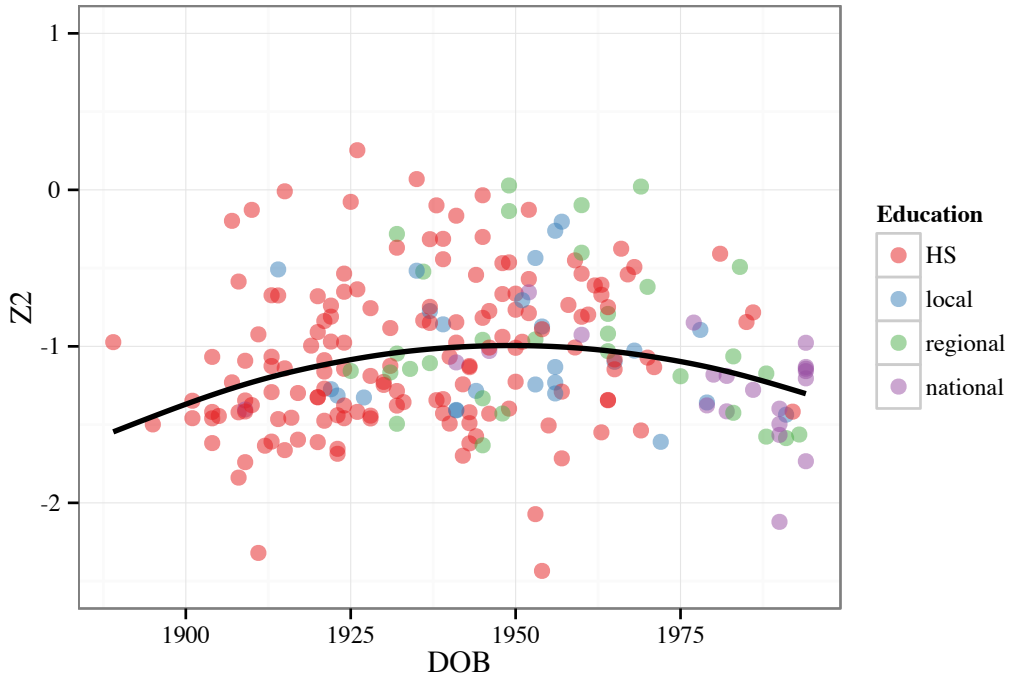


Figure 3.21: (Kuw) quadratic fit.

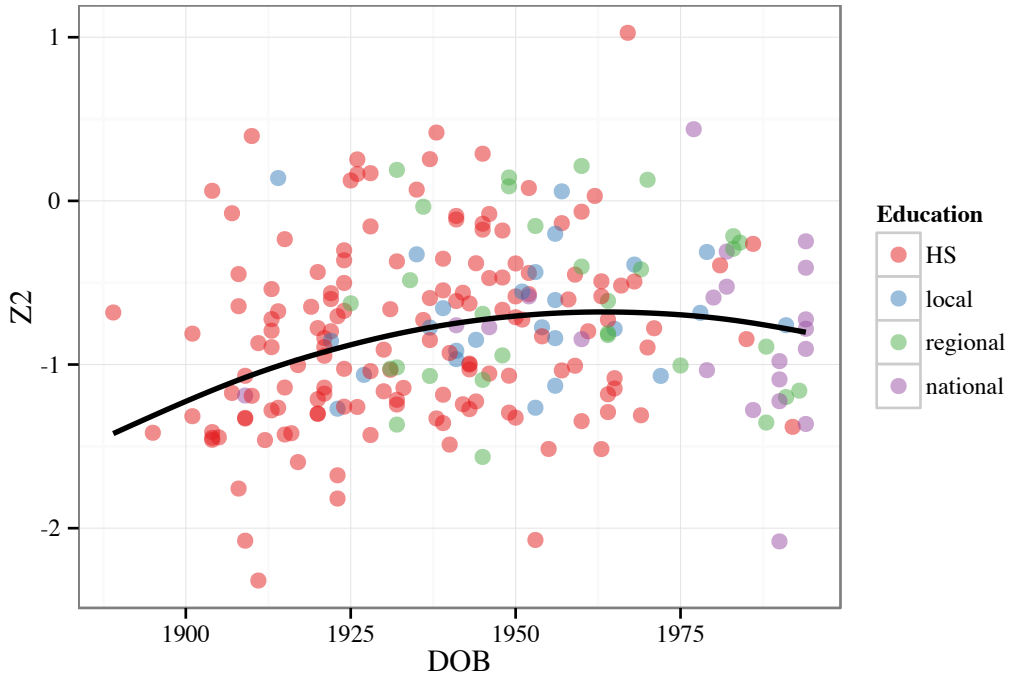


Figure 3.22: (Kuw) quadratic fit, without pre-lateral tokens.

steady over the time period under study. As Figure 3.23 shows, the gap between pre-lateral tokens and all other environments has widened over time, such that the latest speakers in the corpus have a larger difference between pre-lateral (Kuw) and elsewhere than the earliest speakers. Indeed, adding an interaction between date of birth and manner of following segment to the model in Table 3.12 results in a significant improvement in fit ($\chi^2_{df=10} = 138.7, p < .001$).

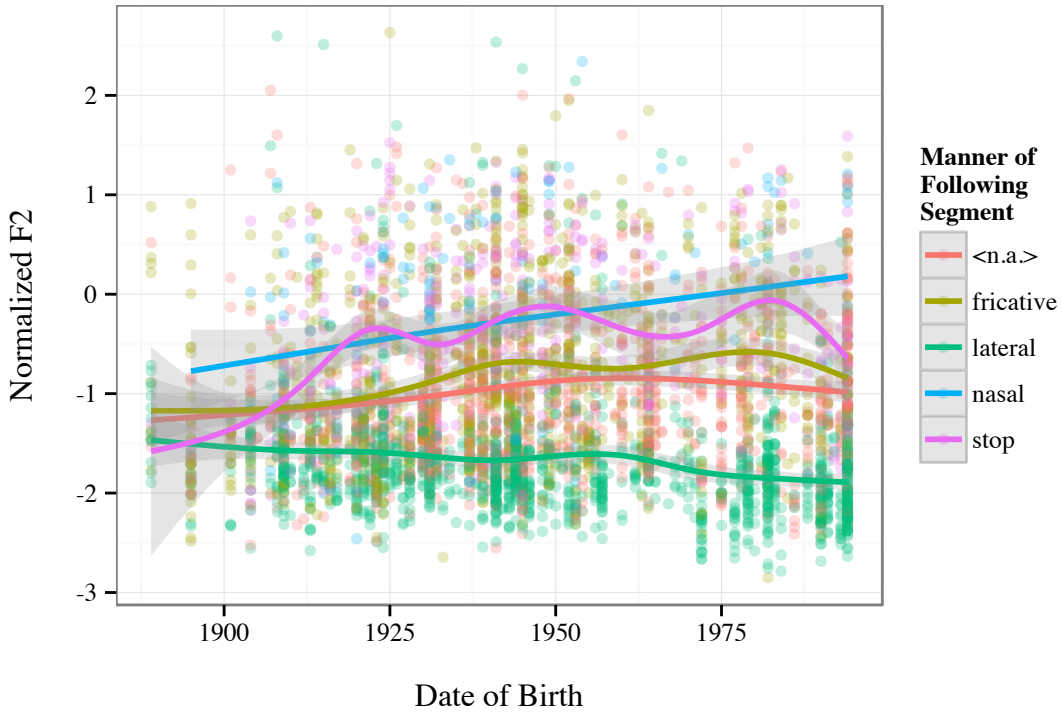


Figure 3.23: (Kuw) tokens by following manner, GAM curves.

Therefore, including lateral tokens in the speaker means in Figure 3.21 had the effect of artificially lowering the means for the most recent speakers, who have the most-fronted non-lateral (Kuw) and the least-fronted pre-lateral (Kuw).

## 3.3 Salience of the Philadelphia Dialect

We have seen that education is a significant predictor of the quality of some vowels in Philadelphia, but not others. How might we explain the fact that education does not have a uniform influence on the local vowel system? This section examines the extent to which the social salience of these vowels can explain why national university-education speakers do not show a wholesale retreat from the local system.

We are once again fortunate to have relevant data dating back to the 1970s. In addition to collecting sociolinguistic interviews, the LCV study used subjective reaction tests involving a "job suitability" measure to assess the social salience of (æh), (aw), (ay0), and (ow). A modified matched guise technique was employed, in which the guises participants listened to were produced by several different speakers who represented various points along a continuum of the phonetic productions found in Philadelphia. Each speaker produced two conditions: one containing a vowel variable, and a "zero" guise which contained no tokens of the variables. Participants were asked to indicate the highest possible job they thought the speaker could hold. This was measured on a seven-point scale ranging from "no job at all" to "television personality" (Labov 2001:207). The results indicate that listeners are quite sensitive in their ability to recognize local changes in progress, as they consistently downgraded the job suitability of speakers using advanced local forms of these vowels. Returning to the LCV results in their 2013 paper, Labov et al. note, "It appears that the Philadelphia community in the 1970s had developed a moderate degree of social awareness of the type 2 variables /aw/, /ow/, and /Kuw/, but a lower degree for /ay0/" (Labov et al. 2013:52).

In his 2005 dissertation, Jeff Conn updated the LCV subjective reaction tests for two variables, (ay0) and (aw). Returning to a more traditional matched guise methodology, Conn's stimuli were produced by two Philadelphians with sufficient linguistic training to

perform tokens of (ay0) and (aw) which varied in their extremity. These guises were rated by participants on four scales: job suitability, friendliness, toughness, and masculinity. There were no significant results for (aw), and the results for (ay0) differed according to whether the guise was male or female. The female speaker's "extreme Philadelphia" guise was rated lower in job suitability, while the male speaker's extreme guise was rated higher on toughness and masculinity. The "friendliness" scale produced no interesting results, perhaps indicating that it is not a relevant characteristic for these variables.

Returning to the (æh) variable, we know from more recent work (Labov et al. 2013, IHELP) that young Philadelphians are increasingly switching to the nasal short-*a* system. This change is associated with national universities, and potentially even the type of high school attended, with students who went to elite private and magnet schools showing the change by the time they reach college. Work by Betsy Sneller reveals that this change may be driven by social salience, as she finds the nasal short-*a* system is rated more favorably overall in a subjective reaction test than the Philadelphia short-*a* system. Sneller conducted a modified Magnitude Estimation task to test whether speakers limit their social judgements to particular lexical items or phonetic conditions, or are sensitive to an entire phonological subsystem. Specifically, she examined whether Philadelphians' (negative) judgements of short-*a* are limited to particular stereotypical contexts, or are consistent across the system. Sliding-scale responses to 89 stimuli were collected from 80 Philadelphians, who were asked to rate how "well pronounced" the words sounded (Sneller 2015:22). The stimuli included short-*a* in a full range of phonetic contexts, as well as filler words containing other vowels. The short-*a* tokens were produced in both a tense and a lax form by Sneller, a trained phonetician and native Northern Cities Shift speaker, and in three different test conditions: nasal system (tense before nasals, lax elsewhere), Philadelphia system (see previous chapter for description), and neither system (lax in nasal and Philadelphia tense conditions, tense elsewhere). Ratings were z-scored

before analysis.

Sneller concludes that this isn't actually an either/or situation—speakers' judgements are dependent upon *both* phonetic conditioning factors and their knowledge of an entire short-*a* system. This is based upon the following findings. We know from previous studies (Labov 1989, Kroch 1995:11) that tense short-*a* tokens are stigmatized in Philadelphia. However, Sneller's study reveals that actually only certain tense tokens are rated poorly—namely, the Philadelphia-specific tensing environments. When presented with tense tokens that also adhere to the nasal system, participants rate these tokens highly, suggesting that the nasal system as a whole is perceived positively, and participants are not simply responding negatively to any phonetic tenseness. Conversely, Philadelphia-specific laxing environments were rated favorably, demonstrating that the low ratings for Philadelphia-specific tense tokens are the result of social judgement attached to specific phonetic conditions. Finally, Sneller found that participants rated poorly any tokens that adhered to neither system, again reinforcing the idea that speakers rely on their knowledge of short-*a* systems as a whole in making these judgements.

These findings can be interpreted as showing that speakers face several decision points when evaluating these tokens: First, is the token well-formed in a local short-*a* system? If not, it is rated low. Second, does the token conform to the nasal system, or the Philadelphia system? If it conforms to the nasal system, it is rated high. Finally, if it only conforms to the Philadelphia system, is it a tense or lax token? Philadelphia tense tokens are rated low, while lax tokens are rated high. The crucial take-away here is that the first two decisions are made at the level of the *phonological system*, while the last is a question of *phonetic quality*. Since this work was conducted entirely with Philadelphians, it focused on only the two systems present in the city. It would be instructive in future work to see whether local participants have any knowledge of the Northern Cities Shift short-*a* pattern, to tease apart whether or not the "out of system" tense tokens are rated poorly because the NCS

isn't recognized as an available short-*a* pattern, or whether they're downvoted because the NCS is recognized, and has a negative social evaluation.

From the results of these subjective reaction tests we can conclude that Philadelphians hold a clear set of unconscious biases towards certain local variables—speakers using the traditional pronunciations of (æh), (aw), (ow), (Kuw), and to a lesser extent, (ay0), have been rated less favorably in these studies. To what extent are Philadelphians consciously aware of these biases, such that certain speakers may be motivated to modify their speech?

## 3.4 On attitudes and short-*a* systems

In addition to the rich linguistic data the IHELP project has collected over the past two years, we now have access to a wealth of information about the current generation's attitudes towards their local dialect, as a portion of each interview contained explicit questions about the interviewee's awareness of and opinions about the Philadelphia dialect. These young Philadelphians gave candid descriptions of the most stereotypical local features and their feelings about them. Selecting six speakers from the IHELP dataset, this section pairs their opinions about the Philadelphia dialect with plots of their short-*a* system, to demonstrate the degree to which their production of this negatively-evaluated variable aligns with their expressed attitudes. Pillai scores are also used to indicate each speaker's conformity to either the split or nasal system, with Pillai scores closer to zero indicating a low degree of conformity and scores closer to one indicating high conformity (see Fisher et al. 2015 on the use of this score).

### 3.4.1 Aaron S.

Aaron S. graduated from a Catholic high school in Chestnut Hill, and currently attends the University of Pennsylvania. While he was born and raised in Philadelphia, his parents

are both from northern Pennsylvania, and he doesn't have any relatives who live nearby. He also doesn't seem very tied to the city, as the kids he was friends with in high school were mostly from the Main Line (i.e., the suburbs) rather than from Philadelphia proper. In response to the interview questions regarding awareness of and attitude towards the Philadelphia dialect, he says he thinks "the hard Philadelphia accent is a minus", and goes on to describe how the accent might influence the way he perceives people:

> **Interviewer**: Is there anything about the way that you talk or part of your accent that you've ever tried to change?
>
> **Aaron**: No, I mean, I've always tried to stay away from the Philadelphia accent, I guess. <laughs>
>
> **Interviewer**: So if you met someone with a Philadelphia accent, you would notice it.
>
> **Aaron**: Yeah definitely.
>
> **Interviewer**: Would it influence your opinion of them at all?
>
> **Aaron**: I guess first impressions to be honest, yeah. Um. 'Cause I mean, Philadelphia's…most people from like inner-city Philadelphia are like—low, like low socio-economic status.

For Aaron, a strong Philadelphia accent is a negative, associated with the inner city and low social status. This negative opinion of the local dialect is certainly reflected in Aaron's short-*a* system: he shows no trace of the traditional split system (a Pillai score of only .03), instead producing the near-perfect nasal system (Pillai score of .67), seen in Figure 3.24.

### 3.4.2 Maxine F.

Maxine F's educational background is nearly identical to Aaron S. She attended a Catholic high school and is now a student at the University of Pennsylvania. She is from the Mt.

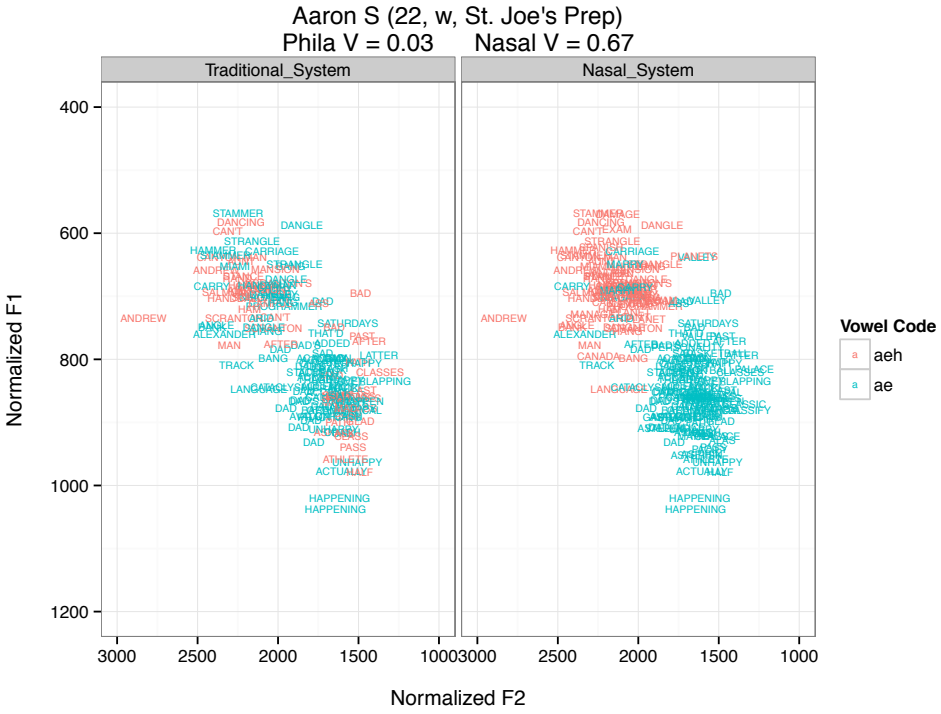


Figure 3.24: Short-*a* system of Aaron S., with Pillai scores.

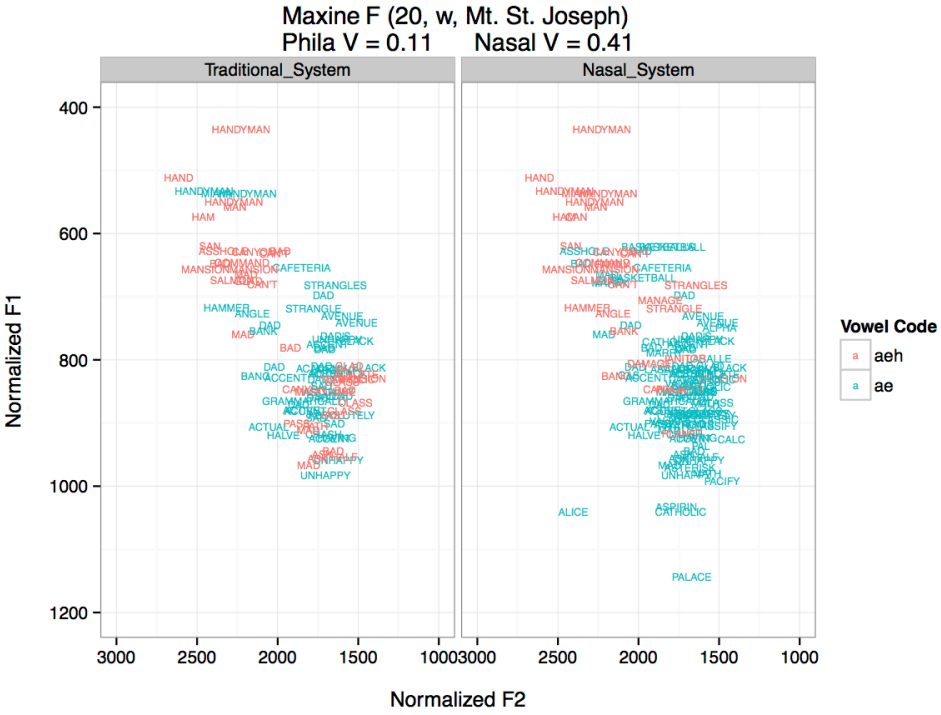


Figure 3.25: Short-*a* system of Maxine F., with Pillai scores.

Airy/Germantown neighborhood, but says that she had no close friends in her neighborhood, and her closest school friends went to college outside of Philly. From her interview, it is clear that she has a negative perception of the Philadelphia accent:

> **Interviewer**: Um, do you actually—do you wanna tell me what you were telling me earlier? About how you say that changed your—how you talk, when you came to college.
>
> **Maxine**: I used to say "mad", "bad", "basketball" [with tense (æh) vowel]
>
> **Interviewer**: And you stopped it like purposefully? When?
>
> **Maxine**: Um, I think, like, almost immediately. Because, like, I think it makes you sound super unintelligent.

It is telling that she specifically relates the Philadelphia accent to a lack of intelligence—a crucial trait for any individual seeking higher education at a national university to display. Nor is she the only IHELP interviewee who explicitly linked sounding educated with not sounding Philadelphian. Given that Maxine associates the Philadelphia accent with unintelligence and specifically mentions that she has made a conscious effort to correct her tense short-*a*, it is unsurprising that her short-*a* system in Figure 3.25, while not perfect, is more clearly a nasal split than Philadelphian.

### 3.4.3 Holly D.

Holly D. is a 19-year-old currently attending Kenyon college, who graduated from an elite Quaker high school. Her short-*a* system, shown in Figure 3.26, is the most clearly split nasal system found in the IHELP corpus to date, and her views on the Philadelphia accent are no less clear:

> **Interviewer**: Do you think a Philadelphia accent is seen as a positive or negative thing?
>
> **Holly**: Negative.

**Interviewer**: How do you see it? Like if you heard someone with a really thick accent, what would you think?

**Holly**: It's an ugly accent. <laughs>

**Interviewer**: Do people at your campus know where you're from? Based on the way you talk, or just, they know.

**Holly**: They know, but they also notice differences in the way I talk.

...

**Interviewer**: What do you think makes a Philadelphia accent?

**Holly Dawson**: There's something with the vowels. They're like kind of flat.

**Interviewer**: All vowels or just specific ones.

**Holly**: **Mostly A's I guess**.

Mostly A's indeed. Since Holly has a negative perception of the local accent, commentary from her peers at college likely reinforces this perception, leading to the perfect nasal system (Pillai=0.76) shown in Figure 3.26.

While these three national university students all display clear negative attitudes towards the Philadelphia dialect, expressed both in what they say and how they say it, not all young Philadelphians feel the same way. The following three students represent the opposite end of the spectrum.

### 3.4.4 Jerry P.

22-year-old Jerry P. grew up in Fishtown, attended an elite magnet high school, and went on to college at a regional school, Temple University. While he seems quite aware of his Philadelphia accent—others have pointed it out to him, like the time his manager noticed his tense short-*a* in *Comcast*—he notes that he isn't trying to change it. When asked what distinguishes the local accent, he gives the example of r-vocalization in *Charlie*. He also mimics extreme pronunciations of *toss* (oh), *right* (ay0), *boat*, and *home* (ow), making him

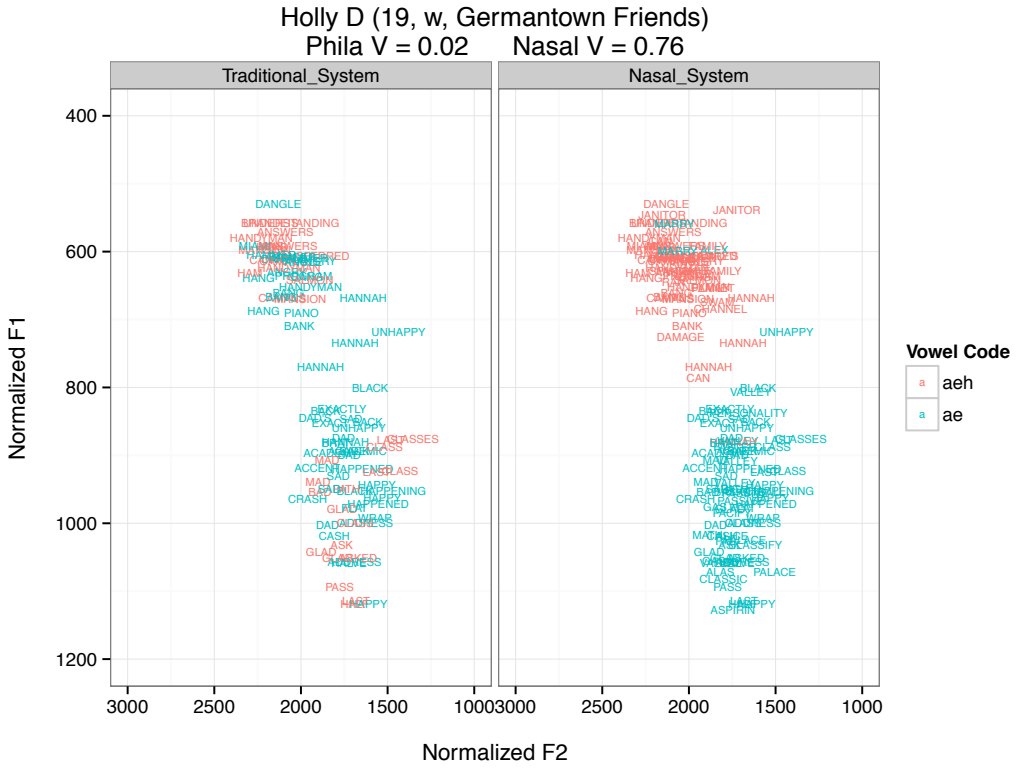


Figure 3.26: Short-*a* system of Holly D., with Pillai scores.

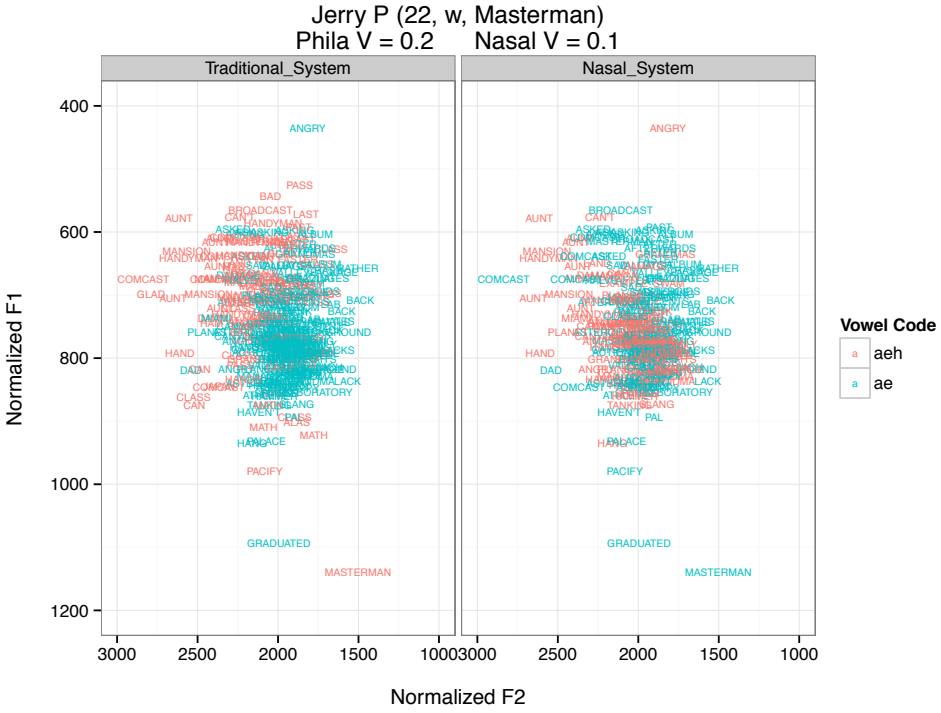


Figure 3.27: Short-*a* system of Jerry P., with Pillai scores.

perhaps the most linguistically-aware individual interviewed to date.

> **Jerry**: [the people he works with said] "you totally have a Philly accent!" and I'm like "You know what? It's—Yes I do. I'm not ashamed of it."

True to his word, Jerry hasn't tried to change his accent—his short-*a* system, while heavily overlapping, is still clearly more Philadelphia than nasal.

### 3.4.5 Jake S.

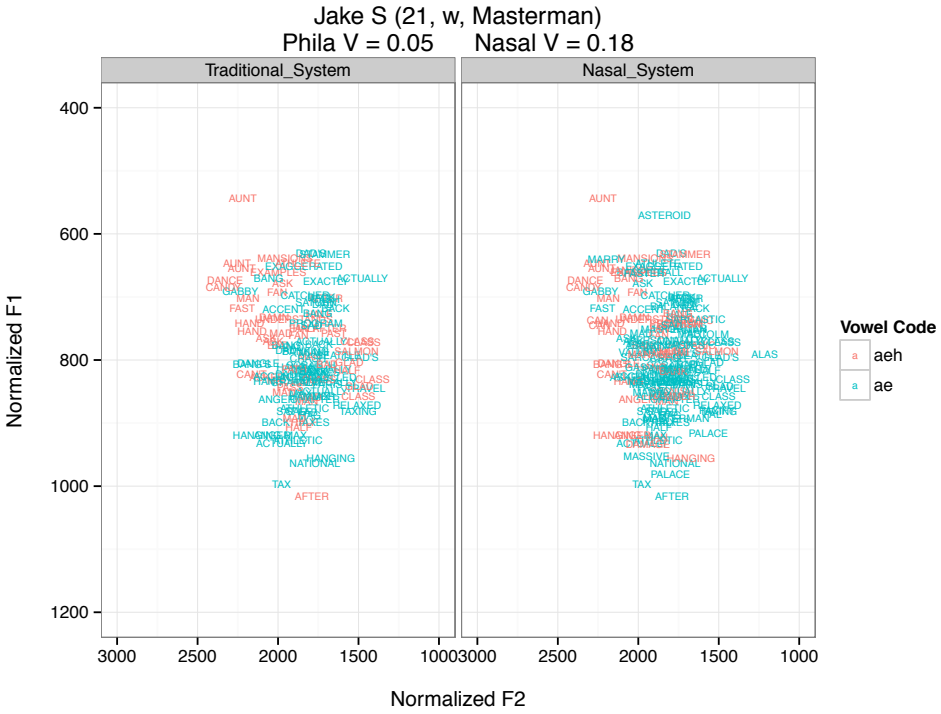


Figure 3.28: Short-*a* system of Jake S., with Pillai scores.

Jake S. meanwhile attended the same magnet school as Jerry P., but continued on to the University of Pennsylvania. Unlike Jerry, he shows no particular awareness of the phonetic features of the local dialect. When asked, he only gives examples of local lexical items—*water, jimmies, hoagies*—which he says people joke about but not really in a negative way. He's never tried to change anything about his accent, and doesn't express

any strong attitudes about it at all. His short-*a* system is equally un-opinionated, showing a completely overlapping distribution which is neither a Philadelphia nor a nasal split.

### 3.4.6 Katrina C.

Finally, at the extreme end of positivity is Katrina C., who attended a Catholic high school and is currently a student at La Salle University, a local school:

> **Interviewer**: The last couple things. So has anyone—you said before that people like who don't know you—do they pick up that you're from Philadelphia? Do—what do they notice? I know you mentioned a little bit before.
>
> **Katrina**: Those little things they'll pick up and be like "what?" Like just the way we say different words I think is is something they pick up on.
>
> **Interviewer**: So from their point of view, do you think they view your accent as like a plus or a minus?
>
> **Katrina**: To be honest, I think the Philadelphia accent is seen as like something that's not eloquent and not…I don't know. It's viewed as like a negative.
>
> **Interviewer**: So what about, like, from your own point of view. Do you view your accent as a plus or a minus?
>
> **Katrina**: I love my accent! I think it's a plus. I'm very like—I think it's cool. I'm like, I have an accent, like that's awesome.
>
> **Interviewer**: And you said La Salle's mostly Philly, so like when you meet people on campus um that don't, like do they like…do they know where you're from? Or like do they pick up—they don't usually pick up on accents 'cause it's in—
>
> **Katrina**: Um. Yeah, I mean, unless they're from like farther away.
>
> **Interviewer**: And so um, is there any part of your accent that you've ever tried to change?
>
> **Katrina**: No, I wouldn't want to change it. I love it. <laughs>

In spite of the awareness that other people view the Philadelphia accent negatively, Katrina loves her accent, and has the traditional split short-*a* system to prove it (Figure 3.29

shows a Pillai of 0.31 for the traditional system, versus 0.04 for the nasal system).

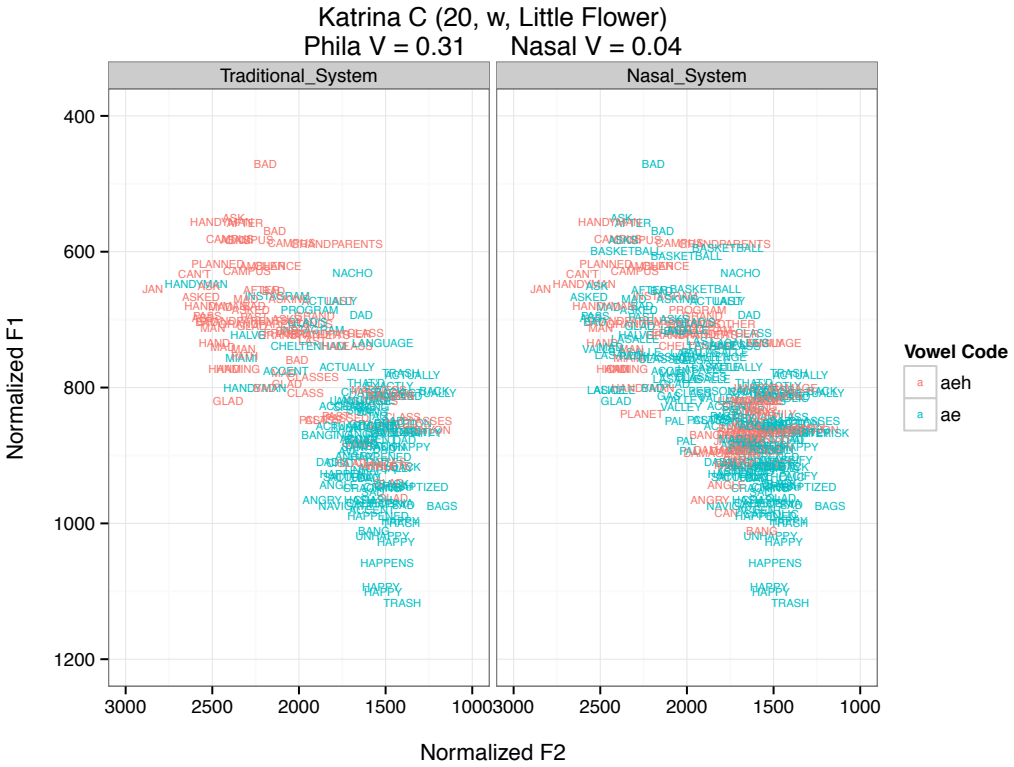


Figure 3.29: Short-*a* system of Katrina C., with Pillai scores.

These three students stand in contrast to the first three presented, and indicate that awareness does not necessitate retreat from the local dialect. While evidence from six students does not constitute a complete argument, I think that the nuanced relationship between speaker attitudes and their use of stereotyped local features bears further investigation, and may provide an explanation for why most national university students show a strong retreat from negatively-evaluated local features, but a few do not.

## 3.5 Summary

The results presented in this chapter demonstrate that the changes in the Philadelphia vowel system over the course of the past century are reflective of a complex set of inter-

actions between both social and linguistic factors. Most of the vowel variables studied showed some effect of education, as measured by the four-level index, and many were best described by an interaction of education with one or more other variables.

The variables (æh), (aw), and (ow) displayed the most complex interactions; all showed a significant interaction between education and date of birth, with high school and local college speakers continuing to increment the raising/fronting of the vowel over time while other college-educated speakers began to move in the opposite direction. They also display an interaction between education and sex: in the case of (æh), regional and national college women led the change away from the traditional split system, while high school and local college women led the raising of the traditional (æh) class; in the case of (aw) and (ow), high school and local women led the traditional trajectory, and there were no apparent sex differences among the regional and national college speakers. Finally, both vowels are affected by the presence of a following nasal, and the effect differs by education group. For (æh) this effect follows naturally from Labov et al.'s (2013) finding that national college students are adopting the nasal short-*a* system; it is less clear how to interpret this effect for (aw).

Education was also a significant predictor in the lowering of (oh). All education groups have begun to lower this vowel to some extent, but regional and national speakers are clearly leading this reversal. For the fronting of (Tuw), a significant effect of education showed that regional and national speakers have more fronted realizations of this vowel.

Education did not prove to be a significant factor in the raising of (ay0), (eyC), or changes in (Kuw). The apparent reversal of (Kuw) reported by Labov et al. 2013 was shown to be largely the result of more subtle changes in the phonetic effects of lateral versus non-lateral environments. This study also followed up on the changing role of sex in (ay0) raising, confirming previous findings by Labov and Conn, and suggesting that Conn's findings were indicative of an ongoing reversal in the pattern—men on average

now have a lower (ay0) realization than women, the reverse of the pattern found in the 1970s.

Finally, this analysis has uncovered one previously-unnoticed change in progress: the raising of (eyF) by national college speakers. While previous analyses of this variable have found it to be stable, or only slightly raising, Figure 3.18 showed that national college speakers as a group are raising this vowel, while other speakers have remained stable.

Between the formal perception studies and the anecdotal attitude data discussed above, it is clear that certain features of the Philadelphia dialect are associated with very strong negative stereotypes. The LCV studies showed us that the Philadelphian pronunciation of (æh), (aw), (ow), and (ay0) are viewed negatively; Conn's work supports this finding for (ay0), while Sneller's supports this for (æh). Furthermore, the attitudes expressed in the IHELP interviews reveal that Philadelphians are very aware of the negative views of their dialect, specifically calling out the (æh), (oh), (ow), and (ay0) vowels. It cannot be mere coincidence that these are also the same features which students attending regional and national universities have begun to avoid, even while they still produce completely local pronunciations for (ey) and (uw).

# Chapter 4

# Raleigh

While the Philadelphia Corpus has been a fruitful testing ground for the development of this new education classification schema, it offers limited room to explore the effect of education on the structure of the vowel system as a whole. With the exceptions of the reorganization of the short-*a* system and the potential for future low-back merger, the vowels in retreat in Philadelphia form relatively isolated changes in the surface phonetics, with no apparent consequences presently for the larger structure of the local vowel system. In some cases, it is not even clear that the entire speech community is participating in the retreat so much as a highly educated subset is parting ways with the local dialect. Therefore a different source of data must be found in order to fully investigate the question of education's interaction with linguistic embedding. The Southern dialect is a good candidate since its defining feature is a chain shift, necessarily a series of interconnected changes in the structure of the vowel system. It is also an excellent testing ground for questions of social embedding, since Southern dialect features are known to provoke strong social evaluation. The second component of this dissertation, then, is a study of Raleigh, NC which investigates the interaction between higher education and the reversal of the Southern Vowel Shift (SVS).

## 4.1 The Southern Dialect

Linguistically, Raleigh is part of the Southern dialect region, historically participating in the Southern Vowel Shift (SVS) and other associated changes. The distinctive series of changes in the front vowel system, diagrammed in Figure 4.1, is thought to be triggered by the monophthongization of (ay), a change which leaves a gap in the system of long upgliding vowels to be subsequently filled by the lowering of (ey), and so on in a more or less pull-chain fashion. This shift has been found in its complete form only in an inner core of the South, called the *Inland South* in the Atlas of North American English (ANAE; Labov et al. 2006). One of the first studies to find this complete shift was Crawford Feagin's (1979, 1986) work in Anniston, Alabama, where she found that women and the working class were leading the change.

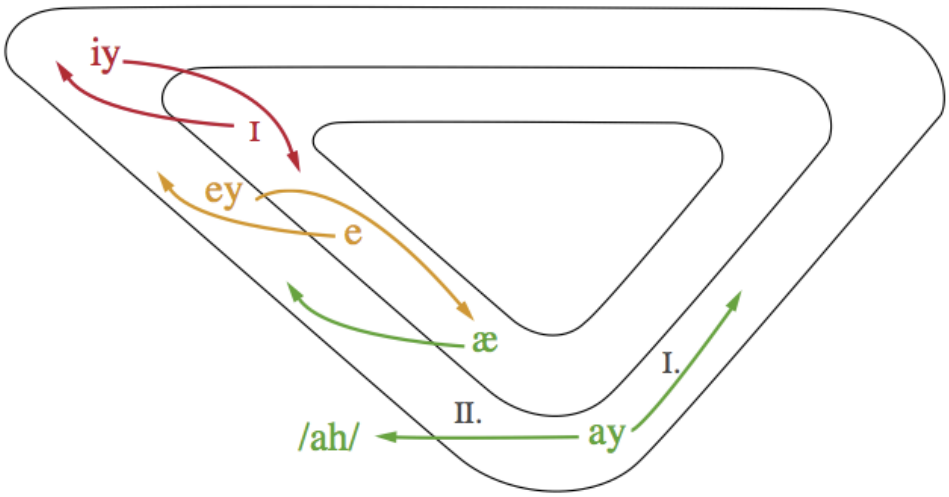


Figure 4.1: The Southern Vowel Shift (Labov et al. 2006:244).

In the previous chapter, we saw that many of the vowels which showed stratification by education had a clear negative evaluation within the local community. A study of Raleigh provides an interesting complement to the Philadelphia study, in that there is national-level awareness of the Southern dialect as a *whole* in a way that is not present

for the Philadelphia dialect. It is widely recognized that Southern-accented speech is stigmatized, and easily the most recognizable feature of Southern speech is the (ay) monophthong at the heart of the Southern Shift. I have observed the salience of this feature firsthand during past fieldwork in Atlanta, GA (Prichard 2010), and the current received wisdom in sociolinguistics agrees. For instance, Fridland (2012:184) states that "/ay/ monophthongization is somewhat of a shibboleth in Southern Speech, as its use is subject to overt commentary unlike other aspects of the vowel shifts described above", while Plichta and Preston (2005:107) assert that "there is no doubt that (ay) monophthongization is one of the principal caricatures of US speech."

Research in phonetic perception suggests that beyond the iconic (ay) monophthong, it is the front vowels generally that are most recognizably Southern (e.g., Heaton 2012). For example, Fridland et al. (2004) conducted a study in which participants from Memphis, TN were presented with pairs of tokens, one resynthesized to sound more Southern and the other more Northern, and were asked to pick out which was the Southern token. Participants picked the correct (ey) token on average 84% of the time, by far the most accurately-identified vowel. Fridland et al. explain their results in relation to the specific linguistic characteristics of Memphis; for example, while (iy) and (i) reversal is also markedly Southern, this stage of the shift is not found in Memphis, and so has less local salience than (ey) and (e) reversal to Memphians identifying Southern speech.

Fridland et al. extend this work in their 2005 paper to examine the social significance of these perceptually salient vowels. They found that participants who were presented with a mix of resynthesized stimuli recognized the (ey) and (ow) tokens as Southern with the highest degree of accuracy. These two vowels were also rated significantly lower on *competence* (education) and *solidarity* (pleasantness) scales than the other vowels studied (*e* and *uw*). These results are interesting, as they show that social evaluation can attach to individual vowel productions, rather than an entire system. As the authors note (378),

"such results begin to point to a more subtle evaluatory process at work, one that appears to relate "Southern" salience scales for each vowel class to education and pleasantness evaluations." So while peripheral (e) and centralized (ey) are equally characteristic of Southern speech, in this study an unequal social salience resulted in unequal social evaluation.

While Southern, Raleigh is not part of the Inland South, and so never reached the full extreme of the SVS found in Alabama and elsewhere. Rather, its realization of the SVS is more akin to that found by Fridland (1999, 2001, 2003) in Memphis, Tennessee, where a high rate of (ay) monophthongization and some mid-front vowel reversal was found, but even those features were retreating in young speakers. My own work in Atlanta, Georgia (Prichard 2010) found essentially the same pattern; the oldest generation shows conditioned (ay) monophthongization and some mid-front vowel shifting, while the youngest generation has neither. All generations, however, have robust back-vowel fronting which does not appear to be structurally connected to the SVS.

Dodsworth and Kohn (2012) frame the linguistic situation in Raleigh in terms of dialect levelling, testing whether the predictions of Trudgill's (1998) three-stage model are borne out. Specifically, they examine whether the first generation born after the influx of Northerners into the Research Triangle in the 1960s show a higher level of inter- and intra-speaker variability than later generations, as predicted by Trudgill's model. The corpus they collected details a complete reversal of the SVS; the oldest speakers show a robust second-stage SVS, comparable to the degree of shifting found in Memphis, while the youngest speakers show little trace of this system. They do not however find evidence that this reversal proceeded along the lines suggested by Trudgill; intra-speaker variance steadily decreases for all vowels over time, while inter-speaker variance remains low and relatively constant across generations. The authors suggest that the shift away from the SVS occurred more quickly and with lower variance than Trudgill's model predicts due to the close and sustained contact between native Raleigh speakers and incoming North-

erners.

In a follow-up paper, Dodsworth (2013) more closely examines the social factors involved in the reversal of the SVS in Raleigh, finding a remarkable community uniformity—date of birth is by far the most consistent and significant factor, followed by occupation: speakers in professional occupations show the most advanced retreat. The effects of neighborhood, sex, and parents' occupation were not as strong, and were not consistent among the front vowels. So while some social factors matter, they may not make as much difference in Raleigh as they did in Philadelphia. Continuing this line of research, Dodsworth has since focused on the role dialect contact within the school system played in the spread of the SVS reversal, modelling school-centered social networks in a 2014 paper. In this paper, Dodsworth uses a one-mode network model to estimate a speaker's *nestedness*, or how densely connected they are to other speakers in the corpus via shared school background. Nestedness was then used as a predictor of speakers' participation in the SVS, with the result that for three of the five vowels (*iy*, *i*, and *e*), a greater degree of nestedness was associated with a more advanced retreat from SVS features. This supports the general hypothesis that greater exposure to incoming Northern norms increases a speaker's likeliness to have less Southern vowel features, as the less densely connected and more geographically peripheral speakers tended to have more conservative systems.

Further research in Raleigh and North Carolina more generally has examined the interplay between the SVS, ethnicity, and adolescent speech (e.g., Dodsworth and Kohn 2009, Kohn and Farrington 2013, Risdal and Kohn 2013). This chapter will add to the body of previous research by focusing specifically on the role higher education may play in the reversal of the SVS in Raleigh. The primary hypothesis tested here is that since (ay)-monophthongization is one of the most socially-salient Southern features, it is subject to overt correction in the same way that Philadelphia tense (oh) is. However, correcting away from monophthongal (ay) carries potential implications for the rest of the vowel

system, as it has been proposed as the triggering event for the SVS (Labov et al. 2006). If speakers correct their (ay), how will that affect the other front vowel changes which are dependent upon it? Will it trigger a reversal of the pull-chain, or will we see a correction of (ay) alone which obscures the initial impetus for the (perhaps) less salient reversals of the mid and high vowels? Given the results of the previous perception studies outlined above, it will be of particular interest to see whether the varying degrees of social salience and evaluation of the SVS vowels will be reflected in an education-stratified retreat from the shifted forms.

The front vowels, then, will be investigated in Raleigh as those most likely to be subject to social evaluation, and therefore linguistic correction. As in the Philadelphia study, some features which are perhaps less likely to be subject to socially-motivated correction will be examined for comparison. Of the many other characteristic Southern features listed in the ANAE (240f.), the following are also known to be present in Raleigh and will be examined here:

- Fronted (uw), (ow), and (aw).
- Upgliding (oh) and distinction from (o).
- Southern breaking in (æ).

## 4.2 Results

### 4.2.1 SVS stage 1: (ay)

The first vowel examined is the iconic (ay). Traditionally this vowel has been monophthongal, with a weak or absent upglide, but only when followed by a voiced consonant, as in *five*, *side*. Figure 4.2 shows an averaged (ay) nucleus-glide trajectory for each speaker in the corpus in normalized F1, F2 space, facetted by education and colored by date of birth.

There is a clear difference between the pre-voiced and pre-voiceless environments,

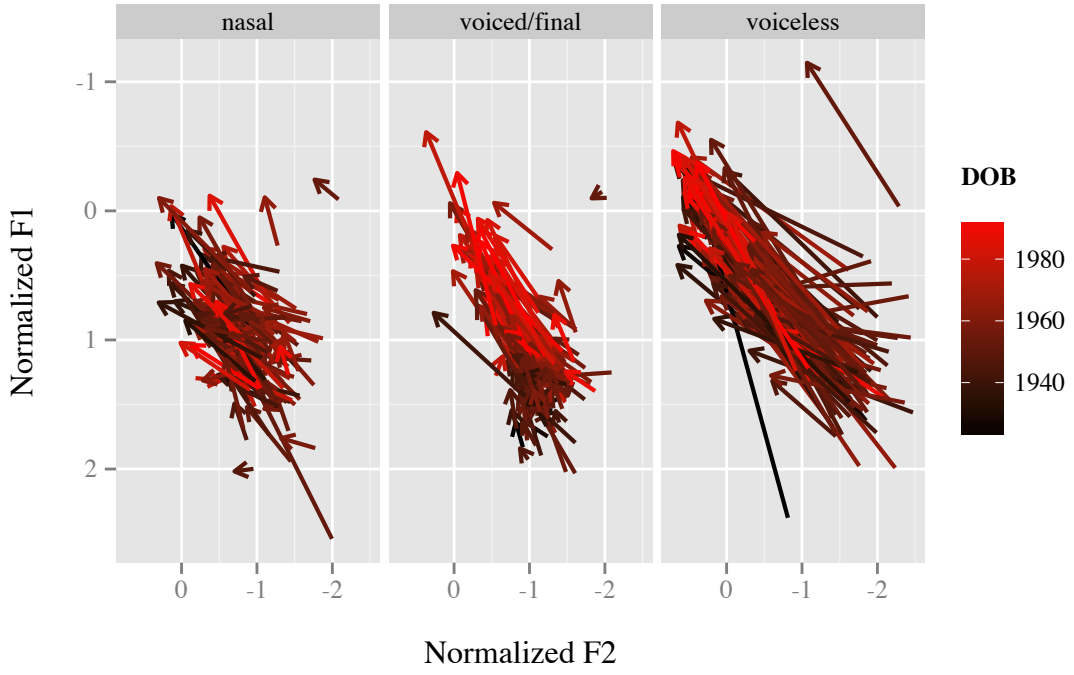


Figure 4.2: (ay) trajectory by date of birth, following segment condition.

with the shorter pre-voiced trajectories reflecting the monophthongization condition in Raleigh. Older speakers frequently have very short glide trajectories in pre-voiced environments, while the youngest speakers have a robust upgliding diphthong in both conditions, as well as a somewhat raised and fronted nucleus relative to older speakers. Figure 4.3 shows this nucleus change in the diagonal dimension, where it can be seen that all education groups have raised and fronted the midpoint of (ay) over time (we presume; again there is no data for high school speakers after about 1960). National speakers appear to be ahead of the curve at mid-century, with regional speakers swiftly catching up.

The results of mixed-effects modelling shown in Table 4.1 emphasize the effect of birth year on (ay) production, showing a significant quadratic effect. The education effect is also significant, and its factor coefficients show the expected directionality, with the national group the most raised along the diagonal. There is also an effect of following segment voice; as expected due to Raleigh's (ay) monophthongization conditioning, the pre-voiced

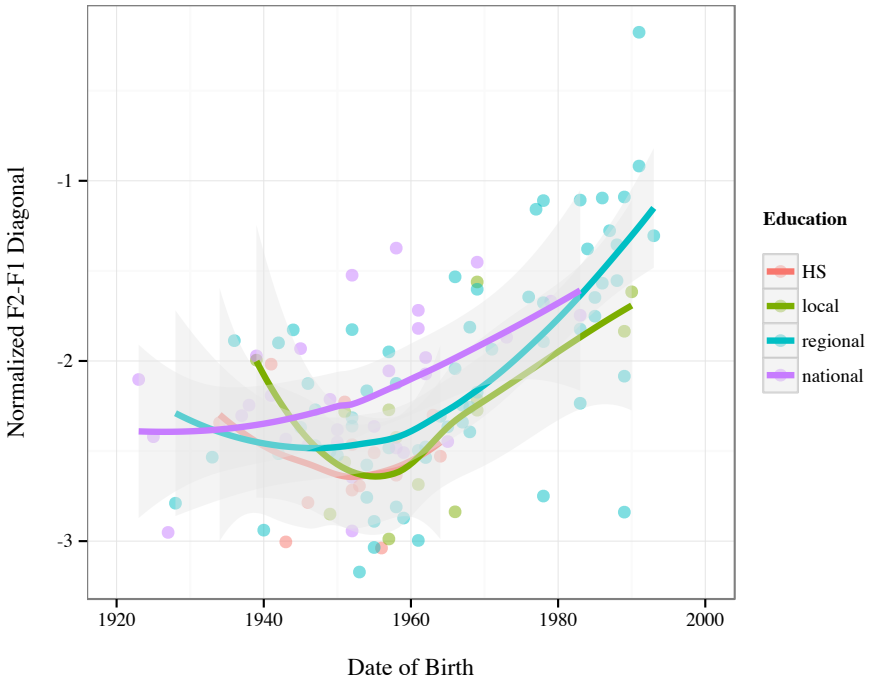


Figure 4.3: (ay) nucleus by date of birth.

| | Estimate | S. E. | $p$-value | |
|---|---|---|---|---|
| (Intercept) | −2.686 | 0.068 | | |
| DOB: | | | < .001 | *** |
| linear | 33.676 | 4.273 | | |
| quadratic | 17.848 | 3.942 | | |
| Male | −0.079 | 0.073 | .286 | |
| Education: | | | .015 | * |
| Local | 0.002 | 0.155 | | |
| Regional | 0.147 | 0.126 | | |
| National | 0.355 | 0.132 | | |
| Preceding place: | | | < .001 | *** |
| Following voice: | | | < .001 | *** |
| Voiced | −0.129 | 0.047 | | |
| Voiceless | 0.308 | 0.044 | | |
| AIC: 35715, BIC: 35859, log $\mathcal{L}$: −17838 | | | | |

Table 4.1: (ay) F2−F1 ∼ DOB + Sex + EdIndex + Preceding Place + Following Environment

tokens lag behind the pre-voiceless tokens.

### 4.2.2 SVS stage 2: (ey) and (e)

If (ay)-monophthongization is the first stage of the SVS, then the second stage is the reversal of (ey) and (e). This change is accomplished via the backing and lowering of (ey) towards the position vacated by (ay), accompanied by the fronting and raising of (e) along the peripheral track. Dodsworth and Kohn (2012:225-6) found that some of the oldest middle-class speakers in the Raleigh corpus (born in 1928, 1939) show complete reversal of these two vowels, and that this feature is retained in the working class speech of later generations (e.g., Dodsworth and Kohn 2012 Figure 5, a working-class man born in 1958).

Figure 4.4 shows a similar change over time to that seen for (ay). For context, the starting point of (ey) in the 1920s is very close to (e), shown in Figure 4.5. Around the 1950s or 1960s, the community began to raise and front this vowel, undoing the SVS reversal. Again, the national speakers appear to be on the leading edge of this reversal.

| | Estimate | S. E. | $p$-value | |
|---|---|---|---|---|
| (Intercept) | 0.705 | 0.109 | | |
| DOB: | | | < .001 | *** |
| linear | 21.51 | 2.802 | | |
| quadratic | 7.335 | 2.607 | | |
| Male | 0.017 | 0.049 | .790 | |
| Education: | | | .028 | * |
| Local | 0.022 | 0.104 | | |
| Regional | 0.165 | 0.087 | | |
| National | 0.216 | 0.088 | | |
| Preceding place: | | | < .001 | *** |
| AIC: 27977, BIC: 28139, log $\mathcal{L}$: $-13967$ | | | | |

Table 4.2: (ey) F2−F1 ∼ DOB + Sex + Education + Preceding Place + Following Place

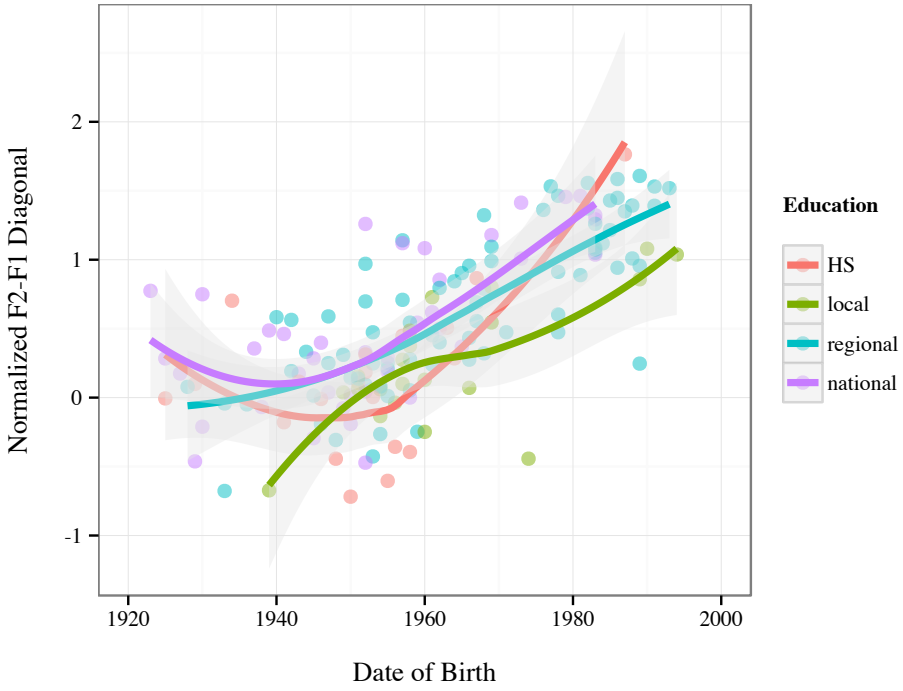


Figure 4.4: (ey) by education group.

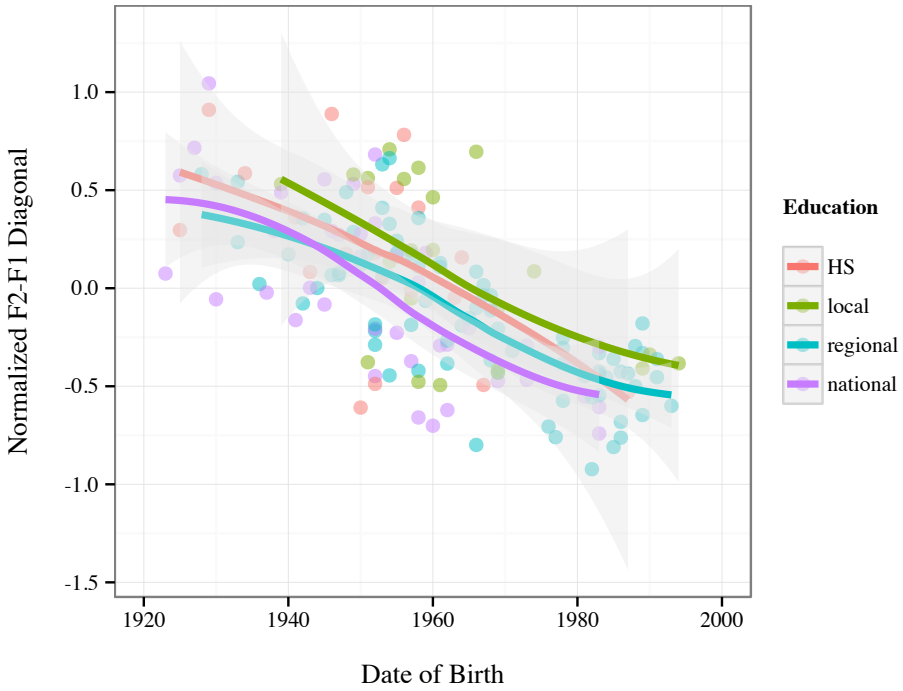


Figure 4.5: (e) by education group.

Table 4.2 gives the mixed effects model results for this vowel. Unsurprisingly there is a strong significant quadratic effect of date of birth, indicating that this vowel is more fronted and raised over time, as well as an effect of education, indicating that this change is led by national university speakers. The model was not improved by adding an interaction term for education and date of birth, indicating that the trajectory of the change over time is consistent across education groups. That is, the whole community is reversing course on this vowel, the national speakers are simply on the leading edge.

Given the results for (ey), we should expect to see a parallel reversal of (e) over time; that is, backing and lowering along the front diagonal. This expectation is borne out in Figure 4.5. We can see that this vowel started from a relatively stable raised and fronted position for speakers born in the 1920s through 1940s, and then began backing and lowering. Again, national speakers appear to be on the leading edge of this reversal.

This is confirmed in the model given in Table 4.3. A significant quadratic term for date of birth reflects the backing and lowering of (e), while a significant effect of education confirms that national speakers are consistently ahead of the other education groups in this reversal. Like (ey), there is no interaction between education and date of birth in the reversal of (e), showing the community moving in the same direction over time.

### 4.2.3 SVS stage 3: (iy) and (i)

So far we have seen that the oldest speakers in the Raleigh corpus clearly participated in the first two stages of the Southern Shift: the monophthongization of (ay), and the reversal of (ey) and (e). Now we will examine the last stage of the SVS, the reversal of (iy) and (i). This stage is only strongly attested in a small inner core of the South, labelled the *Inland South* in the ANAE, which roughly corresponds to the southern portion of the Appalachian mountain range. Raleigh lies outside this area, and so we do not expect to see a full reversal of the high front vowels.

| | Estimate | S. E. | $p$-value | |
|---|---|---|---|---|
| (Intercept) | 0.075 | 0.291 | | |
| DOB: | | | < .001 | *** |
| linear | −13.547 | 2.248 | | |
| quadratic | −1.723 | 2.108 | | |
| Male | −0.036 | 0.041 | .411 | |
| Education: | | | .016 | * |
| Local | 0.006 | 0.088 | | |
| Regional | −0.131 | 0.072 | | |
| National | −0.181 | 0.075 | | |
| Preceding place: | | | < .001 | *** |
| Following place | | | .125 | |
| AIC: 20734, BIC: 20871, log $\mathcal{L}$: −10348 | | | | |

Table 4.3: (e) F2−F1 ∼ DOB + Sex + Education + Preceding Place + Following Place

The results for (iy) show more movement over time than expected. Figure 4.6 shows that (iy) was actually at its most *peripheral* production (front and high) around 1960; since then it has lowered and backed a bit. This is echoed in the regression model presented in Table 4.4, in which we find a significant quadratic effect of date of birth. This pattern is the inverse of what we would expect to see in a community which participated in this stage of the SVS. Modelling also confirms that there is neither a significant effect of education, nor an interaction between education and date of birth. Speaker sex is significant, with males having generally more peripheral productions.

Meanwhile, Figure 4.7 shows a more expected pattern for (i). This vowel is not quite as high and front as (iy) at the start of the time period, indicating an overlapping rather than completely reversed system, but it does back and lower away from (iy) over the course of the 20th century. This change in apparent time is significant and roughly linear, as the model shown in Table 4.5 was not improved by either the addition of a polynomial term, or an interaction between date of birth and education. The latter is not surprising, as education fails to reach significance in this model. Again, unlike the models for the

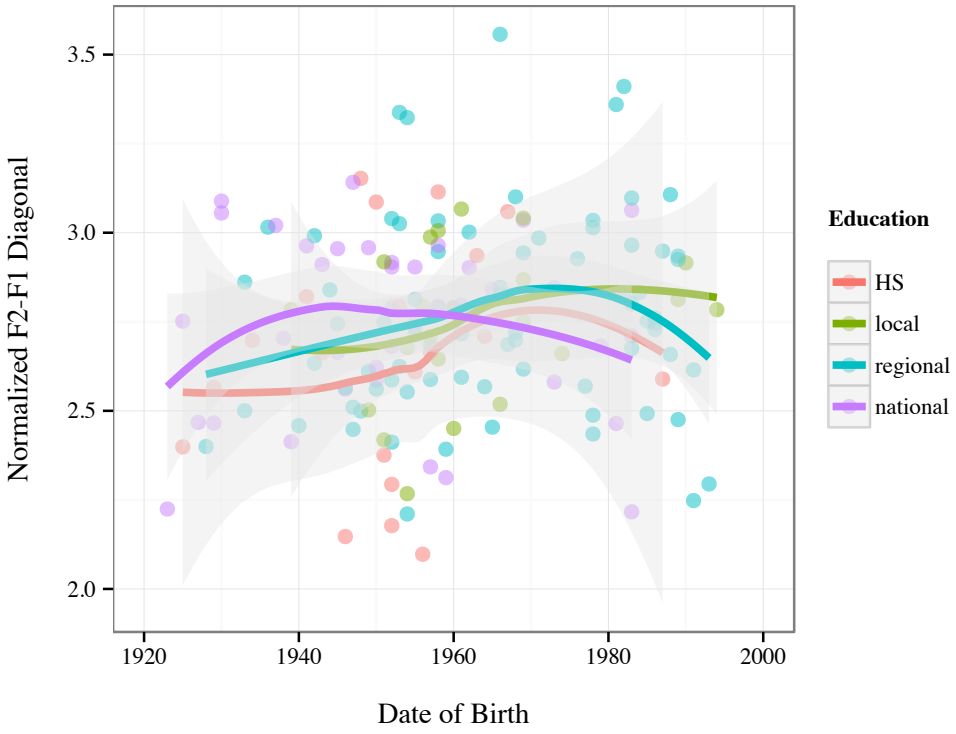


Figure 4.6: (iy) by education group.

| | Estimate | S. E. | $p$-value | |
|---|---|---|---|---|
| (Intercept) | 2.778 | 0.119 | | |
| DOB: | | | < .001 | *** |
| linear | −6.255 | 2.182 | | |
| quadratic | −8.578 | 2.039 | | |
| Male | 0.242 | 0.043 | < .001 | *** |
| Education | | | .466 | |
| Preceding place: | | | .001 | ** |
| Following place: | | | < .001 | *** |
| AIC: 22358, BIC: 22521, log $\mathcal{L}$: −11156 | | | | |

Table 4.4: (iy) F2−F1 ∼ DOB + Sex + Education + Preceding Place + Following Place

first two SVS stages, there is a significant effect of speaker sex on this vowel, with men showing more fronted and raised realizations than women. This appears to be a case of women favoring the standard vowel quality over the potentially stigmatized local norm.

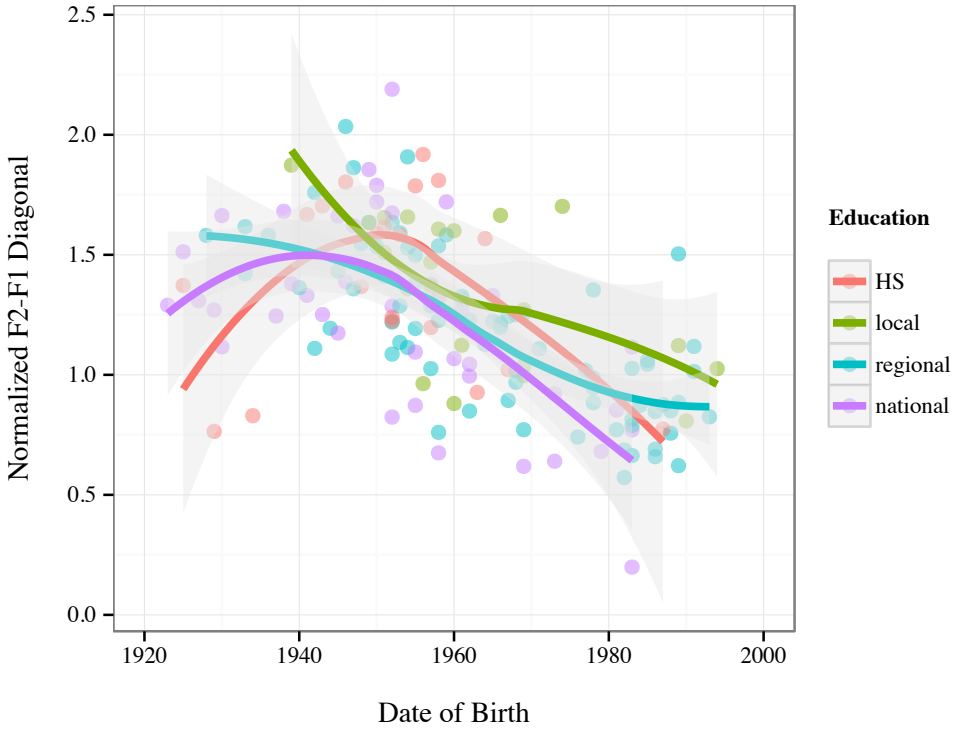


Figure 4.7: (i) by education group.

| | Estimate | S. E. | $p$-value | |
|---|---|---|---|---|
| (Intercept) | -1.073 | 0.119 | | |
| DOB | 0.033 | 0.009 | < .001 | *** |
| Male | 0.071 | 0.018 | < .001 | *** |
| Education: | | | .051 | |
| Local | −0.029 | 0.039 | | |
| Regional | 0.038 | 0.032 | | |
| National | 0.052 | 0.033 | | |
| Preceding Place | | | .009 | *** |
| Following Place | | | .076 | ** |
| AIC: 15871, BIC: 15996, log $\mathcal{L}$: −7917 | | | | |

Table 4.5: (i) F2−F1 ∼ DOB + Sex + Education + Following Place

### 4.2.4 SVS: (ae)

Like the other lax front vowels, the SVS short-*a* is fronted and raised along the peripheral track. Many SVS speakers also exhibit another regional shibboleth—Southern breaking—which is characterized by a rise and fall in F2 over the course of the vowel, accompanied by a [j] glide (see Labov 2001:178). This trajectory is stereotypical of the "Southern drawl", and so clearly carries the negative social significance of the Southern dialect. Thus, this vowel is another good candidate for socially-motivated correction, similar to (ay) monophthongization. Figure 4.8 plots the averaged midpoint -> glide trajectory of this vowel for our Raleigh speakers, who are color-coded according to date of birth. Speakers who exhibit Southern breaking should have a more front-to-back trajectory, i.e., the fall in F2.

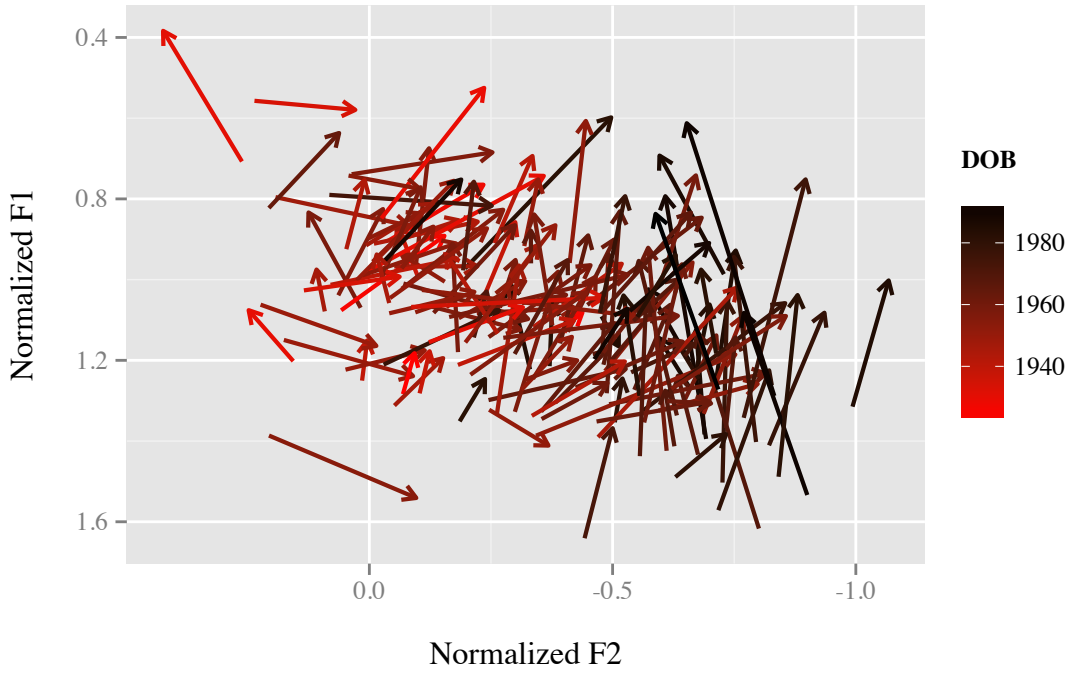


Figure 4.8: Short-*a* trajectory by DOB.

Indeed, this plot reveals a clear generational difference in (ae) production. To begin with, the younger speakers (in black) are much more uniform, with (ae) midpoints that are

lower and backer than previous generations, and a clear upgliding tendency. By contrast, older generations show a wider variety of trajectories, which is perhaps simply reflective of the use of two points to visualize a complex formant contour. Many, however, do show a clear front-to-back movement in F2, which dovetails neatly with the second half of the Southern breaking trajectory. The model presented in Table 4.6 focuses on the midpoint movement that can be seen in Figure 4.8, and more clearly in Figure 4.9. All of the fixed effects in this model were significant. There is a significant change over time reflected in the third-order polynomial coefficient for birth year; this effect did not interact with any other fixed effect. Men are significantly more conservative than women, while speakers with higher education are more innovative (have less peripheral short-*a*) than those without. The following place effect agrees with that reported by Labov (2001).

The front vowels of the oldest Raleigh speakers, then, are much what we would expect based on previous work: monophthongization of (ay) in pre-voiced context (Stage 1 completion), raised and fronted (ae) with Southern breaking, overlapping or reversed mid-front vowels (Stage 2 completion), and somewhat overlapping but not reversed high-front vowels (minimal Stage 3 change). From this traditional mid-range SVS starting point, we then saw that all of the SVS changes are being reversed by the entire community. As in Philadelphia, nationally-oriented speakers are leading the changes away from the most salient features, (ay), (ae), (ey), and (e). Unlike in Philadelphia, however, the rest of the community is following right along behind them at the same rate. The following section will look for any changes happening elsewhere in the vowel space, and explore whether education stratification may be found there as well.

### 4.2.5 Other Southern variables

The next three vowels examined here form the back upgliding series: (aw), (ow), and (uw). In the Southern dialect, these vowels are all markedly fronted (*aw* is also somewhat raised,

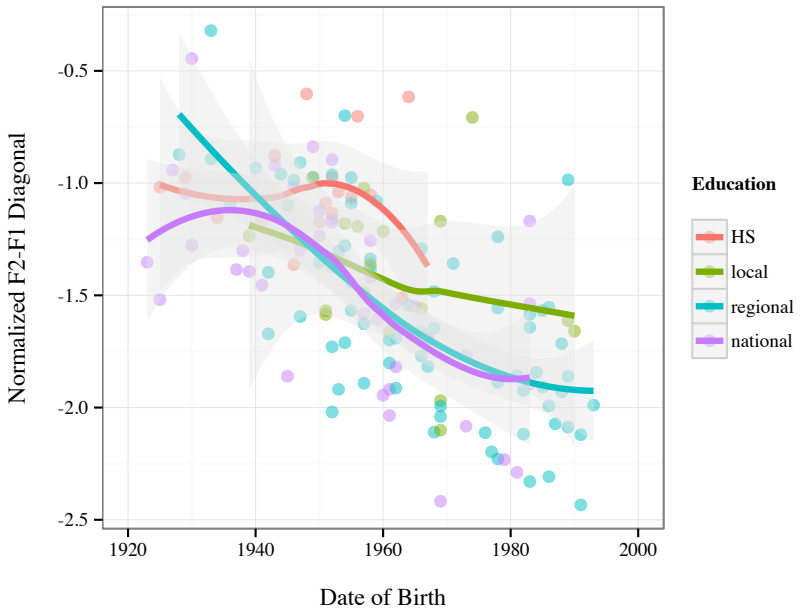


Figure 4.9: Short-*a* diagonal by DOB.

| | Estimate | S. E. | *p*-value | |
|---|---|---|---|---|
| (Intercept) | −1.447 | 0.342 | | |
| DOB: | | | < .001 | *** |
| linear | −21.079 | 2.562 | | |
| quadratic | −0.256 | 2.362 | | |
| cubic | 4.764 | 2.367 | | |
| Male | 0.168 | 0.044 | < .001 | *** |
| Education: | | | .014 | * |
| Local | −0.089 | 0.095 | | |
| Regional | −0.227 | 0.077 | | |
| National | −0.205 | 0.081 | | |
| Following Place | | | < .001 | *** |
| labial | 0.051 | 0.337 | | |
| coronal | 0.281 | 0.335 | | |
| velar | −0.195 | 0.336 | | |
| [h] | −0.533 | 0.552 | | |
| AIC: 25779, BIC: 25904, log $\mathcal{L}$: −12873 | | | | |

Table 4.6: (ae) F2−F1 ∼ DOB + Sex + Education + Following Place

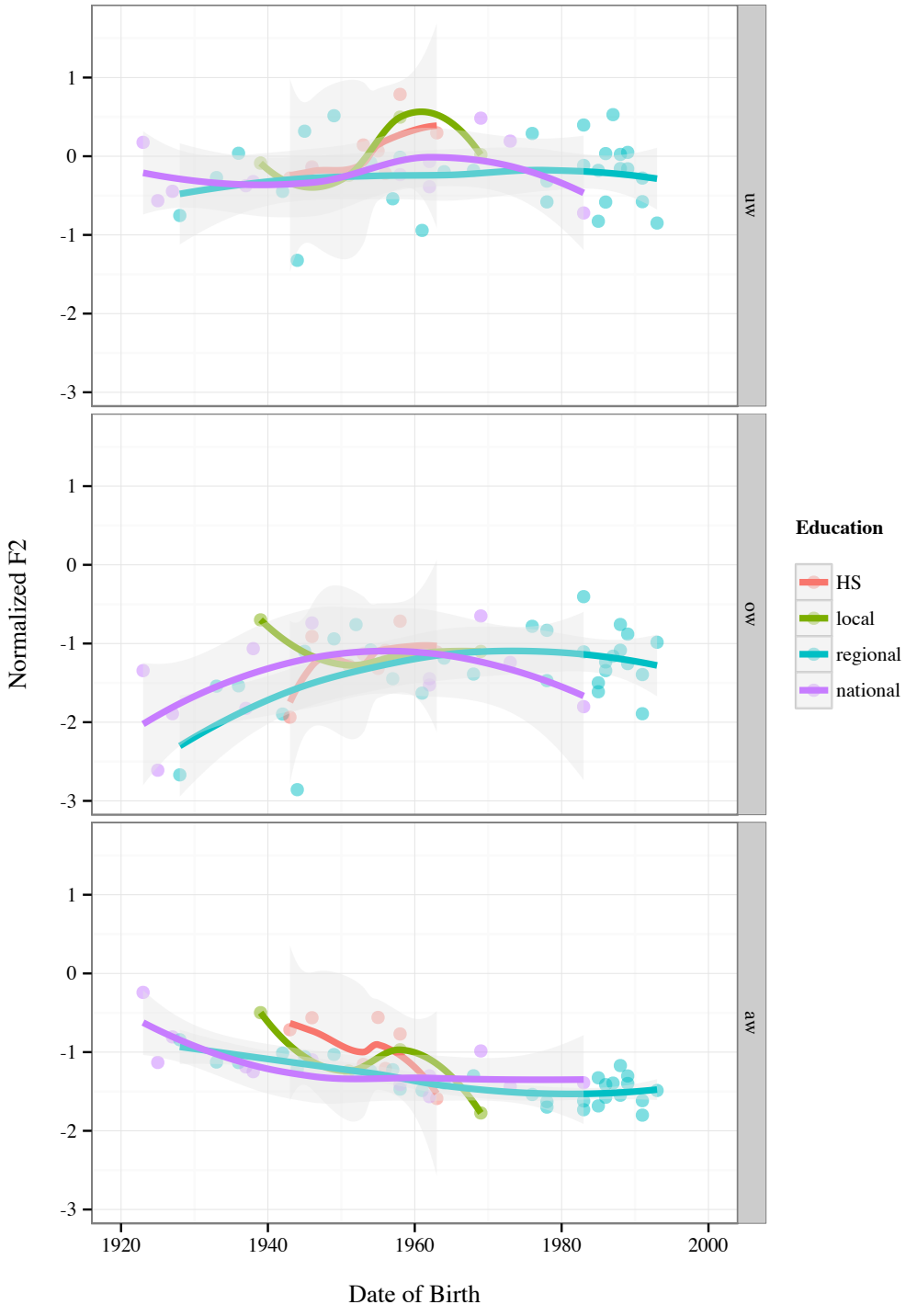


Figure 4.10: Back vowels by education group.

similar to Philadelphia's). Recall that for the analysis of Philadelphia (uw), we first split the vowel into post-coronal vs. elsewhere sets, and then excluded pre-/l/ tokens to account for the conditioning of fronting in Philadelphia. These steps are not as necessary for the Raleigh analysis, as Southern fronting of (uw) is much more general and less strongly affected by phonetic environment. Pre-/l/ tokens are excluded here as well, but preceding segment is simply included as a fixed effect when modelling. As the models below show, there are still significant effects of preceding and following segment, but not to the same extreme found elsewhere in the U.S. (Labov et al. 2006:152-3).

Figure 4.10 displays the change over time in all three back upgliding vowels along the F2 dimension. We see that fronted (uw) has remained steady, and the most fronted, over the span of the corpus. There is no clear differentiation among the education groups; however it is clear that the smaller sample here (N=54) is exacerbating the slightly uneven distribution of the groups over time, as there are very few representatives of the high school and local categories. The regional and national LOESS fits look much more reliable here, and the extensive wiggle in the other two education groups should not be interpreted. In contrast to the stable (uw) productions, (ow) can be seen clearly fronting over time, perhaps with some reversal among young speakers, while (aw) appears to back slightly over time.

The model results given in Table 4.7 confirm that there is a significant effect of date of birth on (aw) F2. The polynomial coefficients indicate a downward, slightly concave change over time. Neither the education variable nor sex were significant, and although a preceding coronal or velar favored fronting, there was no effect of following place. While the addition of an interaction between date of birth and education did technically improve the model's AIC and log likelihood, the improvement was slight (AIC -8, BIC +32, log $\mathcal{L}$ +9), and likely not meaningful given the education group imbalance in the back vowels.

Table 4.8 shows similar results for (ow), only the direction of the quadratic term has

| | Estimate | S. E. | $p$-value | |
|---|---|---|---|---|
| (Intercept) | −0.744 | 0.216 | | |
| DOB: | | | < .001 | *** |
| linear | −12.407 | 2.090 | | |
| quadratic | 4.301 | 1.998 | | |
| Education | | | .066 | |
| Male | 0.009 | 0.061 | .883 | |
| Preceding place: | | | .002 | ** |
| Coronal | 0.061 | 0.048 | | |
| [h] | −0.389 | 0.136 | | |
| Labial | −0.077 | 0.065 | | |
| Velar | 0.108 | 0.057 | | |
| Following place | | | .362 | |
| AIC: 7271, BIC: 7390, log $\mathcal{L}$: −3616 | | | | |

Table 4.7: (aw) F2 ∼ DOB + Education + Sex + Preceding Place + Following Place

| | Estimate | S. E. | $p$-value | |
|---|---|---|---|---|
| (Intercept) | −1.299 | 0.194 | | |
| DOB: | | | < .001 | *** |
| linear | 12.078 | 3.469 | | |
| quadratic | −7.900 | 3.348 | | |
| Education | | | .326 | |
| Male | -0.013 | 0.118 | .912 | |
| Preceding place: | | | < .001 | *** |
| Coronal | 0.215 | 0.061 | | |
| [h] | 0.010 | 0.150 | | |
| Labial | −0.238 | 0.074 | | |
| Velar | 0.123 | 0.079 | | |
| Following place: | | | < .001 | *** |
| Coronal | 0.125 | 0.095 | | |
| [h] | −0.404 | 0.259 | | |
| Labial | −0.299 | 0.105 | | |
| Velar | 0.011 | 0.114 | | |
| AIC: 7228, BIC: 7351, log $\mathcal{L}$: −3594 | | | | |

Table 4.8: (ow) F2 ∼ DOB + Education + Sex + Preceding Place + Following Place

| | Estimate | S. E. | $p$-value | |
|---|---|---|---|---|
| (Intercept) | −1.859 | 0.473 | | |
| DOB | 0.076 | 0.053 | .173 | |
| Education | | | .100 | |
| Male | 0.238 | 0.101 | .022 | * |
| Preceding place: | | | < .001 | *** |
| Coronal | 2.007 | 0.451 | | |
| [h] | 1.321 | 0.464 | | |
| Labial | 1.239 | 0.452 | | |
| Velar | 1.641 | 0.480 | | |
| Following place: | | | .002 | ** |
| Coronal | 0.284 | 0.088 | | |
| [h] | −0.156 | 0.751 | | |
| Hiatus | −2.054 | 0.753 | | |
| Labial | 0.169 | 0.112 | | |
| Velar | 0.302 | 0.156 | | |
| AIC: 4731, BIC: 4843, log $\mathcal{L}$: −2345 | | | | |

Table 4.9: (uw) F2 ∼ DOB + Education + Sex + Preceding Place + Following Place

reversed: (ow) shows an overall upward and concave trajectory, which is to say, strong fronting followed by a slight reversal. Neither education nor speaker sex were significant predictors, and although it is tempting to interpret the reversal of fronting in Figure 4.10 after 1960 as being led by national speakers, modelling does not currently support an interaction between education and date of birth.

Finally, Table 4.9 presents the model for (uw). Unlike the previous two back upgliding vowels, (uw) does not show a change in F2 over time, but *does* show a significant effect of speaker sex ($p$ = .022), with men more fronted than women. This is an intriguing result which requires further investigation, as previous studies (e.g., ANAE: 153) have found women leading the fronting of (uw). I do not have a satisfactory explanation at present, but speculate that (uw) fronting has been established in the South long enough that it is no longer an innovative feature likely to be led by women. Education was also not significant, so unsurprisingly, there was no significant interaction with date of birth.

The last two Raleigh vowels examined here are the low-back vowels, (oh) and (o). In much of the U.S. these two vowels have merged; traditionally, the South has maintained a distinction between them, usually accomplished via a distinctively upgliding (oh) realization. To see whether this distinction is maintained, Figure 4.11 compares the midpoint-to-75% trajectories of both vowels, colored by date of birth.

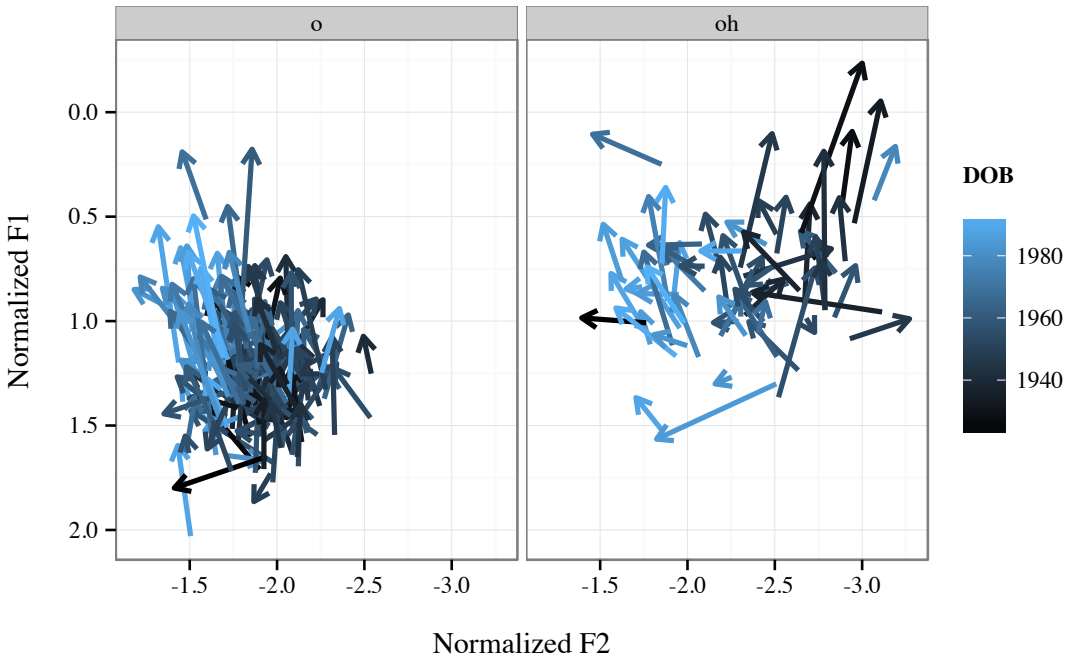


Figure 4.11: Low-back vowel trajectory by birthyear.

Notice that while (o) appears to be more or less stable over time, with only some slight fronting and/or raising, younger speakers' (lighter blue arrows) productions of (oh) are quite different from older speakers. Not only have they shifted this vowel forward to overlap with (o), the trajectory is less clearly upgliding. Some speakers may have a small inglide, while others appear to have no glide at all. So it seems that Raleigh has moved towards the low-back merger as well.

Interestingly enough, this change seems to be purely generational in this data. While in Philadelphia the lowering of (oh) was clearly led by the national and regional speakers

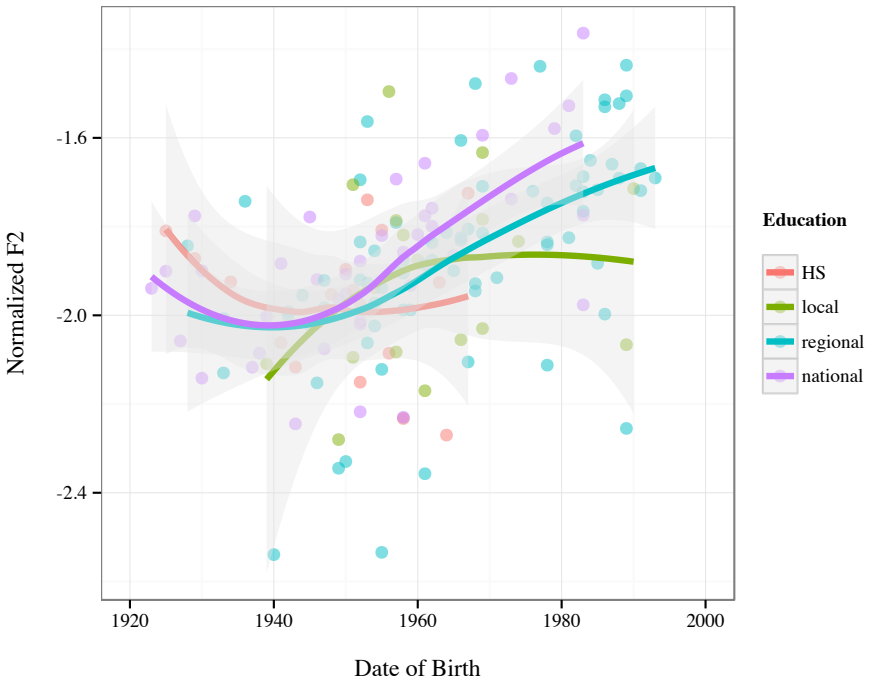


Figure 4.12: (o) by education group.

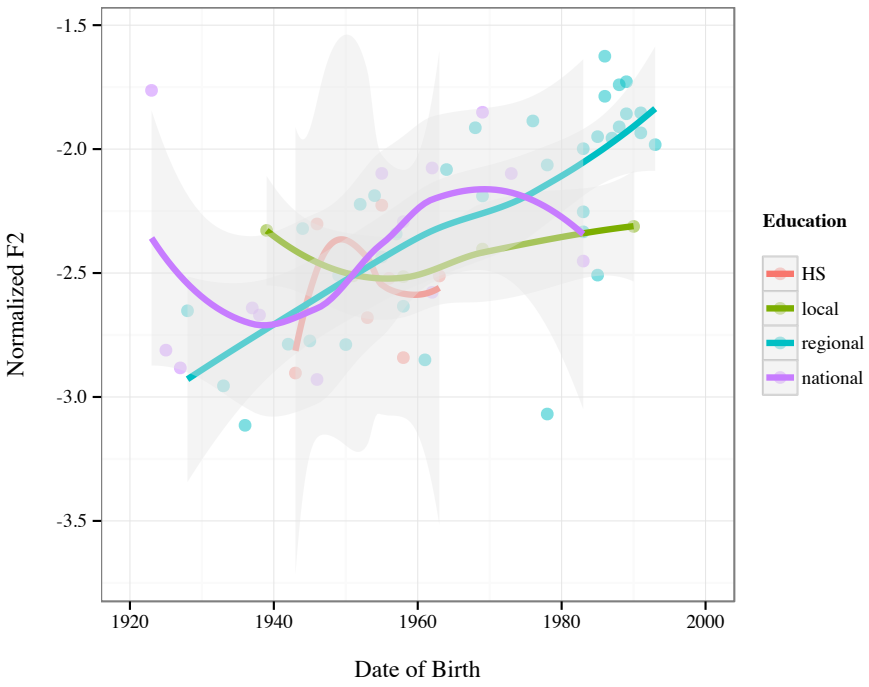


Figure 4.13: (oh) by education group.

and closely tied to the negative social salience attached to the traditional local quality, neither education nor sex were significant predictors of the Raleigh change. As the results in Table 4.10 show, date of birth and preceding/following segment place were significant predictors for (o), while in Table 4.11 we see that the *only* significant predictor of (oh) fronting is date of birth. Thus it is likely that in Raleigh, as in other parts of the country, the low-back merger is proceeding without remark.

| | Estimate | S. E. | $p$-value | |
|---|---|---|---|---|
| (Intercept) | −1.545 | 0.187 | | |
| DOB | 0.094 | 0.017 | < .001 | *** |
| Education | | | .225 | |
| Male | −0.012 | 0.031 | .698 | |
| Preceding place: | | | < .001 | *** |
| Coronal | 0.072 | 0.055 | | |
| [h] | 0.016 | 0.073 | | |
| Labial | −0.150 | 0.058 | | |
| Lateral | −0.175 | 0.315 | | |
| Velar | 0.183 | 0.063 | | |
| Following place: | | | .043 | * |
| AIC: 4428, BIC: 4556, log $\mathcal{L}$: −2194 | | | | |

Table 4.10: (o) F2 ∼ DOB + Education + Sex + Preceding Place + Following Place

| | Estimate | S. E. | $p$-value | |
|---|---|---|---|---|
| (Intercept) | −2.617 | 0.187 | | |
| DOB | 10.099 | 1.798 | < .001 | *** |
| Education | | | .581 | |
| Male | −0.069 | 0.081 | .389 | |
| Preceding place | | | .106 | |
| Following place | | | .288 | |
| AIC: 3466, BIC: 3564, log $\mathcal{L}$: −1715 | | | | |

Table 4.11: (oh) F2 ∼ DOB + Education + Sex + Preceding Place + Following Place

## 4.3 Summary

Unlike in Philadelphia, where nationally- and regionally-oriented university students are diverging from the local norms largely maintained by local and high school speakers (as shown by significant interactions between education and birth year), in Raleigh we see that the community is generally moving together in the same direction, the nationally-oriented university students are simply a little bit ahead of the rest of the community in some cases. This distinction likely stems from the differing level of social salience of the two dialects—while surely every American has heard a stereotyped imitation of a Southern drawl and understood the negative perceptions associated with it, the Philadelphia dialect has much less widespread recognition, and speakers likely feel less pressure to correct the dialect unless they are less tied to the local community.

On the question of linguistic embedding, the results are unfortunately somewhat inconclusive. Since we see the entire community moving away from all the core Southern Vowel Shift features, and we know from perception work conducted elsewhere in the South that all of the SVS vowels bear some level of salience, it is impossible to say whether the reversal of this shift is more socially or linguistically motivated—very likely, it is a combination of the two.

In Raleigh, we saw the same pattern for the vowels which we know to be stereotypically Southern: those involved in the Southern Vowel Shift, especially the (ay) monophthong and the reversal of (ey) and (e). The younger generations are moving away from those Southern pronunciations in favor of less stigmatized productions. They do not appear to be retreating from other Raleigh features however, as (aw), (uw), and (oh) have remained relatively stable over time. The possible exception here is in (ow) fronting; while perception studies by Fridland et al. showed that this vowel was recognizably Southern, it has shown only a slight retreat at best in Raleigh.

# Chapter 5

# Conclusion

## 5.1 Summary of findings

The two case studies presented in this dissertation show that education can have an effect on sound change above and beyond a speaker's raw years of schooling. By ensuring that the social variable of study reflects social reality, the education index introduced here was able to reveal subtle new changes which were not previously noted in the literature, indicating that this is a fruitful direction for future quantitative studies to develop further. It will be informative to see how successfully this approach may be generalized to other speech communities, and in what ways it will evolve in the process. By employing this measure in the study of Raleigh, NC, I have shown that while education may not have a uniform effect across communities, this index does have the potential to generalize beyond the Philadelphia speech community.

In Philadelphia, we saw that speakers who attended national and regional institutions are leading a retreat from some of the traditional local variables—the Philadelphia short-*a* system, the low-back distinction, (aw) raising, and (ow) fronting—while local and high school speakers have maintained these traditional features. However, all education groups

are participating in some newer local changes—(ay0) raising, (eyC) raising—and national and regional speakers are even leading the way in (eyF) raising and (Tuw) fronting. So the effect of higher education in Philadelphia is not simply a wholesale rejection of the local dialect, it is feature-specific.

By contrast, in Raleigh everyone is retreating from the Southern Vowel Shift. Regional and national speakers are simply ahead of the curve in these changes. National and regional speakers lead the way in the shifts of the (ay), (ey), (e), (i), and (æ) nuclei, while (uw) and (iy) have remained relatively stable over time. The traditional realizations of the back vowels (ow), and (aw) may also be retreating, but more slowly, and so far with no clear education stratification. The low-back vowels are definitely beginning to merge, without any stratification by education. Raleigh shows more of a wholesale rejection of the dialect than Philadelphia, but with some exceptions which require further investigation with a larger quantity of data.

In each case, I have suggested that social salience was responsible for the patterns of change seen and the varying effect of education. In this final chapter, I flesh out this argument in relation to other alternative explanations. First, the most common response to these results: isn't education just a reflections of social class?

## 5.2 Is this just social class stratification?

In the introduction, I briefly touched on the relationship between education and social class, arguing that while they are certainly correlated, there is not a one-to-one mapping between the types of education studied here and the social class of the speakers. This is a natural question to ask however, and bears further consideration. The underlying assumption is that individuals who are able to pursue higher education at a prestigious national university are generally of middle to upper class backgrounds to begin with. This

is likely true, but the equivalence between type of education and social class does not hold up under investigation.

For example, if we return to Kroch's (1995) work on the Philadelphia upper class, both before and after World War II the characteristics which distinguish the upper class are not the same ones that we find marking a prestigious higher education here. Kroch found that the upper class still participates in the same phonological speech community as other Philadelphians—they share ongoing changes in progress, and notably follow the same short-*a* pattern as working class speakers. The only difference is that they show less extreme forms in some cases; for example, their short-*a* split is not as phonetically wide as working class speakers, but is still identifiably Philadelphian (Kroch 1995:10). Kroch (1995:20) explains that, "By using local pronunciations in a phonetically minimal way, it shows, to the maximal extent possible given its underlying dialect, that it is allied to the standard regional and national language as against the local one." While this motivation is most likely shared by national university students, what we see reflected in the education stratification presented here is something entirely different and new: Philadelphians with national educations are not merely using less extreme short-*a* realizations, but actually switching to a less stigmatized system, the nasal system.

Furthermore, on a more anecdotal level, there are several cases within the PNC and IHELP data where stratification by education may be seen within even the same generation of a single family—siblings with identical upbringings who have pursued different educational trajectories (see Prichard and Tamminga 2012, Fisher et al. 2015 for examples). So while of course there may be a certain amount of overlap between the education index introduced here and broader social class measures, this study's findings are not merely the rediscovery of the differences between upper class and lower class that have always existed.

## 5.3 What about accommodation?

Another possible explanation, which has the advantage of overcoming the sibling difficulty, is that what we are seeing is accommodation. National college students simply have more contact with speakers of other dialects, so these findings could be the result of a mechanistic convergence process. According to this line of reasoning, students who attend different types of universities retreat from the local dialect in accordance with the amount of exposure to outside dialects they receive within the college setting. This is certainly a compelling and intuitive theory, but it is not at all simple to prove. While a student at a national university has the *potential* to come into contact with a great many speakers of other dialects, it is not certain that they in fact *do*. Furthermore, even if they do have daily contact with other dialects, we do not know whether these contacts are of a type which leads to lasting linguistic change. There is continued debate concerning the extent to which dialect contact can lead to long-term dialect change (Bowie 2000, Trudgill 1986, 2008). And contact does not always lead to convergence; studies have shown that in some cases, when speakers do not wish to be identified with their interlocutors, that is, increase the social distance between them, it may actually lead to *divergence* (Bourhis and Giles 1977). Likewise, people tend to only accommodate to dialects which carry some amount of prestige (Surek-Clark 2000). Finally, there is the difficulty of pinpointing the target of this accommodation. How is it that Philadelphian students at universities with varying mixes of regional dialects have managed to converge towards a common target?

Of course, none of this is to say that there is no role whatsoever for accommodation processes to help shape the patterns found here. There is no doubt some degree of unconscious accommodation at work in every dialect contact situation, particularly in the college environment, and degree of contact between different social groups likely explains how such changes are spread throughout the speech community. However, it is simply

not as straightforward an answer as it appears to be, and much more inquiry is needed into the questions I raise above in order to tease out what that role is in actuality. Interesting avenues of research to pursue include the examination of how salience (Auer et al. 1998) and frequency (Babel 2010) affect accommodation.

## 5.4 Internalized negative evaluation

So while both accommodation and social class have their roles to play, neither by itself completely explains the facts as of yet. In the cases presented here, the connection between higher education and salience is crucial. However the question remains, why is it that the effect of salience is strongest at national universities, and hardly present at all for local colleges? One explanation, which is somewhat similar in reasoning to that of accommodation, is that national college students are inevitably made more aware of the negative stereotypes associated with their local dialect features than their peers at local colleges, due to the overt comments of their non-local peers. This explanation is certainly supported by some of the conversations recorded in the IHELP corpus; students at the University of Pennsylvania for example were much more likely to report that their classmates have commented on their accent than students at local colleges were. Stephany Dunstan's (2013) work on Appalachian students attending college in urban North Carolina is also highly informative here. She notes that especially for rural students, college is often the first time that they encounter negative attitudes towards their dialect. This has a strong effect on these students; Dunstan (2013:366) records that "Some participants noted that their attitudes toward their own speech (and the need to code-switch) changed over time in college" and that these attitudes were tied to a concern about how they are perceived by others: "Many participants in this study suggested that they felt a need to change their speech on campus to sound more professional, to be taken seriously, or to

avoid stereotyping and judgment" (2013:370).

The standardizing influence of an elite national university education is clear. While this influence may sometimes assert itself in subtle, subconscious ways, through the automatic convergence of speakers from different dialect areas coming into contact, this is not what is seen here. In both Philadelphia and Raleigh, this influence is overt, communicated through social stereotypes and the negative salience of specific linguistic features. As ongoing analysis of the IHELP data reveals a similar stratification of local features among high school students, we may find that this standardizing influence has begun to reach beyond college into the college-prep schools which are increasingly focused on preparing students for admission to the elite national universities.

## 5.5 Return to the beginning: education and actuation

I will conclude with the question that so many sociolinguists strive to solve: why these changes, now? The results presented here have tantalizing implications for the actuation problem, which will need to be investigated further. Labov et al. (2013:60) raise this question, asking "what happened in the period 1945-1960 that reoriented Philadelphians toward a Northern realization of their vowel system?" They note that the changes to the Philadelphia dialect lack a clear linguistic cause, as they don't "maximize the functional economy of the system" and generally run counter to the principle of maximal dispersion (Labov et al. 2013:48). Likewise, there is no evidence of large-scale dialect contact or an influx of North Midlands speakers to explain this realignment. Therefore, these changes are most likely due to other social factors (Labov et al. 2013:62), such as changes in the social evaluation of these variables.

While it is not within the scope of this work to prove one way or another whether changes in the education system resulted in these sound changes, I will return to the work

of Martin Trow, who noted that "WWII was the watershed event for higher education in modern democratic societies" (Trow 2010c:557). The fact that speakers with prestigious national college educations are leading a reversal of stereotyped local features, a reversal which begins during the *same* period as a sea change in American educational attainment, is quite suggestive.

Thirty years ago, John Rickford challenged sociolinguists to take the 'socio' side of sociolinguistics more seriously, by developing new approaches to the study of social class which draw on existing sociological theory (Rickford 1986). He writes that by ignoring the work of other social scientists, we risk missing out on valuable insights our social variables could provide. While this dissertation has barely scratched the surface of the sociological literature on education, much less fully embraced the conflict theory approach advocated by Rickford, it has demonstrated that his 1986 call to action is no less relevant now than it was then—by reconsidering the way we approach the study of social variables, we can achieve fresh insight into the nature of linguistic change.

# Appendix A

# Details of analysis

## A.1 R packages and functions used for analysis

- `plot`: When applied to a linear model object, produces a series of diagnostic plots. The Cook's distance metric used here is derived from one of these plots.
- `scale`: Formant normalization and date of birth centering and scaling
- `lme4:lmer`: Fitting mixed effects models
- `stats:drop1`: Log-likelihood ratio test for significance of predictors
- `multcomp:glht` + `mcp`: Post-hoc Tukey tests
- `ggplot2`: Plotting

## A.2 Philadelphia token counts and outlier analysis

| | total | removed | | total | removed |
|---|---|---|---|---|---|
| (aeh) | 8,731 | 7 | (eyF) | 7,402 | 4 |
| (ae) | 13,932 | 0 | (eyC) | 21,726 | 5 |
| (oh) | 13,879 | 5 | (owC) | 17,403 | 5 |
| (o) | 14,858 | 0 | (owF) | 16,412 | 5 |
| (aw) | 16,934 | 6 | (Tuw) | 7,464 | 4 |
| (ay0) | 16,789 | 4 | (Kuw) | 4,320 | 8 |

Table A.1: Summary of token counts for each vowel in Chapter 3: Philadelphia.

## A.3 Raleigh token counts

| | total | | total |
|---|---|---|---|
| (iy) | 4,371 | (uw) | 1,507 |
| (i) | 7,944 | (ow) | 3,626 |
| (ey) | 8,403 | (aw) | 4,286 |
| (e) | 6,537 | (o) | 7,475 |
| (æ) | 11,775 | (oh) | 1,280 |
| (ay) | 8,331 | | |

Table A.2: Summary of token counts for each vowel in Chapter 4: Raleigh.

## A.4 Multiple comparison results

| Linear Hypothesis | Estimate | Std. Error | $p$ value | |
|---|---|---|---|---|
| 2 - 1 == 0 | −0.113 | 0.113 | .743 | |
| 3 - 1 == 0 | −0.609 | 0.108 | < .001 | *** |
| 4 - 1 == 0 | −1.191 | 0.137 | < .001 | *** |
| 3 - 2 == 0 | −0.496 | 0.137 | .002 | ** |
| 4 - 2 == 0 | −1.079 | 0.155 | < .001 | *** |
| 4 - 3 == 0 | −0.583 | 0.146 | < .001 | *** |

1=HS, 2=Local, 3=Regional, 4=National

Table A.3: (æh) EdIndex Multiple Comparisons of Means: Tukey Contrasts.

| Linear Hypothesis | Estimate | Std. Error | $z$ value | $p$ value | |
|---|---|---|---|---|---|
| DOB:Ed1 vs. DOB:Ed2 == 0 | 0.049 | 0.073 | 0.671 | .904 | |
| DOB:Ed1 vs. DOB:Ed3 == 0 | 0.146 | 0.063 | 2.316 | .090 | |
| DOB:Ed1 vs. DOB:Ed4 == 0 | 0.282 | 0.069 | 4.076 | < .001 | *** |
| DOB:Ed2 vs. DOB:Ed3 == 0 | 0.097 | 0.089 | 1.088 | .687 | |
| DOB:Ed2 vs. DOB:Ed4 == 0 | 0.232 | 0.094 | 2.485 | .059 | |
| DOB:Ed3 vs. DOB:Ed4 == 0 | 0.135 | 0.086 | 1.573 | .383 | |

1=HS, 2=Local, 3=Regional, 4=National

Table A.4: (eyF) EdIndex Multiple Comparisons of Means.

# Bibliography

(2016). National Center for Education Statistics College Navigator. https://nces.ed.gov/collegenavigator/.

(2016). US News & World Report Best Colleges Rankings. http://colleges.usnews.rankingsandreviews.com/best-colleges.

Auer, P., B. Barden, and B. Grosskopf (1998). Subjective and objective parameters determining 'salience' in long-term dialect accommodation. *Journal of Sociolinguistics 2*(2), 163–187.

Babel, M. (2010). Dialect divergence and convergence in New Zealand English. *Language in Society 39*, 437–456.

Becker, K. (2011). The social meaning(s) of raised BOUGHT in New York City: A perceptual approach. Paper presented at NWAV 40, Georgetown University, October 28.

Becker, K. (2014). The social motivations of reversal: Raised bought in New York City English. *Language in Society 43*(4), 141–168.

Berrett, D. (2015). The day the purpose of college changed. *The Chronicle of Higher Education*. Last modifed January 26, 2015. http://chronicle.com/article/The-Day-the-Purpose-of-College/151359/?cid=at&utm_source=at&utm_medium=en.

Bigham, D. (2010). Mechanisms of accommodation among emerging adults in a university setting. *Journal of English Linguistics 38*, 193–210.

Bourhis, R. Y. and H. Giles (1977). The language of intergroup distinctiveness. *Language, ethnicity, and intergroup relations*, 119–136.

Bowie, D. (2000). *The Effect of Geographic Mobility on the Retention of a Local Dialect*. Ph. D. thesis, University of Pennsylvania, Philadelphia.

Brint, S., M. Riddle, and R. A. Hanneman (2006, July). Reference sets, identities, and aspirations in a complex organizational field: The case of American four-year colleges and universities. *Sociology of Education 79*(3), 229–252.

Clopper, C., D. Pisoni, and K. de Jong (2005). Acoustic characteristics of the vowel systems of six regional varieties of American English. *Journal of the Acoustical Society of America 118*(3), 1661–1676.

Conn, J. C. (2005). *Of "Moice" and Men: The Evolution of Male-led Sound Change*. Ph. D. thesis, University of Pennsylvania.

De Decker, P. (2006). A real-time investigation of social and phonetic changes in post-adolescence. In M. Ravindranath (Ed.), *University of Pennsylvania Working Papers in Linguistics 12.2: Selected papers from NWAV 34*, pp. 65–76.

Dinkin, A. J. (2013). What's really happening to short-*a* before *l* in Philadelphia? *American Speech 88*(1), 7–31.

Dodsworth, R. (2013). Retreat from the Southern Vowel Shift in Raleigh, NC: Social Factors. *University of Pennsylvania Working Papers in Linguistics 19.2: Selected Papers from NWAV 41*, 31–40.

Dodsworth, R. (2014). Network embeddedness and the retreat from Southern vowels in Raleigh. *University of Pennsylvania Working Papers in Linguistics 20.2: Selected Papers from NWAV 42*, 41–50.

Dodsworth, R. and M. Kohn (2009). Urban and rural AAE vowels in North Carolina: A supra-regional shift and regional accommodation. Paper presented at NWAV 38, University of Ottawa, October 24.

Dodsworth, R. and M. Kohn (2012). Urban rejection of the vernacular: The SVS undone. *Language Variation and Change 24*, 221–245.

Dunstan, S. (2013). *The influence of speaking a dialect of Appalachian English on the college experience*. Ph. D. thesis, North Carolina State University, Raleigh, NC.

Feagin, C. (1979). *Variation and Change in Alabama English*. Washington, D.C.: Georgetown University Press.

Feagin, C. (1986). More evidence for vowel change in the South. In D. Sankoff (Ed.), *Diversity and diachrony*, pp. 83–95. Amsterdam: John Benjamins.

Ferguson, C. A. (1972). 'Short-a' in Philadelphia English. In M. E. Smith (Ed.), *Studies in Linguistics in Honor of George L. Trager*. The Hague: Mouton.

Fisher, S., H. Prichard, and B. Sneller (2015). The apple doesn't fall far from the tree: Incremental change in Philadelphia families. *University of Pennsylvania Working Papers in Linguistics 21.2: Selected Papers from NWAV 43*, 49–57.

Fridland, V. (1999). The Southern shift in Memphis, Tennesee. *Language Variation and Change 11*, 267–85.

Fridland, V. (2001). The social dimension of the Southern vowel shift: gender, age and class. *Journal of Sociolinguistics 5*, 233–53.

Fridland, V. (2003). "Tie, tied and tight": the expansion of /ai/ monophthongization in African-American and European-American speech in Memphis, Tennessee. *Journal of Sociolinguistics 7*, 279–98.

Fridland, V. (2012). Rebel vowels: How vowel shift patterns are reshaping speech in the modern South. *Language and Linguistics Compass 6*(3), 183–192.

Fridland, V., K. Bartlett, and R. Kreuz (2004). Do you hear what I hear? Experimental measurement of the perceptual salience of acoustically manipulated vowel variants by Southern speakers in Memphis, TN. *Language Variation and Change 16*, 1–16.

Fridland, V., K. Bartlett, and R. Kreuz (2005). Making sense of variation: Pleasantness and education ratings of southern vowel variants. *American Speech 80*(4), 366–387.

Fridland, V., T. Kendall, and C. Farrington (2014). Durational and spectral differences in American English vowels: Dialect variation within and across regions. *Journal of the Acoustical Society of America 136*(1), 341–349.

Fruehwald, J. (2011). The phonological aspect of phonetic change. Paper presented at NWAV 40, Georgetown University, October 30.

Gorman, K. (2010). The consequences of multicollinearity among socioeconomic predictors of negative concord in Philadelphia. *University of Pennsylvania Working Papers in Linguistics 16.2: Selected Papers from NWAV 38*, 66–75.

Gorman, K. and H. Prichard (2014). Measures of education and participation in regional sound change. Paper presented at the LSA Annual Meeting, Minneapolis, January 5.

Heaton, H. (2012). As seen on TV: An acoustic analysis of American Southern dialect. Paper presented at NWAV 41, Bloomington, Indiana, October 27.

Kerswill, P. (2006). Socio-economic class. In C. Llamas and P. Stockwell (Eds.), *The Routledge Companion to Sociolinguistics*. London: Routledge.

Kohn, M. and C. Farrington (2013). A Tale of Two Cities: Community Density and African American English Vowels. *University of Pennsylvania Working Papers in Linguistics 19.2: Selected Papers from NWAV 41*, 101–110.

Kroch, A. (1995). Dialect and style in the speech of upper class Philadelphia. In G. Guy, J. Baugh, D. Schiffrin, and C. Feagin (Eds.), *Towards a Social Science of Language: Papers in Honor of William Labov*. Philadelphia: John Benjamins.

Labov, W. (1966). *The Social Stratification of English in New York City*. Washington, D.C.: Center for Applied Linguistics.

Labov, W. (1989). Exact description of the speech community: Short A in Philadelphia. In R. W. Fasold and D. Schiffrin (Eds.), *Language Change and Variation*, Volume 52 of *Current Issues in Linguistic Theory*. Philadelphia: John Benjamins.

Labov, W. (1994). *Principles of Linguistic Change: Internal Factors*. Oxford: Blackwell.

Labov, W. (2001). *Principles of Linguistic Change: Social Factors*. Oxford: Blackwell.

Labov, W. (2014). The role of African Americans in Philadelphia sound change. *Language Variation and Change 26*, 1–19.

Labov, W., S. Ash, and C. Boberg (2006). *The Atlas of North American English*. Berlin: Mouton de Gruyter.

Labov, W., A. L. Henderson, and S. E. Wagner (2013). The impact of higher education on local phonology. NSF Grant No. BCS-1251437.

Labov, W. and I. Rosenfelder (2011). The Philadelphia Neighborhood Corpus.

Labov, W., I. Rosenfelder, and J. Fruehwald (2013). One hundred years of sound change in Philadelphia: linear incrementation, reversal and re-analysis. *Language 89*(1), 30–65.

Labov, W., M. Yaeger, and R. Steiner (1972). *A Quantitative Study of Sound Change in Progress*. Philadelphia: US Regional Survey: Report on NSF Project no. GS-3287.

Mason, K. C. (2015). "Obama: Community college should be 'as free and universal in America as high school'". *PBS*. Last modified January 20, 2015. http://www.pbs.org/newshour/rundown/community-college-tuition-top-theme-state-union-speech/.

Meyer, J. W. (1977). The effects of education as an institution. *American Journal of Sociology 83*(1), 55–77.

Payne, A. C. (1980). Factors controlling the acquisition of the Philadelphia dialect by out-of-state children. In W. Labov (Ed.), *Locating Language in Time and Space*, pp. 143–178. Academic Press.

Plichta, B. and D. R. Preston (2005). The /ay/s have it: the perception of /ay/ as a north-south stereotype in United States English. *Acta Linguistica Hafniensia: International Journal of Linguistics 37*(1), 107–130.

Prichard, H. (2010). Linguistic variation and change in Atlanta, Georgia. *University of Pennsylvania Working Papers in Linguistics 16.2: Selected Papers from NWAV 38*, 141–149.

Prichard, H. (2012). The role of higher education in socially-motivated correction: a new look at Philadelphia vowels. Ms. (Second Qualifying Paper), University of Pennsylvania.

Prichard, H. and K. Gorman (in prep.). Educational attainment and the retreat from the Philadelphia short-a system.

Prichard, H. and M. Tamminga (2012). The impact of higher education on Philadelphia vowels. *University of Pennsylvania Working Papers in Linguistics 18.2: Selected Papers from NWAV 40*, 87–95.

Rickford, J. R. (1986). The need for new approaches to social class analysis in sociolinguistics. *Language & Communication 6*(3), 215–221.

Risdal, M. and M. Kohn (2013). Ethnolectal and generational differences in vowel trajectories: Evidence from African American English and the recession of the Southern Vowel Shift. Paper presented at NWAV 42, University of Pittsburgh, October 18.

Rosenfelder, I., J. Fruehwald, K. Evanini, S. Seyfarth, K. Gorman, H. Prichard, and J. Yuan (2014). FAVE (Forced Alignment and Vowel Extraction) Program Suite v1.1.3. doi:10.5281/zenodo.9846.

Sneller, B. (2015). Individual conditioning factors and system knowledge contribute to evaluation of phonological systems. Paper presented at PLC 39, University of Pennsylvania, March 21.

Surek-Clark, C. (2000). Dialect acquisition and prestige. *University of Pennsylvania Working Papers in Linguistics 6.3*, 259–267.

Trow, M. (2010a). Elite Higher Education: An Endangered Species? In M. Burrage (Ed.), *Twentieth-Century Higher Education*, pp. 143–174. Baltimore: The Johns Hopkins Press. Originally published in *Minerva 14* (3): 355-76, 1976.

Trow, M. (2010b). From Mass Higher Education to Universal Access. In M. Burrage (Ed.), *Twentieth-Century Higher Education*, pp. 513–553. Baltimore: The Johns Hopkins Press. Originally published in *Minerva 37*: 1-26, 2000.

Trow, M. (2010c). Reflections on the Transition from Elite to Mass to Universal Access. In M. Burrage (Ed.), *Twentieth-Century Higher Education*, pp. 556–610. Baltimore: The Johns Hopkins Press. Originally published in *International Handbook on Higher Education*, New York: Springer, 2006.

Trow, M. (2010d). The Second Transformation of American Secondary Education. In M. Burrage (Ed.), *Twentieth-Century Higher Education*, pp. 55–85. Baltimore: The Johns Hopkins Press. Originally published in *International Journal of Comparative Sociology* 2.2, 1961.

Trudgill, P. (1986). *Dialects in Contact*. Oxford: Basil Blackwell.

Trudgill, P. (1998). The chaos before the order: New Zealand English and the second stage of new-dialect formation. In E. H. Jahr (Ed.), *Advances in historical linguistics*, pp. 1–11. Berlin: Mouton de Gruyter.

Trudgill, P. (2008). Colonial dialect contact in the history of European languages: On the irrelevance of identity to new-dialect formation. *Language in Society 37*(2), 241–254.

Wagner, S. E. (2008). *Linguistic change and stabilization in the transition from adolescence to adulthood*. Ph. D. thesis, University of Pennsylvania.