Speech and Wages

Jeffrey Grogger

University of Chicago Harris School of Public Policy
1155 E. 60th Street
Chicago, IL 60637
jgrogger@uchicago.edu

December 15, 2014

Abstract: Speech is fundamentally human behavior and a topic that has been widely studied. I ask two questions here that have nevertheless received little research attention. The first is whether a worker's speech, in his native language, is related to his wages. The second is whether speech is responsive to economic incentives. To do this I collected audio data, which I transformed and merged to respondents from the NLSY97. The results show that there is a wage premium for mainstream speech that is not explained by education, test scores, family background, or a set of other worker characteristics. The premium is large for workers with more than a high school education and small to non-existent among workers with less schooling. The results suggest that in areas where the mainstream speech premium is higher, at least some speakers are more likely to acquire mainstream speech patterns as children.

For comments and assistance of many different kinds, the author thanks Chenyu Qiu, Brandon Waldon, Chuck Safiran, Nola du Toit, Charles Pierret, and especially Dan Black. This work has been supported by grants from the National Institute of Child Health and Human Development and the Russell Sage Foundation. I am grateful for their support but am solely responsible for the opinions and conclusions expressed herein.

I. Introduction

Speech is fundamentally human, separating us from other forms of life. The literature on language is extensive, even providing an explanation for why we say "razzle dazzle" instead of "dazzle razzle" (Pinker 1999). Here I address two questions which nonetheless have received little attention. The first is whether a worker's speech, in his native language, is related to his wages. The second is whether speech is responsive to economic incentives.

To address these questions, I make use of variation in spoken language stemming from two dialects of American English: African American Vernacular English (AAVE) and Southern American English (SoAE). Both of these dialects differ from Standard American English (SAE) in ways that are well understood (Nagle and Sanders 2003). Both are widely recognized. Linguists have shown that SoAE is a highly salient dialect of American English (Preston 1996; Hartley 1999; Clopper and Pisoni 2004) and have shown that listeners can identify the race of a speaker based on short audio clips (Thomas 2002; Thomas and Reaser 2004).

Moreover, speech plays an important role in how the speaker is perceived by listeners. Social psychologists have shown that both black and white listeners routinely rate AAVE speakers lower in terms of socioeconomic status, intelligence, and even personal attractiveness (Bleile, McGowan and Barnthal 1997; Doss and Gross 1992, 1994; Johnson and Buttny 1982; Koch, Gross, and Kolts 2001). Rodriguez, Cargile, and Rich (2004) show that the greater the occurrence of AAVE linguistic features, the lower is the listener's perception of the speaker's social status. Research similarly has shown

that listeners from outside the South rate SoAE low relative to SAE on certain subjective scales, including correctness and the degree to which the speaker sounds intelligent (Preston 1996, 1999; Hartley 1999, Heblich et al. 2014; Kinzler and Dejesus 2012; Tucker and Lambert 1969). Even many Southerners perceive SoAE negatively on these scales (Bailey and Tillery 1996; Fridland, Bartlett and Kreuz 2005; Fridland and Bartlett 2006).

Other research has argued that distinctive dialects are an important element of social identity (Trudgill 1972, Labov 1966; Fordham and Ogbu 1986; Baugh 1992; Pattillo 1999; Schneider 2003). Recent theoretical work in economics has analyzed how identity may influence economic behavior (Akerlof and Kranton 2000; Austin-Smith and Fryer 2004). Empirical studies have considered how social identification affects education and labor market outcomes (Bertrand and Mullainathan 2004, Fryer and Levitt 2004, Fryer and Torelli 2005).

Other studies indicate that speech may have consequences for diverse aspects of economic behavior. Audit studies indicate that landlords are more likely to show apartments to renters who sound white over the phone (Purnell Idsardi, and Baugh 1999; Massey and Lundy 2001). Falck et al (2012) show that migration is higher between areas with more similar dialects, holding distance constant.

More closely related to the topic of this paper is work on language and the success of immigrants. A wide variety of studies has shown that immigrants generally fare better in the labor market of their host country, the better they speak that country's language (McManus, Gould, and Welch 1983; Chiswick 1991; Trejo 1997, and Bleakley and Chin

2004; Chiswick and Miller 2001). This is consistent with Lang's (1986) model, which predicts that bilingual immigrants should be compensated in a competitive market for the cost of acquiring the host-country language.

Yet the link between speech and wages may be very different for immigrants speaking a second language and non-migrant workers speaking their native tongue. The target language skills of immigrants vary from rudimentary to near-native. At the bottom end of this spectrum, the speaker may struggle to convey basic meaning to the listener. In this study, in contrast, the speakers are generally native English speakers, whose basic meaning is clear to all other native English speakers. Thus the question is not about basic meaning, but rather about other inferences drawn by listeners in response to non-mainstream dialects.

The focus on racial and regional dialects also links this study to the literature on inequality. The paper most closely related to this study showed that black workers whose race was not apparent from their speech had wages similar to those of equally skilled whites (Grogger 2011). This paper extends on that work in several ways. First, it employs a much larger sample, which allows for more flexible regression modeling. Second, it extends the analysis to a second sizeable dialect, namely SoAE, thereby revealing a broader link between speech and the labor market. Third, I go further in discussing economic models that could explain the link between speech and wages. Finally, I also analyze whether speech patterns are responsive to speech-related wage premia. This appears to be the first time that this question has been addressed

The next section of the paper provides important background information on speech. Section III discusses collection and processing of the speech data. Section IV presents the main regression results and some robustness checks. In Section V, I discuss a number of models that could potentially explain why speech is related to wages. I also present some additional regression results. Section VI turns to the question of whether speech patterns are responsive to economic incentives. Section VII concludes.

II. Background on Speech

The linguistics literature provides important background information for the analysis to follow. I focus on two questions. The first is, where does variation in speech come from? The second is, what influences the way we speak our native language?

An important dimension of variation in speech comes from the fact that different speakers of the same language speak different dialects. Like the mainstream standard to which they are related, dialects follow rules implicitly known by all speakers of the dialect. What distinguishes dialects from the standard (and each other) is that some of the rules are different.

The rules in question can involve different aspects of speech, including syntax (e.g., negation rules), morphology (e.g., subject-verb agreement), and phonology (e.g., the way vowels are produced). Furthermore, rules may be variably applied. Few speakers apply only the rules of their native dialect. Most incorporate both dialect and mainstream rules at different times (Labov 1972).

The literature on second language acquisition shows evidence of a "sensitive period" for native dialect acquisition. Before the sensitive period ends, children are

capable of acquiring native-sound speech in whatever language they are exposed to. Once the sensitive period ends, it is much more difficult to acquire a native-sounding accent in a second language.

There is some debate as to when the sensitive period ends, but a fair amount of agreement that it is over before puberty concludes (Johnson and Newport 1989; Hyltenstam and Abrahamsson 2003; Granena and Long 2013). There is some evidence that different aspects of language acquisition have different sensitive periods. For example, the sensitive period for the acquisition of native-sounding phonology may end as early as age seven or eight, whereas the sensitive period for morphology may extend into the teens (Granena and Long 2013; Siegel 2010). Second dialect acquisition is similar to second language acquisition, in that it is difficult to acquire a native-sounding accent in a second dialect after the sensitive period ends (Siegel 2010). The evidence indicates further that one tends to acquire one's native accent from one's linguistic peers during the sensitive period, rather than from one's parents or other sources such as broadcast media (Labov 1972).

Linguists have shown that roughly 40 features differentiate AAVE from SAE. These features occur at the level of syntax, morphology, phonology, and even acoustics (Bailey and Thomas 1998; Clopper and Pisoni 2004; Green 1998; Labov 1972; Martin and Wolfram 1998; Mufwene 1998; Rickford and Rafal 1996; Thomas and Reaser 2004; Walton and Orlikoff 1994; Washington and Craig 2002; Wolfram 1969, 1991). Thomas and Reaser (2004) conclude that listeners rely on these features, as well as the speaker's cadence and intonation, to identify race on the basis of speech.

The literature also shows that SoAE differs from SAE in many ways. Differences in the way vowels are articulated play a particularly important role in distinguishing Southern from mainstream English (Dorrill 2003; Kurath and McDonald 1961). Some syntactical and morphological features that distinguish SoAE also appear in AAVE (Fasold 1981; Cukor-Avila 2003).

III. Data

A. General information

Data come from the 1997 cohort of the National Longitudinal Survey of Youth (NLSY97), which is a large, nationally representative panel survey of the labor market behavior of youths who were aged 12 to 16 in 1997. The main interviews are conducted annually by NORC, a social science research organization affiliated with the University of Chicago which conducts the survey on behalf of the federal Bureau of Labor Statistics. The Center for Human Resource Research (CHRR) at Ohio State University provides technical support for the project, programming the computer-assisted personal interviewing (CAPI) system that resides on interviewers' laptops. CHRR also prepares the data for public release and provides user support.

NLSY interviews cover topics such as schooling, employment, earnings, sources of income, dating, sex-related behavior, family formation, substance abuse, and crime, among others. The response rates for recent interviews have been roughly 80 percent. Roughly 85 percent of the interviews are carried out in person.

B. Audio data collection

Audio data were collected during Round 15 of the NLSY97, which was fielded between September 2011 and June 2012. The data were collected in response to two speech prompts, designed to capture both informal and formal speech. One prompt was administered at the end of the interview, when respondents were asked to recount the happiest moment (HM) in their life since the date of their last interview. The second question involved a job-search (JS) role-playing exercise. Administered during the employment section of the interview, respondents were asked:

> Let's suppose you applied for a job that sounded really interesting to you and they called you and asked you to come in for an interview. How would you describe your skills, qualifications, and experience to me if I were the person interviewing you for this job? (Employed respondents heard a slightly different preamble to the question.)

All respondents who conducted in-person interviews and who gave consent to be recorded were eligible to be assigned at least one speech prompt. Answers were recorded by the on-board microphone in each field interviewer's (FI's) laptop. To make the recording, the CAPI interview software was programmed to turn on the FI's laptop microphone for one minute once a prompt was reached. FI's were provided with instructions designed to keep the respondent talking for as much of that minute as possible.

Because of similarities between AAVE and SoAE dialects, both stimulus questions were assigned to all African-American respondents Southern white respondents. Southern white respondents are defined as non-Hispanic whites who resided in the South

Census region at age 12. Residence at age 12 is provided in the NLSY97. In light of what is known about language acquisition, it would be desirable to have more information about the respondent's residential history as a child. Fortunately, age 12 corresponds at least roughly to the end of the sensitive period for dialect acquisition.

A random sample of 500 respondents who were neither black nor Southern white were also to be assigned both speech prompts, as were roughly 295 other respondents for whom speech data was collected in 2006 as part of my earlier study (Grogger 2011) but who were not included in the other categories above. All other speakers, including non-Southern white respondents and all other respondents, were randomly assigned to only one of the speech prompts.

Table 1 provides data on Round-15 speech-prompt sampling and response rates, disaggregated by race/region at age 12. Of the 8,984 original NLSY97 respondents, 7,423 were interviewed during Round 15. Among those interviews, 6,579 were carried out in-person. Among those, 6,080 provided consent and were thus eligible to be recorded. The share of Round 15 respondents providing in-person interviews and consent to be recorded was .83 for blacks, .80 for both white groups, and .84 for the other group.

The center panel of the Table shows how eligible respondents were assigned to speech prompts. For the most part, the assignments followed the sampling plan fairly closely. All but seven of the black respondents, and all but two of the Southern white respondents, were assigned both questions. Among non-Southern whites and others, 795

respondents were assigned to both stimulus questions. Ten otherwise eligible respondents were not assigned either speech question.

The bottom panel of the Table provides counts of eligible respondents for whom audio files were actually generated by the interviews. There is a troubling discrepancy between the number of respondents from whom audio data should have been collected and the number from whom it was actually collected. Of the 6,080 eligible respondents, audio files were obtained from only 4,907. The rate of loss among eligibles was 17 percent for blacks and Southern whites, 21 percent for non-Southern whites, and 20 percent for others. The panel also shows that there were black and Southern whites respondents for whom only one audio file was obtained, when there should have been two.

The reasons for this loss of data are unclear. I have been assured by NORC staff that this is not a matter of misplaced audio files; rather, that audio files never existed for the 1,173 (=6,080-4,907) respondents who were eligible to be recorded but for whom no audio data are available. One possibility is that a flaw in the CAPI program allowed FIs to skip the recordings. If so, any such skipping would appear to have been unintentional, since the loss of recordings is widely distributed among FIs, rather than being concentrated among particular FIs.

C. Producing numerical data from the audio files

To generate data suitable for regression analysis, I recruited anonymous listeners to listen to the audio files and answer questions about the speakers. After listening to each audio file, listeners were asked to specify the speaker's sex, race/ethnicity, and

region of origin. Three listeners were assigned to each audio file. Thus speakers who responded to both the HM and JS prompts have six listener reports, whereas speakers who responded to only one of the prompts have three. To deal with data security issues surrounding the use of potentially identifying voice data, listeners were recruited from the pool of NORC field interviewers and research assistants. Data processing was carried out remotely using specially configured laptops that provided secure connections to NORC's computer network, where the audio files resided. All listeners received confidentiality training stipulated by both NORC and BLS.

Summary characteristics of the listeners are reported in Table 2. The modal listener was white and female, reflecting the demographics of NORC's workforce. Listeners were drawn from throughout the US, with a disproportion of Midwesterners. All listeners had completed high school; most had at least some tertiary education. The 22 listeners who listened to the JS audio files tended to be older, more Southern, and less educated than the 43 listeners who listened to the HM audio files (10 listened to both). Care was taken to ensure that speakers were not assigned to listeners who had interviewed them during Round 15.[1]

The HM files were processed first. All speakers with an HM audio file were in-scope for HM data processing unless the file was empty or unintelligible. The top part of Table 3 shows that about 94 percent of the HM audio files were in-scope, where this fraction varied from 89 percent for black speakers to 99 percent for non-Southern whites.

[1] Listener reports of the speaker's race and region varied by characteristics of the listener. However, listener characteristics do not have much effect on the estimated relationship between speech and wages, as I demonstrate below.

Budgetary issues limited the scope of processing for the JS files. The goals for JS file processing were to maximize the number of black and Southern whites for whom both HM and JS data were available, and to maximize the number of non-Southern whites for whom data from at least one of the speech prompts would be available, while meeting the project budget constraint. A handful of "other" speakers were processed as well. As with the HM data, JS files that were empty or inaudible were deemed out of scope. The middle part of Table 3 shows that 83 percent of the available JS files for black speakers were processed, compared to 92 percent of those for Southern whites and 79 percent of those for non-Southern whites. Speech data from at least one prompt are available for a total of 4,225 NLSY respondents.

Since speech data are unavailable for a sizable share of the sample, it is natural to ask how respondents with speech data compare to respondents without it. Table 4 provides such a comparison in terms of many variables thought to influence wages. The table is disaggregated by the respondent's race/region at age 12.

For blacks, the two groups are fairly similar. One exception involves the respondent's education, where 25.9 percent of those with speech data have some college, compared to 30.3 percent of those without speech data. Other variables involving noteworthy differences include the share of respondents growing up with two parents and the distribution of maternal education.

For the other groups the differences are greater. For both groups of whites and the other group there are differences in urban residence, marital status, and AFQT scores among those with and without speech data. For both white groups there are differences

in household income in 1997 (when the respondents were living with their parents) as well. There are further differences in maternal education among Southern whites and respondent education among non-Southern whites. These differences may limit the inferences that can be drawn from the analyses below.

D. Listener reports of speakers' race and region

Table 5 reports the distribution of listener reports that the speaker is black (first two columns) or Southern (last two columns). The vast majority of blacks and Southern whites responded to both speech prompts and thus had six listener reports (tabulations for those who responded to only one prompt appear in Appendix Table 1). Thus zero to six listeners could have reported the speaker to be black, and likewise, zero to six listeners could have reported the speaker to be Southern. Since non-Southern whites and the "other" group responded to only one speech prompt, the corresponding range for them is zero to three.

Column (2) shows that at least one listener reported all but 5.5 percent of the black speakers to be black. At the same time, all six listeners concurred that 32.6 percent of the black speakers were black. Seventy-one percent of the black speakers were perceived to be black by at least four listeners.

Moving down the column, we see that 60.6 percent of Southern white speakers were not reported to be black by any of the listeners. Of the remainder, most were reported to be black by only a single listener. Considering the similarities between AAVE and SoAE as discussed above, this level of confusion is not surprising. There is considerably less such confusion when it comes to non-Southern whites, of whom only

10.9 (=100-89.1) percent were reported to be black by any of the listeners. For speakers in the "other" group, made up largely of Latinos and Asians, the corresponding number is 25.3 percent.

Column (4) shows the distribution of listeners reporting that the speaker was Southern. For 16.7 percent of the blacks, none of the listeners perceived the speaker to be Southern. All six listeners reported 8.3 percent of the black speakers to be Southern. The distribution between these extremes was roughly constant. As shown in Table 2, 58 percent of blacks lived in the South at age 12. The rough uniformity of listener reports that black speakers sound Southern may have to do with similarities between AAVE and SoAE.

The distribution for Southern whites shows that 76.1 percent were reported to be Southern by at least one listener. At the same time, 31.7 percent of Southern whites were reported to be Southern by four or more listeners. This compares well to findings by Baily and Tillery (1996), who report that 32 percent of Southern residents sound "strongly Southern."

Although non-Southern whites have only three listener reports, compared to most Southern whites' six, the data show nonetheless that the distribution of Southern-sounding speech is very different between the two groups. To see this, suppose that we obtained three additional listener reports for each non-Southern white. In the very unlikely event that every additional listener reported every speaker to be Southern, the share of non-Southern whites reported to be Southern would be only 24.4 percent,

compared to 31.7 percent for the Southern whites. Roughly one-third of the "other" group is reported to sound Southern by at least one listener.

E. Speech Patterns and Human Capital

I conclude this section by presenting data on speech patterns and human capital. I consider two measures of human capital: years of education and Armed Forces Qualifying Test (AFQT) scores. Years of education are the highest level of schooling observed by 2011, when the NLSY97 respondents were 26 to 30 years old. The AFQT is a test administered by the Department of Defense for the purpose of screening recruits. It was taken by NLSY97 respondents in 1997. It has been interpreted as a measure of ability or pre-market skills in a number of previous wage studies (Altonji and Pierret 2001; Cameron and Heckman 1993; Farber and Gibbons 1996; Neal and Johnson 1996). The NLSY97 provides percentile scores, which I have standardized to have mean zero and standard deviation one (in the full sample). In this table I restrict attention to white and black males, as I will in the wage regressions below.

There is a strong relationship between speech patterns, measured as the number of listeners reporting that the speaker is black, and human capital. Among blacks, there is a difference of almost three years of education, and a full standard deviation of AFQT score, between the extremes of the speech pattern distribution. A similarly strong pattern appears among Southern whites, although some of the cell sizes are small. The pattern is weaker among non-Southern whites.

The lower panel of the Table displays human capital as a function of the number of listeners reporting that the speaker is Southern. Here too, the relationship between

speech patterns, schooling, and AFQT scores is strong. Among blacks, there is a difference of 2.35 years of education, and 0.82 standard deviations of AFQT score, between the extremes of the speech pattern distribution. For Southern whites, the differences are larger: 3.76 years of schooling and 1.31 standard deviations of AFQT score. For non-Southern whites, the differences are 2.81 years of schooling and 0.85 standard deviations of AFQT score.

Grogger (2011) showed that there was a strong relationship between speech patterns and human capital among African Americans. Table 6 extends those findings. It shows that speech reveals large differences in human capital not just among blacks, but also among whites. It shows that for whites, Southern-sounding speech is more highly correlated with human capital than black-sounding speech. For Southern whites, the correlation between speech patterns and human capital is particularly strong. I analyze the relationship between speech patterns and wages in the next section.

IV. Regression analysis of wages

A. The regression model

I estimate regressions where the log of the hourly wage is the dependent variable. I restrict attention to workers who are either black or white in order to focus on workers who are likely native English speakers.[2] I restrict attention to males to avoid the sample selection issues that arise among women of prime childbearing age. I pool data over the years 2005-2011. Thus the mean age of workers in the estimation sample is 26. I further limit the sample to workers who have spent at least two consecutive years out of school,

[2] The NLSY97 has questions about languages spoken by other people in the respondent's childhood home, but no questions that ask directly what languages are spoken by the respondent.

in order to focus on those whose primary activity is likely to be employment, rather than education.[3]

The key explanatory variables in the regression are dummy variables for race/region at age 12 (i.e., black and Southern white dummies, where non-Southern whites constitute the omitted category) and variables capturing the worker's speech pattern. Also included are a basic set of human capital variables, including dummy variables for educational attainment, experience, and experience squared. The basic regressor set also includes dummies for whether the worker currently resides in the South, currently resides in an urban area, and is currently married.[4]

The first column of Table 7 reports for purpose of comparison estimates from a wage equation that does not include any measures of speech. The coefficient on the black dummy is -0.105 and significant. The coefficient indicating that the worker resided in the South at age 12 is 0.030 and insignificant. The other coefficients in the model are largely as one might expect.

B. Alternative representations of speech

An important question is how to represent workers' speech patterns in a regression model. Table 7 shows results from a number of different specifications. The first, in column (2), is the simplest. For workers with six listener reports, the second row

[3] I also eliminate observations of wages that are less than $1/hour or greater than $60/hour, where wages are expressed in terms of 2008 dollars. I also drop wage observations during periods when the worker reports himself to be self-employed.

[4] In this and all other regressions reported below, in addition to variables shown, the regressions include year dummies and missing value flags for region, educational attainment, and urbanicity. Missing value flags equal one when the corresponding variable is missing and equal zero otherwise. Missing values of the corresponding variable are recoded to zero..

reports the coefficient on the number of listener reports that the worker is black. For workers who responded to only one of the speech prompts, and who therefore have only three listener reports, this variable equals two times the number of actual listener reports that the speaker was black. The coefficient is -0.036 and statistically significant, indicating that the wage of a worker with six such reports on average is 18 percent lower than that of a worker with one such report. The coefficient on the black dummy indicates that black workers not reported to be black by any of the listeners have wages 2.4 percent less than those of similarly skilled whites.

In the 13th row of the table is the coefficient on the number of listener reports that the worker was Southern.[5] This coefficient is -0.050 and statistically significant. Workers reported to be Southern by six listeners earn wages roughly 25 percent lower than workers reported to be Southern by only one listener. Including the speech variable raises the South-at-age-12 coefficient a bit, but it remains insignificant.

Column (3) replaces the simple speech-pattern variables above with analogous variables designed to check whether listener characteristics affect the results. To construct it, I estimated two regressions for which the unit of observation was the speaker-listener pair. In the first, the dependent variable was equal to one if the listener reported the speaker to be black and was equal to zero otherwise. The explanatory variables were dummy variables for each listener and a dummy equal to one for responses to the job-search prompt. The second regression was similar, except the

[5] As above, each report for workers who responded to only one speech prompt was treated as if it represented two reports.

dependent variable equaled one if the listener reported the speaker to be Southern and equaled zero otherwise. I then summed the residuals for each speaker.

These sums of residualized listener reports were included in the regression that appears in column (3). Purging the speech variables of listener characteristics in this way has little effect on the estimates: the coefficient on the black speech measure falls a bit (in absolute value) whereas the coefficient on the Southern speech measure rises a bit. Presumably, aggregating over multiple listener reports already neutralizes the effect of any individual listener's characteristics, so that explicitly eliminating the effects of listener characteristics has little bearing on the regression results.

The regressions discussed so far impose linearity, whose main virtue is simplicity. The regression in column (4) relaxes that constraint. Here I replace the previous speech measures with two sets of dummies. One set contains one dummy variable for each possible number of listener reports that the speaker is black. The other contains one dummy variable for each possible number of listener reports that the speaker is Southern. In both cases, speakers with no such listener reports constitute the omitted group. As above, for speakers who responded to only one of the speech prompts, I classify the speakers as if they had twice the number of actual listener reports indicating that they were black or Southern.

The estimates show a strong and rather non-linear relationship between speech patterns and wages. The coefficients for the dummies indicating that one, two, or three listeners reported the speaker to be black have mixed signs and are insignificant. The coefficients for the dummies indicating that four, five, or six listeners reported the

speaker to be black are all negative and sizeable and two are statistically significant. The F-statistic for the joint significance of all six dummies is 2.97, with a p-value of 0.007.

Turning to the estimates for Southern speech patterns, all six coefficients are negative. The coefficients for the dummies indicating that one, two, or three listeners reported the speaker to be Southern are insignificant; those indicating that four, five, or six listeners reported the speaker to be Southern are all sizeable and statistically significant. The F-statistic for the joint significance of all six dummies is 3.14, with a p-value of 0.005.

The results from this flexible specification of speech patterns show a strong and non-linear relationship between wages, black-sounding speech, and Southern-sounding speech. At the same time, the large number of coefficients makes the specification unwieldy. To simplify the discussion to follow, I adopt a simplified specification that nonetheless preserves the main dimension of the non-linearity. I also interact the speech measures with the race/region dummies to facilitate race- and region-specific analyses that I discuss below.

To capture black-sounding speech, I dichotomize the number of listener reports that the speaker was black. I construct one dummy that is equal to one for speakers with fewer than four such reports and equal to zero otherwise. By this measure, 29 percent of blacks have mainstream speech. I interact this dummy with the black dummy, and refer to the interaction as "black * mainstream speech". For white speakers (regardless of region at age 12), I construct a complementary dummy that is equal to one for speakers

with four or more listener reports that the speaker was black and equal to zero otherwise. I refer to this variable as "white * black speech."

I construct similar variables to capture Southern-sounding speech. One is a dummy that is equal to one for speakers with fewer than four listener reports that the speaker is Southern and equal to zero otherwise. By this measure, 68 percent of Southerners have mainstream speech. I interact this dummy with the South-at-age-12 dummy, and refer to the interaction as "South * mainstream speech". For speakers who did not reside in the South at age 12 (regardless of race), I construct a complementary dummy that is equal to one for speakers with four or more listener reports that the speaker was Southern and equal to zero otherwise. I refer to this variable as "non-South * Southern speech."

Regression results that make use of these variables appear in column (5). The black coefficient now measures the wage gap between blacks whose voices are distinctively black and non-Southern whites who sound neither black nor Southern. The coefficient is -0.140 and significant. Black workers with mainstream speech earn 11.5 percent more than blacks with distinctively black speech. Adding these coefficients shows that black workers with mainstream speech patterns earn 2.5 percent (standard error =4.1 percent) less than comparably skilled whites, on average. The results also show that whites whose voices are perceived as black earn 15.4 percent less than whites with mainstream speech.

The South-at-age-12 coefficient now measures the difference in log wages between workers who resided in the south at age 12 and have Southern-sounding speech

patterns and non-Southern white workers who have mainstream speech patterns. The coefficient is negative but insignificant. However, the South*mainstream speech coefficient indicates that Southerners with mainstream speech patterns earn 10.3 percent more than Southerners with distinctively Southern speech. At the same time, non-Southerners who are perceived as sounding Southern earn wages 9.7 percent lower than non-Southerners with mainstream speech.

The results here pertaining to black-sounding speech are consistent with those in Grogger (2011). Workers whose speech sounds distinctively black earn lower wages than others, whereas African American workers with mainstream speech have wages nearly the same as those of their similarly skilled white counterparts. The results regarding Southern speech are new, and indicate that wage inequality extends more broadly along the lines of speech than was previously recognized. Although Southern-sounding Southerners are not significantly penalized for their speech relative to mainstream non-Southerners, Southerners with mainstream speech earn significantly higher wages.

C. Further wage regressions

A natural question is whether these regression estimates reflect the effect of speech per se, or whether they are also picking up unobservable characteristics of workers that are correlated with both speech and labor market productivity. The discussion in Section II suggests that it is probably impossible to isolate the effect of speech completely. Children acquire their native dialects before puberty, and they acquire them from their linguistic peers. This means that to isolate the effect of speech,

one would have to randomly assign pre-pubescent children to different linguistic peer groups in such a way as to influence their speech without influencing them in other ways that might affect their eventual labor market productivity. Since linguistic peer groups are probably composed of children who live in the same neighborhood or attend the same school, it's hard to see how one could do such a thing even conceptually.

However, one can ask a related question, which is whether the effects attributable to speech stem rather from family characteristics that are likely to affect both the worker's linguistic peer group as a child and his labor market productivity as an adult. The NLSY97 provides measures of a number of such characteristics, including family structure, household income in 1997 (expressed in $10,000s), and maternal and paternal education. It also provides data on whether the worker attended a Catholic or private school and the AFQT score, which may provide an indicator of the quality of the education that the worker received.

Column (1) of Table 8 presents results from a regression that adds these variables to the specification from column (5) of Table 7.[6] Although many of these variables are not significant, with maternal education providing an important exception, adding them to the regression reduces the coefficient on the black dummy from -0.140 to -0.098. Thus about one-third of the wage gap between black workers with racially distinctive speech patterns and non-Southern whites with mainstream speech patterns can be explained by variables related to family background and school quality. However, adding these variables has much less effect on the mainstream speech premium for blacks, reducing it

[6] All regressions that include this extended set of regressors also includes missing value flags for household income and parental education.

only from 0.115 to 0.107. The mainstream speech premium for Southerners falls a bit more, from 0.103 to 0.085, but it remains highly significant.

The next two columns present results from the subsamples of black and Southern white workers, respectively. These regressions allow for coefficient heterogeneity between groups. Restricting the sample to blacks in column (2) reduces the mainstream speech premium from 0.107 to 0.086, although it remains significant at the 10 percent level. The South-at-age-12 coefficient is essentially zero, whereas the South*mainstream speech effect shows that blacks from the South whose speech is not regionally distinctive earn a small but insignificant wage premium. The South*mainstream speech coefficient in column (3) shows that mainstream Southern whites earn 12.1 percent more than Southern whites whose speech is distinctively Southern.

In column (4) I return to the pooled sample, but add dummies for two-digit occupation codes. One might expect speech patterns to influence occupation, which in turn could influence wages. However, both of the mainstream speech coefficients remain large and significant.

Another issue of potential interest involves so-called code shifting. This is a special case of style shifting, or altering one's speech, particularly in terms of its formality, depending on context. A number of authors have argued that some African Americans adopt more mainstream usage in formal contexts such as work, while using more AAVE features in less formal settings (Labov 1972; Baugh 1983; Rahman 2008).

To construct a measure of code shifting, I compare listener perceptions of the speaker's speech between the two different speech prompts. The expectation was that

speakers would use more formal speech in response to the job search prompt than in response to the happiest moment prompt. To measure code shifting, I construct two dummies. One is equal to one if fewer listeners reported the speaker to be black on the basis of the JS prompt than on the basis of the HM prompt. The other is equal to one if fewer listeners reported the speaker to be Southern on the basis of the JS prompt than on the basis of the HM prompt. I interact the former dummy with the black dummy and the latter one with the South-at-age-12 dummy.

Because this exercise requires me to drop blacks and Southern whites from the sample who responded to only one of the speech prompts, I present in column (5) results from a regression based on this subsample that does not include the code shifting variables. For the most part, the estimates in column (5) are comparable to those in column (1), which are based all data available.

Column (6) reports estimates based on the model that includes the code-shifting dummies. Surprisingly, both coefficients are negative, although both are larger than their standard errors. Code shifting, as least as measured here, does not help explain the speech coefficients.

D. Additional specification issues

In this section I address some further issues that may bear on the validity of the regression results. One involves the availability of wage data. Even after a workers leaves school, there are many periods when The NLSY97 does not observe his wages, either because he is not employed or because of item non-response. If wages are missing

non-randomly in a manner that is correlated with speech patterns, then the speech coefficients could reflect on the process underlying the missing data rather than speech.

Table 9 presents results from a regression that addresses this issue. The sample includes all person-years when the worker satisfies the sample inclusion criteria discussed in Section VI.A. The dependent variable equals one if a wage is observed and zero otherwise. The regression includes all the variables included in the wage regression reported in column (1) of Table 8. Only variables related to race, region of origin, and speech are included here in order to save space.

None of the variables shown is significantly related to the availability of wage data. The joint F-statistic for all the variables shown is 1.27, with a p-value of 0.27. Race, region, and speech are largely unrelated to missing wages.

Another question is whether workers can adapt their speech. Although the language-acquisition literature shows that it is difficult to acquire a native-sounding accent in a second language or dialect after puberty, some workers may nevertheless be able to adopt more mainstream speech patterns as adults if they perceive it to be in their interest to do so. Such adaptation could exaggerate the extent of wage inequality stemming from speech if workers facing higher wage prospects are those most able to adapt.

The speech data can be used to provide some evidence on this account, although only a bit. For this I combine the speech data here with speech data from Grogger (2011). Data for that study were collected in 2006. As with the data here, anonymous listeners listened to short audio clips and answered short questions about the speakers. In the 2006

data, speakers who were perceived as black by at least four out of five listeners were categorized as having distinctively black speech. I refer to the remainder as having mainstream speech. Likewise, speakers who were perceived as Southern by at least four out of five listeners were categorized as having distinctively Southern speech. I refer to the remainder as having mainstream speech.

The main limitation of this approach is that there are few NLSY97 respondents with speech data from both 2006 and 2011. Speech data from 2006 were originally available for 124 black and 77 Southern white respondents. Due to non-response and missing data issues, only 58 of those black respondents, and 43 of the Southern white respondents, also have speech data from 2011.

Table 10 presents cross-tabulations of 2006 speech patterns by 2011 speech patterns separately for blacks and Southern whites. The first three columns of the top panel show that 36 of 40 black speakers classified as having distinctive speech patterns in 2006 were similarly classified in 2011. Ten of 18 black speakers were who were classified as mainstream speakers in 2006 were classified the same way in 2011. Among Southern whites, 10 of 17 speakers classified as having distinctive speech patterns in 2006 were similarly classified in 2011. Twenty of 26 speakers classified as mainstream in 2006 were also classified as mainstream in 2011.

As argued above, a problem arises if persistence of speech patterns varies between workers as a function of wage opportunities related to their speech. If we believe that speech patterns are more important for more educated workers, we would

want to compare changes in speech patterns between 2006 and 2011 according to educational attainment.

The remaining columns of Table 10 disaggregate the cross-tabulations according to whether the speaker had a high school diploma or less on the one hand, or more than a high school diploma on the other. Stability in speech patterns is fairly similar between education groups, in the sense that the diagonal elements tend to be larger than the off-diagonal elements, and off-diagonal elements are roughly comparable in magnitude. The exception involves better-educated Southern whites whose speech was classified as distinctive in 2006, but since there were only four such speakers, firm conclusions are difficult to draw.

Another concern involves the young age of the sample members. One might be concerned that any results obtained from young workers might change as they age. Although there are limits to what one can do, given the basic age limits of the sample, Appendix Table 2 reports estimates from regressions that impose various minimum age thresholds. Most of the speech premia change little as the minimum age rises, and if anything, they tend to rise rather than fall.

Before moving on, I consider the potential role of some additional, usually unobserved characteristics. The NLSY97 contains personality scores, called the Ten Item Personality Inventory, or TIPI; measures of respondents' skin color as reported by an interviewer, on a scale of 1 (lightest) to 10 (darkest); and indicators of whether the respondent has been arrested or incarcerated. I code the personality scores as suggested by Gosling et al (2003) and the skin color measures as suggested by Kreisman and

Rangel (2013). I code one dummy variable equal to one if the respondent ever reports being arrested and another one equal to one if he ever reports being incarcerated. Appendix Table 3 reports estimates from wage regressions that include these variables. None has much effect on the estimated speech-related wage premia.[7]

V. Explaining the relationship between speech patterns and wages

The analysis above shows a strong relationship between speech patterns and wages. It also shows that that relationship cannot be explained by omitted variable bias involving family income, family structure, parental education, personality traits, arrest records, or test scores. In this section I ask what types of economic models might predict the observed relationship. I discuss in turn a model of discrimination, a model of employer learning with statistical discrimination, and an identity model with human capital signaling.

One candidate to explain the link between speech and wages involves discrimination against non-mainstream speech. If employers differed in their level of prejudice toward non-mainstream speakers along the lines of Becker (1968), distinctive speakers would tend to sort themselves toward the least prejudiced employers, and one would expect the speech-related wage penalty for distinctive speech within a labor market to reflect the distaste of the marginal employer in the labor market, that is, the most prejudiced employer who actually hired non-mainstream speakers. With data that represented tastes toward distinctive speech among employers in different labor markets, one could test this prediction along the lines used by Charles and Guryan (2008) to test

[7] The skin-color variables do greatly reduce the coefficient on the black dummy. However, that result is hard to interpret, since the coefficients on the skin-color dummies (not shown) are highly non-monotonic in skin color.

for racial prejudice in wage setting. The problem is that such data do not seem to exist. Dialectologists have produced data characterizing attitudes toward speech among college students in a few locales such as Michigan, Indiana, and South Carolina, but nationally representative data do not appear to exist (Preston 1996).

In models of employer learning with statistical discrimination (ELSD), employers base initial wages on readily observed characteristics such as education. Over time, however, as employers gain more information about the workers initially unobservable productivity, productivity has a greater effect on wages and observable indicators such as education lose their importance (Altonji and Pierret 2001).

Altonji and Pierret tested such a model by estimating wage regressions that included race, education, and a proxy for initially unobservable productivity as well as interactions between those variables and experience. If race is negatively correlated with unobservable aspects of productivity, due to racial differences in school quality, for example, and employers initially treat race as an unobservable (due to legal restrictions about basing wages on race), then the main effects of race and productivity should be zero, but grow in absolute value over time. At the same time, the main effect of education should be positive, but the education-experience interaction should be negative.

In contrast to the discrimination model discussed above, one can provide evidence on the ELSD model based on data available in the NLSY97. However, one requires some assumptions and some proxies for initially unobservable productivity. I assume that speech is initially observable, since employment law does not forbid speech from being used in wage determination. It seems reasonable to assume that mainstream speech

is positively correlated with productivity, based on the data from Table 6. For productivity proxies, I use the AFQT score, as did Altonji and Pierret, and household income in 1997. Household income seems unlikely to be observed well by employers and it was positive and significant in the regressions reported in Table 9.

Table 11 presents regressions designed to test whether ELSD explains the observed relationship between speech patterns and wages. Due to the large number of interaction terms, I have streamlined the specification a bit, replacing the four educational attainment variables with years of education and dropping the parental education, family structure, and Catholic/private school dummies. The first two columns employ the AFQT as the proxy for productivity. The second two employ household income. Columns (1) and (3) present regressions that exclude experience interactions. The race/region and speech coefficients are similar to those presented in Tables 7 and 8.

Columns (2) and (4) present regressions that include interactions between experience and education, the race and region dummies, and the interactions between black and mainstream speech and South and mainstream speech. Adding the interactions to the model raises the mainstream-speech coefficients, consistent with the idea that the effect of an observable such as speech may have larger effects among new workers. However, the interactions between experience and the mainstream speech accord only partially with the ELSD model, since the black*mainstream*experience coefficients are insignificant and the South*mainstream*experience coefficients are marginally significant. Neither the AFQT-experience interaction nor the household income-experience interaction is significant, which the model predicts if indeed those variables

provide reasonable proxies for productivity. Finally, the education-experience interaction is insignificant, contrary to expectation.

Finally, I consider a model proposed by Kim and Loury (2012). Workers who are members of an abstract identity group choose whether to adopt the distinctive identity of that group or whether to adopt a mainstream identity. They also choose whether to invest in human capital. Employers assign workers to jobs on the basis the worker's chosen identity, which is observed, an imperfect indicator of the worker's human capital, and the employer's own belief about the investment behavior of the workers with the observed identity.

In Kim and Loury, both the identity group and the means of expressing that identity are abstract. Here I have two separate identity groups, blacks and Southern whites. I equate identity to speech, assuming that each worker either speaks in a manner that is racially or regionally distinctive, or alternatively, adopts mainstream speech patterns. Aside from my use of more concrete terminology, the model described below is taken directly from Kim and Loury (2012).

Agents are endowed with two attributes, talent and linguistic aptitude. Greater talent reduces the cost c of acquiring human capital e. Greater linguistic aptitude reduces the cost k of acquiring mainstream speech. It is assumed that c and k are statistically independent, so talent cannot be inferred from speech.

Talent is not directly productive in the labor market, but human capital is. With knowledge of c and k, agents choose whether to invest in human capital, in which case e=1. Otherwise e=0. They also choose whether to adopt mainstream speech or the

distinctive speech of their identity group. Although it is convenient to say that agents make these decisions, it is more realistic to think of these decisions as being made by parents, considering that the costs of acquiring mainstream speech are lowest when the agent is young.

Employers cannot observe either c or k. Furthermore, they cannot observe the worker's human capital e, but only a noisy indicator of it. They do observe the worker's speech. Employers have beliefs about the share of the worker's speech group that invests in human capital. They use those beliefs, the worker's speech, and the worker's noisy human capital indicator to equate the wage they pay to the worker's expected productivity.

If employers believe that the human capital level of the mainstream speech group is greater than that of the distinctive-speech group, and a number of technical assumptions are satisfied, the Kim-Loury model yields an equilibrium in which higher-talent agents are more likely to invest in human capital. The model predicts that: (i) higher-talent agents should be more likely to adopt mainstream speech; (ii) mainstream speakers should have higher returns to human capital; and (iii) agents with greater talent should have higher returns to mainstream speech.

Evidence consistent with prediction (i) appears in Table 6, since more talented individuals acquire more human capital, and human capital is positively correlated with mainstream speech. Evidence on prediction (ii) is reported in Table 12, in the form of regressions for the two identity groups, blacks and Southern whites, estimated separately

by speech pattern.[8] For both blacks and Southern whites, the education coefficients are much larger for the mainstream speakers than for those with racially or regionally distinctive speech.

Evidence on prediction (iii) is reported in Table 13. There I disaggregate the sample by workers' of human capital, specifically, according to whether they have high school diploma or less versus more than a high school diploma.. For both blacks and Southern whites, the mainstream speech premium is large and statistically significant for the better educated group. For the groups with less education, the mainstream speech premium is small and insignificant.

Thus the data are consistent with three predictions from Kim and Loury's identity model. However, their model also predicts that at least half of the workers in each identity group should choose the mainstream identity. This prediction bears out for Southern whites, of whom 68 percent have mainstream speech. However, it fails for blacks, of whom only 29 percent adopt mainstream speech.

VI. Is speech influenced by economic incentives?

The regression analysis above shows that mainstream speech is associated with higher wages. Such speech-related wage premia presumably provide incentives for parents to invest in their children while the cost of acquiring particular speech patterns is relatively low so as to facilitate their adopting mainstream speech. In this section, I ask whether speech patterns are responsive to wage incentives.

[8] In addition to the variables shown, all regressions in Table 12 include all the variables included in the regressions that appear in Table 8.

In an ideal setting, I would regress the mainstream speech indicator for each NLSY97 respondent on his parents' expectation of the speech-related wage premium in his future labor market, along with controls for the respondent's idiosyncratic costs of acquiring mainstream speech. In practice, the data permit me to estimate actual mainstream speech premia by state of residence during adulthood. Furthermore, because I do not observe data directly related to the cost of dialect acquisition, I control instead for parental characteristics that may be correlated with parents' behavior toward their children's speech.

Complicating matters further is the fact that the state-specific mainstream-speech premia must be estimated. This introduces a potentially serious sample size problem, especially since the speech premia need to be estimated separately for blacks and Southern whites. The problem is that there are few states with enough observations to reliably estimate race- or region-specific speech-related wage premia.

This is because I require some minimum number of wage observations in both the mainstream and distinctive speech categories within each state, separately for blacks and Southern whites. I also need to control for black- or Southern-white-specific wage gaps, independent of speech pattern, which further requires me to have some minimum number observations in the state of both those groups and of non-Southern whites. Let these minimum numbers be the same and denote that minimum number by m. For different values of m, there will be different numbers of states in the sample.

Table 14 reports estimates from regressions based on m=10. For m=10 I could estimate racial wage gaps and mainstream speech premia for blacks in 15 states. I could

estimate regional wage gaps and mainstream speech premia for Southern whites in 8 states. I estimated these variables by workers' state of residence, then merged them to workers according to the state in which they were born.[9] I then regressed the mainstream speech dummy on state-specific race- or region-specific wage gaps, the state-specific mainstream wage premium, the respondent's region and urbanicity of residence at age 12, maternal and paternal educational attainment, a family structure dummy, household income in 1997, and a dummy for whether the respondent attended a Catholic or other private school.

Estimates for blacks appear in column (1). The coefficient on the state-specific black-white wage gap, in the first row, is small and insignificant. However, the coefficient on the state-specific mainstream wage premium for blacks, in the second row, is 0.249 (0.100). Because the mainstream wage premium varies only by state, and the number of states is so small, I also report p-values based from the clustered wild bootstrap procedure of Cameron, Gelbach, and Miller (2008) in brackets. The mainstream speech coefficient is significant at conventional levels. Its magnitude indicates that raising the mainstream speech premium by 0.10, which amounts to roughly doubling it based on estimates in Table 8, would increase the share of black workers with mainstream speech by 2.49 percentage points.

Estimates for Southern whites appear in column (2). The coefficient on the state-specific regional wage gap is positive but insignificant. The coefficient on the state-

[9] In specifications not presented below, I also experimented with linking the variables to each respondent according to the respondent's current state of residence. This had little qualitative effect on the results.

specific mainstream wage premium for Southern whites is comparable in magnitude to the corresponding coefficient for blacks, but it is insignificant.

Some of the other coefficients in the regressions warrant mention. Blacks who grew up in the South are significantly less likely to have mainstream speech than those who grew up elsewhere. Maternal education is not significantly related to mainstream speech for either blacks or Southern whites. Paternal education is positively related to mainstream speech in both groups, although the estimates are significant only for Southern whites. Family structure and family income are not significantly related to speech, although attending a Catholic or private school strongly affects black speech patterns.

To asses the robustness of the results, I estimated race/region- and state-specific mainstream wage premia (and state-specific race/regional wage gaps) for values of m=6, 14, and 18 (as well as 10). For m=6, there were 16 states for which I could estimate speech-related wage premia and racial wage gaps for blacks. There were nine states for which I could estimate speech-related wage premia and regional wage gaps for Southern whites. For m=18, the corresponding numbers of states were 10 and 5.

The results for blacks were fairly stable across different values of m. In all cases, the coefficient on the mainstream speech premium was similar to that reported here and it was significant at least at the 10 percent level, based on the clustered wild bootstrap procedure. The situation was different for Southern whites. The coefficient on the mainstream speech premium was positive for all values of m, but its magnitude was implausibly large for m>10. Its significance varied across specifications as well.

In column (3) I report estimates from a pooled model. Here, blacks are matched to race-specific wage gaps and speech premia according to their state of birth, and Southern whites are similarly matched to are matched to region-specific wage gaps and speech premia. Pooling the data slightly increases the number of states in the regression. This may beneficial if the parameter instability problem observed for Southern whites is primarily due to the very small number of states in the sample. The pooled coefficient is 0.206 (0.100) and significant. Like the coefficient in the model for mainstream black speech, the magnitude and significance of the coefficient from the pooled model was stable across different values of k.

VII. Conclusion

Speech plays an important role in influencing how others perceive us. This paper shows that mainstream speech is associated with higher wages among two groups known for distinctive speech patterns, African Americans and Southern whites. Considering what is known about language acquisition, it is impossible say that the regression analysis isolates the effect of speech. What can be said is that the estimated speech effects cannot be explained by a variety of factors for which speech might be a proxy, including family structure, family income during childhood, parental education, private schooling, personality traits, or arrest records.

The results here reveal a dimension of inequality about which little has been known. More racially or regionally distinctive speech patterns are strongly correlated with lower levels of education and lower AFQT scores. Speech-related inequality within groups of black or white workers is in some cases as large as the inequality we observe

between blacks and whites. Yet even after controlling for these factors, distinctive speech is associated with lower wages.

There are several economic models that in principle would predict a relationship between speech and wages. Speech-based discrimination is a natural explanation, although the data necessary to test such a model are not available. Between two other models, the data are more consistent with an identity/signaling model due to Kim and Loury (2013) than with an employer-learning statistical-discrimination model due to Altonji and Pierret (2001). At the same time, the fit to the identity/signaling model is not perfect.

The existence of speech-related wage premia leads naturally to the question of whether speech responds to those premia. The analysis suggests that at least some people respond to such incentives. However, the sample size for this analysis is so small that the conclusion should be take with caution.

References

Akerlof, George A. and Rachel E. Kranton. "Economics and Identity." Quarterly Journal of Economics 115 (3), 2000, 715-753.

Altonji, J. G. & Pierret, C. R. (2001). Employer Learning and Statistical Discrimination. Quarterly Journal of Economics, 464 (February), pp. 313-350.

Austen-Smith, David, and Roland G. Fryer, Jr. "An Economic Analysis of 'Acting White.'" Quarterly Journal of Economics, 2005, 551-583.

Bailey, Guy and Erik Thomas. "Some Aspects of African American Vernacular Phonology." In Mufwene, Salikoko S, John R. Rickford, Guy Bailey, and John Baugh, eds., African American English: Structure, History, and Use. London: Routledge, 1998.

Baugh, John. "Hypocorrection: Mistakes in Pronunciation of Vernacular African American English as a Second Dialect." Language and Communication 12 (3/4), 1992, 317-326.

Becker, Gary S. The Economics of Discrimination. Chicago: The University of Chicago Press, 2nd edition, 1971.

Bertrand, Marianne and Sendhil Mullainathan. "Are Emily and Greg More Employable than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination." American Economic Review 94(4), 2004, 991-1013.

Bleakley, Hoyt and Aimee Chin. "Language Skills and Earnings: Evidence from Childhood Immigrants." Review of Economics and Statistics 86 (2), 2004, 481-496.

Borjas, George J., Jeffrey Grogger, and Gordon H. Hanson. "Imperfect Substitution Between Immigrants And Natives: A Reappraisal." NBER Working Paper 13887, March 2008.

Bound, John, and Richard B. Freeman. "What Went Wrong? The Erosion of Relative Earnings and Employment Among Young Black Men in the 1980s." Quarterly Journal of Economics 107, (February 1992), 201-232.

Cameron, Steven and James J. Heckman. "The Nonequivalence of High School Equivalents." Journal of Labor Economics 11, (January 1993), 1-47.

Charles, Kerwin K. and Jon Guryan. "Prejudice and the Economics of Discrimination." NBER Working Paper 13661, December 2007.

Chiswick, Barry R. "Speaking, Reading, and Earnings among Low-Skilled Immigrants." Journal of Labor Economics 9 (2), 1991, 149-170.

Clopper, Cynthia G., and David B. Pisoni. "Some Acoustic Cues for the Perceptual Categorization of American English Regional Dialects." Journal of Phonetics 32, 2004, 111-140.

Cook, Phillip, and Jens Ludwig. "Weighing The "Burden Of 'Acting White'": Are There Race Differences In Attitudes Towards Education? Journal of Public Policy and Analysis, 16, 1997, 256-278.

Cukor-Avila, Patricia. "The complex grammatical history of African-American and white vernaculars in the South." In Stephen J. Nagle and Sara L. Sanders, eds., English in the Southern United States. Cambridge: Cambridge University Press, 2003, 82-105.

Dorrill, George. "Sounding southern: A look at the phonology of English in the South." In Stephen J. Nagle and Sara L. Sanders, eds., English in the Southern United States. Cambridge: Cambridge University Press, 2003, 17-35.

Doss, Richard C. and Alan M. Gross. "The Effects of Black English on Stereotyping in Intraracial Perceptions." Journal of Black Psychology 18 (2), 1992, 47-58.

Doss, Richard C. and Alan M. Gross. "The Effects of Black English and Code-Switching on Intraracial Perceptions." Journal of Black Psychology 20 (3), 1994, 282-293.

Falck, Oliver, Stephan Heblich, Alfred Lameli, and Jens Südekum. "Dialects, cultural identity, and economic exchange." Journal of Urban Economics 72 (2–3), 2012, 225-239.

Farber, H. S. & Gibbons, R. (1996). Learning and Wage Dynamics. Quarterly Journal of Economics 111:1007-47.

Fasold, Ralph W. "The Relation Between Black and White Speech in the South." American Speech 56, 163-189.

Fordham, Signithia and John U. Ogbu. "Black Students' School Success: Coping with the 'Burden of "Acting White."' The Urban Review 18 (3), 1986, 176-206.

Fridland, Valerie. "Regional differences in perceiving vowel tokens on Southerness, education, and pleasantness ratings." Language Variation and Change 20, 2008, 67-83.

Fridland, Valerie, and Kathryn Bartlett. "CORRECTNESS, PLEASANTNESS, AND DEGREE OF DIFFERENCE RATINGS ACROSS REGIONS." American Speech 81 (4), 2006, 358-386.

Fridland, Valerie, Kathryn Bartlett and Roger Kreuz. "MAKING SENSE OF VARIATION: PLEASANTNESS AND EDUCATION RATINGS OF SOUTHERN VOWEL VARIANTS." American Speech 80 (4), 2005, 366-387.

Fryer, Roland G. Jr., and Steven D. Levitt. "The Causes and Consequences of Distinctly Black Names." Quarterly Journal of Economics 119, 2004, 767-805.

Fryer, Roland G. Jr., and Paul Torelli. "An Empirical Analysis of 'Acting White.'" NBER Working Paper 11334, May 2005.

Gosling, S. D., Rentfrow, P. J., & Swann, W. B., Jr. (2003). A Very Brief Measure of the Big Five Personality Domains. Journal of Research in Personality, 37, 504-528.

Granena, Gisela, and Mike Long. Sensitive periods, language aptitude, and ultimate L2 attainment. Amsterdam/Philadelphia: John Benjamins Publishing Company, 2013.

Green, Lisa. "Aspect and predicate Phrases in African American Vernacular English." In Mufwene, Salikoko S, John R. Rickford, Guy Bailey, and John Baugh, eds., African American English: Structure, History, and Use. London: Routledge, 1998.

Grogger, J. "Does School Quality Explain the Recent Black-White Wage Trend?" Journal of Labor Economics 14 (1996), 231-253.

Grogger, J. (1998). Market Wages and Youth Crime. Journal of Labor Economics 16, no. 4, October 1998, 756-791.

Hartley, Laura. "A View from the West: Perceptions of U.S. Dialects by Oregon Residents." In D. R. Preston, ed., Handbook of Perceptual Dialectology. Amsterdam: John Benjamins Publishing Company, 1999, 315-332.

Heblich, Stephan & Lameli, Alfred & Riener, Gerhard, 2014. "The Effect of Perceived Regional Accents on Individual Economic Behavior: A Lab Experiment on Linguistic Performance, Cognitive Ratings and Economic Decisions," IZA Discussion Papers 8640, Institute for the Study of Labor (IZA).

Hyltenstam, Kenneth and Niclas Abrahamsson, "Maturational constraints in SLA," in Doughty, Catherine J. and Michael H. Long, eds., The handbook of second language acquisition, 539-599. Malden, MA: Blackwell Publishing, 2003.

Johnson, Jacqueline S., and Elissa L. Newport. "Critical period effects in second language learning: The influence of maturational state on the acquisition of English as a second language." Cognitive psychology 21 (1), 1989, 60-99.

Kim, Young Chul, and Glenn C. Loury. "Sterotypes and Inequality: A 'Signaling' Theory of Identity Choice." KDI Journal of Economic Policy, Vol. 34, No. 2, 2012.

Kinzler, Katherine D., and Jasmine M. DeJesus. "Northern = smart and Southern = nice: The development of accent attitudes in the United States." The Quarterly Journal of Experimental Psychology 66 (6), 2012, 1146-1158.

Koch, L., Gross, A., & Kolts, R. "Attitudes toward Black English and code switching." Journal of Black Psychology 27, 2001, 29–42.

Kurath, Hans, and Raven Ioor McDavid. The Pronunciation of English in the Atlantic States: Based upon the Collections of the Linguistic Atlas of the Eastern United States. University of Michigan Press, 1961.

Labov, William. The social stratification of English in New York City. Washington, DC: Center for Applied Linguistics, 1966.

Labov, William. Language in the Inner City: Studies in the Black English Vernacular. Philadelphia: University of Pennsylvania Press, 1972.

Labov, William. "Co-existent Systems in African American Vernacular English." In Mufwene, Salikoko S, John R. Rickford, Guy Bailey, and John Baugh, eds., African American English: Structure, History, and Use. London: Routledge, 1998.

Lang, Kevin. "A Language Theory of Discrimination." Quarterly Journal of Economics 101 (2), 1986, 363-382.

Lange, Fabian. "The Speed of Employer Learning." Journal of Labor Economics 25 (1), January 2007.

Long, Michael H. "Maturational Constraints on Language Development." Studies in Second Language Acquisition 12, 251-285, 1990.

Martin, Stefan and Walt Wolfram. "The Sentence in African American Vernacular English." In Mufwene, Salikoko S, John R. Rickford, Guy Bailey, and John Baugh, eds., African American English: Structure, History, and Use. London: Routledge, 1998.

Massey, Douglas S. and Garvey Lundy. "Use of Black English and Racial Discrimination in Housing Markets." Urban Affairs Review 36 (4), 2001, 452-469.

McManus, Walter, William Gould, and Finis Welch. "Earnings of Hispanic Men: The Role of English Language Proficiency." Journal of Labor Economics 1 (2), 1983, 101-130.

Mufwene, Salikoko S. "The Structure of the Noun Phrase in African American Vernacular English." In Mufwene, Salikoko S, John R. Rickford, Guy Bailey, and John Baugh, eds., African American English: Structure, History, and Use. London: Routledge, 1998.

Neal, Derek. "Black-White Labour Market Inequality in the United States." In Steven Durlauf and Lawrence Blume, eds., New Palgrave Dictionary of Economics, 2006

Neal, D. A. and Johnson, W. R. (1996). The Role of Premarket Factors in Black-White Wage Differences. The Journal of Political Economy, Vol. 104, No. 5 (Oct., 1996), pp. 869-895.

Neal, D. A., Johnson, W. R. and Kitamura. "Evaluating a Simple Method for Estimating Black-White Gaps in Median Wages." American Economic Review 90, (May 2000), 339-343.

Jencks, Christopher, and Meredith Phillips. "The Black-White Test Score Gap: An Introduction." In Jencks, Christopher, and Meredith Phillips. eds., The Black-White Test Score Gap. Washington, DC: Brookings Institution Press, 1998.

Pattillo, Mary. *Black Picket Fences: Privilege and Peril Among the Black Middle Class.* Chicago" University of Chicago Press, 1999.

Pinker, Steven. Words and Rules: The Ingredients of Language. New York: Basic Books, 1999.

Preston, Dennis R. "Where the worst English is spoken." In Edgar Schneider, ed., Focus on the USA. Amsterdam: Benjamins, 1996, 297-360.

Preston, Dennis R. "A Language Attitude Analysis of Regional US Speech: Is Northern US English Not Friendly Enough?" Cuadernos de Filologia Inglesa 8, 1999, 129-146.

Purnell, Thomas, William Idsardi, and John Baugh. "Perceptual and Phonetic Experiments on American English Dialect Identification." Journal of Language and Social Psychology 18 (1), 1999, 10-30.

Rickford, John R. and Christine Theberge Rafal. "Preterite Had + V-Ed in the Narratives of African-American Preadolescents." American Speech 71 (3), 1996, 227-254.

Rodriguez, J., Cargile, A., & Rich, M. "Reactions to African-American vernacular English: Do more phonological features matter?" The Western Journal of Black Studies 28, 2004, 407–414.

Schneider, Edgar W. 2003. "Shakespeare in the coves and hollows? Toward a history of Southern English." In Stephen J. Nagle and Sara L. Sanders, eds., English in the Southern United States. Cambridge: Cambridge University Press, 17-35.

Siegel, Jeff. Second Dialect Acquisition. 1st ed. Cambridge: Cambridge University Press, 2010.

Thomas, Erik R. "Sociophonetic Applications of Speech Perception Experiments." American Speech 77 (2), 2002, 115-147.

Thomas, Erik R., and Jeffrey Reaser. "Delimiting Perceptual Cures Used for the Ethnic Labeling of African American and European American Voices." Journal of Sociolinguistics 8 (1), 2004, 54-87.

Trejo, Stephen J. "Why Do Mexican Americans Earn Low Wages?" Journal of Political Economy 105 (6), 1997, 1235-1268.

Tucker, G. Richard, and Wallace E. Lambert. "White and Negro Listeners' Reactions to Various American-English Dialects." Social Forces 47 (4), 1969, 463-468.

Walton, Julie H. and Robert F. Orlikoff. "Speaker Race Identification from Acoustic Cues in the Vocal Signal." Journal of Speech and Hearing Research 37 (4), 1994, 738-746.

Washington, Julie A. and Holly K. Craig. "Morphosyntactic Forms of African American English Used by Young Children and their Caregivers." Applied Psycholinguistics 23, 2002, 209-231.

Wolfram, Walt. "Black-White Speech Differences Revisited." in Wolfram, Walt and Nona H. Clarke, eds., Black White Speech Relationships. Washington, DC: Center for Applied Linguistics, 1971.

Wolfram, Walt. Dialects and American English. Englewood Cliffs, NJ: Prentice Hall, 1991.

Table 1: Round-15 response counts by respondent's race and region at age 12

Race/region:	Black	Southern white	Non-southern white	Other	Total
Original 1997 sample	2,335	1,160	3,253	2,236	8,984
R15 respondents	2,036	931	2,588	1,868	7,423
In-person interviews	1,833	797	2,269	1,680	6,579
…and consent to record	1,698	741	2,079	1,562	6,080
Speech prompt assignment:					
Both questions	1,691	739	257	538	3,225
HM only	1	0	906	516	1,423
JS only	6	2	913	501	1,422
No assignment	0	0	3	7	10
At least one audio file	1,402	616	1,638	1,251	4,907
Both questions	1,283	570	194	419	2,466
HM only	22	6	706	400	1,134
JS only	97	40	738	432	1,307

Notes: HM = happiest moment; JS = job search.

Table 2: Percentage distribution of listener characteristics, by speech prompt

Prompt: Characteristic	HM (1)	JS (2)
Sex		
Male	27	16
Female	73	84
Total	100	100
Race/ethnicity		
White	83	84
Black	13	15
Hispanic	2	1
Other	2	0
Total	100	100
Region of residence		
Northeast	21	19
Midwest	37	35
South	21	37
West	21	10
Unknown	0	0
Total	100	100
Level of education		
HS diploma or GED	5	24
HS and some college	38	33
Bachelor's degree or higher	57	43
Total	100	100
Mean age (years)	48	54

Note: Listeners are weighted by the number of speakers to whom they listened. HM = happiest moment; JS = job search.

Table 3: Counts of speakers with speech data, by speaker's race and region at age 12

Race/region:	Black	Southern white	Non-southern white	Other	Total
HM audio file	1,305	576	900	819	3,600
In-scope for HM speech data	1,162	526	890	810	3,388
JS audio file	1,380	610	932	851	3,773
In-scope for JS speech data	1,139	564	739	59	2,501
Any speech data	1,168	567	1,629	861	4,225

Notes: HM = happiest moment; JS = job search.

Table 4: Characteristics of respondents by race/region and availability of speech data (for all R15 respondents)

Speaker's race/region:	Black		Southern white		Non-Southern white		Other	
Variable	No speech data	Speech data	No speech data	Speech data	No speech data	Speech data	No speech data	Speech data
In South at age 12	0.55	0.58	1	1	0.0	0.0	0.155	0.366
Age-12 region missing	0.104	0.095	0	0	0.180	0.146	0.148	0.0825
Less than HS	0.27	0.268	0.209	0.206	0.143	0.13	0.257	0.214
HS only	0.224	0.259	0.22	0.215	0.22	0.227	0.25	0.232
Some college	0.303	0.259	0.212	0.208	0.254	0.224	0.278	0.282
BA or more	0.182	0.199	0.354	0.365	0.375	0.413	0.199	0.26
Educ. missing	0.0219	0.0163	0.00549	0.00529	0.0073	0.00614	0.0159	0.0116
Experience	9.294	9.307	8.68	8.611	8.587	8.396	9.301	8.961
Not in South	0.386	0.362	0.107	0.0988	0.828	0.861	0.762	0.604
In South	0.608	0.638	0.885	0.899	0.147	0.138	0.21	0.394
Region missing	0.00576	0	0.00824	0.00176	0.025	0.00123	0.0288	0.00232
Non-urban	0.164	0.163	0.385	0.36	0.252	0.246	0.0993	0.0987
Urban	0.817	0.834	0.596	0.631	0.714	0.748	0.86	0.897
Urban missing	0.0196	0.00342	0.0192	0.00882	0.0334	0.00614	0.0407	0.00465
Married	0.185	0.222	0.41	0.481	0.373	0.483	0.337	0.379
Normalized AFQT	-0.593	-0.563	0.274	0.351	0.361	0.473	-0.275	-0.197
Missing AFQT	0.229	0.213	0.143	0.164	0.153	0.154	0.268	0.243
Cath/priv school	0.0576	0.0454	0.11	0.0988	0.118	0.111	0.0477	0.0488
Two parents	0.273	0.313	0.571	0.601	0.6	0.619	0.578	0.595
Gross HH income 97 (in $10,000s)	2.081	2.029	4.668	5.019	4.379	4.687	2.331	2.317
HH inc. missing	0.301	0.306	0.124	0.138	0.237	0.216	0.316	0.323
Mom less than HS	0.224	0.226	0.165	0.15	0.111	0.101	0.444	0.397
Mom HS grad	0.388	0.409	0.316	0.346	0.346	0.356	0.236	0.243
Mom some college	0.189	0.202	0.236	0.219	0.26	0.265	0.137	0.156

Mom college grad	0.0657	0.0565	0.124	0.138	0.138	0.15	0.0536	0.072
Mom postgrad	0.0207	0.0291	0.0934	0.0882	0.1	0.0853	0.0218	0.0256
Mom's ed. missing	0.113	0.0771	0.0659	0.06	0.0459	0.0417	0.107	0.107
Dad less than HS	0.137	0.151	0.159	0.168	0.125	0.106	0.352	0.329
Dad HS grad	0.339	0.37	0.319	0.317	0.312	0.346	0.197	0.197
Dad some college	0.0887	0.105	0.168	0.155	0.197	0.187	0.112	0.111
Dad college grad	0.0541	0.0522	0.121	0.132	0.118	0.134	0.0606	0.0592
Dad postgrad	0.0138	0.0188	0.0934	0.104	0.126	0.123	0.0278	0.0465
Dad's ed. missing	0.368	0.303	0.14	0.123	0.122	0.103	0.251	0.257
Observations	868	1168	364	567	959	1629	1007	861

Table 5: Percentage distribution of listener reports that speaker is black or Southern, by speaker's race/region at age 12

	L reports that speaker is black		L reports that speaker is Southern	
	Number	Percentage	Number	Percentage
Speaker's race/region	(1)	(2)	(3)	(4)
Black	0	5.5	0	16.7
	1	6.5	1	17.1
	2	5.4	2	17.5
	3	11.1	3	15.7
	4	14.7	4	12.7
	5	24.2	5	12.0
	6	32.6	6	8.3
Southern white	0	60.6	0	23.9
	1	23.5	1	17.0
	2	10.1	2	14.9
	3	3.8	3	12.4
	4	1.5	4	13.4
	5	0.4	5	10.5
	6	0.0	6	7.8
Non-Southern white	0	89.1	0	75.6
	1	9.6	1	17.4
	2	1.2	2	4.4
	3	0.1	3	2.6
Other	0	74.7	0	66.1
	1	16.9	1	24.0
	2	6.2	2	6.6
	3	2.2	3	3.3

Note: Excludes blacks and Southern whites with only 3 listener reports. L = listener.

Table 6: Years of education and AFQT scores by listener reports of speaker's race/region at age 12, by speaker's race/region at age 12, males

		Number of listener reports that speaker is black							
Race/region at age 12	Variable	0	1	2	3	4	5	6	Total
Black	Years of education	14.26	13.32	13.24	13.49	12.74	12.20	11.39	12.42
	AFQT	0.133	0.021	-0.536	-0.439	-0.578	-0.742	-0.902	-0.625
	N	23	22	17	49	62	91	125	389
Southern white	Years of education	14.57	13.94	11.55	10.86	10.00	9.50		13.89
	AFQT	0.627	0.234	-0.281	-0.851	-0.749	-1.256		0.360
	N	133	52	20	7	4	2		218
Other white	Years of education	14.25	13.90	14.23					14.22
	AFQT	0.466	0.311	0.311					0.448
	N	645	71	13					729

		Number of listener reports that speaker is Southern							
Race/region at age 12	Variable	0	1	2	3	4	5	6	Total
Black	Years of education	13.28	13.24	12.49	12.47	12.70	10.73	10.93	12.42
	AFQT	-0.262	-0.468	-0.450	-0.667	-0.672	-1.109	-1.080	-0.625
	N	58	70	65	60	54	41	41	389
Southern white	Years of education	15.59	15.38	13.50	12.86	12.72	12.82	11.83	13.89
	AFQT	0.828	1.007	0.507	-0.022	-0.253	0.075	-0.482	0.360
	N	56	32	32	28	25	22	23	218
Other white	Years of education	14.56	13.59	12.00	11.75				14.22
	AFQT	0.544	0.289	-0.214	-0.308				0.448
	N	547	138	28	16				729

Note: Blacks and Southern whites with only three listener reports are excluded.

Table 7: Log wage regressions with alternative representations of speech

Dependent variable is the log hourly wage

Variable	(1)	(2)	(3)	(4)	(5)
Black	-0.105	-0.024	-0.033	0.020	-0.140
	(0.026)	(0.039)	(0.038)	(0.042)	(0.029)
N. L reports S is black		-0.036			
		(0.018)			
N. L reports S is black, residual			-0.032		
			(0.018)		
1 L report that S is black*				-0.004	
				(0.045)	
2 L reports that S is black*				0.059	
				(0.039)	
3 L reports that S is black*				-0.073	
				(0.062)	
4 L reports that S is black*				-0.134	
				(0.047)	
5 L reports that S is black*				-0.180	
				(0.057)	
6 L reports that S is black*				-0.098	
				(0.059)	
Black*mainstream (white) speech					0.115
					(0.045)
White*black speech					-0.154
					(0.048)
South age 12	0.030	0.053	0.058	0.063	-0.031
	(0.046)	(0.046)	(0.046)	(0.045)	(0.047)
N. L reports S is Southern		-0.050			
		(0.013)			
N. L reports S is Southern, residual			-0.052		
			(0.013)		
1 L report that S is Southern**				-0.067	
				(0.048)	
2 L reports that S is Southern**				-0.049	
				(0.030)	
3 L reports that S is Southern**				-0.075	
				(0.048)	
4 L reports that S is Southern**				-0.140	
				(0.041)	
5 L reports that S is Southern**				-0.165	
				(0.049)	
6 L reports that S is Southern**				-0.137	
				(0.042)	
South*mainstream (non-south) speech					0.103
					(0.032)
Non-south*Southern speech					-0.097
					(0.048)
HS only	0.178	0.161	0.161	0.166	0.164
	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)
Some college	0.267	0.241	0.240	0.242	0.241
	(0.033)	(0.033)	(0.033)	(0.032)	(0.033)
BA or more	0.514	0.479	0.479	0.480	0.481

	(0.041)	(0.040)	(0.040)	(0.040)	(0.041)
Experience	0.048	0.049	0.049	0.049	0.048
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Exp. squared	-0.002	-0.002	-0.002	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Lives in South	-0.037	-0.000	-0.001	-0.005	-0.029
	(0.044)	(0.044)	(0.044)	(0.043)	(0.042)
Lives in urban area	0.021	0.011	0.010	0.009	0.014
	(0.023)	(0.023)	(0.023)	(0.023)	(0.022)
Married	0.158	0.159	0.159	0.160	0.159
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
Observations	5,951	5,951	5,951	5,951	5,951
Adjusted R-squared	0.195	0.205	0.205	0.210	0.204

* Labels pertain to speakers with six listener reports. Speakers with only three listener reports were coded as if two times as many listeners had reported them to be black.

** Labels pertain to speakers with six listener reports. Speakers with only three listener reports were coded as if two times as many listeners had reported them to be Southern.

Note: Standard errors, in parentheses, are clustered by worker. In addition to variables shown, the regressions include year dummies and missing value flags for region, educational attainment, and urbanicity. Missing value flags equal one when the corresponding variable is missing and equal zero otherwise. Missing values of the corresponding variable are recoded to zero.

Table 8: Log wage regressions, alternative specifications

Dependent variable is the log hourly wage						
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Black	-0.098			-0.074	-0.106	-0.107
	(0.031)			(0.029)	(0.031)	(0.031)
Black*mainstream speech	0.107	0.086		0.093	0.115	0.131
	(0.044)	(0.046)		(0.042)	(0.044)	(0.059)
Black* codeshift						-0.033
						(0.078)
White*black speech	-0.160		-0.086	-0.200	-0.144	-0.144
	(0.048)		(0.075)	(0.044)	(0.048)	(0.048)
South age 12	-0.042	0.001		-0.045	-0.018	-0.017
	(0.049)	(0.107)		(0.047)	(0.050)	(0.050)
South*mainstream speech	0.085	0.052	0.121	0.086	0.077	0.079
	(0.032)	(0.046)	(0.052)	(0.030)	(0.032)	(0.035)
South*codeshift						-0.011
						(0.053)
Non-south*South speech	-0.059	0.023		-0.058	-0.055	-0.056
	(0.047)	(0.089)		(0.042)	(0.048)	(0.047)
HS only	0.140	0.137	0.080	0.115	0.149	0.148
	(0.028)	(0.044)	(0.067)	(0.027)	(0.028)	(0.028)
Some college	0.191	0.164	0.025	0.162	0.200	0.199
	(0.034)	(0.059)	(0.083)	(0.033)	(0.034)	(0.034)
BA or more	0.391	0.553	0.331	0.303	0.396	0.396
	(0.045)	(0.088)	(0.106)	(0.046)	(0.045)	(0.045)
Experience	0.049	0.038	0.027	0.046	0.049	0.049
	(0.009)	(0.018)	(0.020)	(0.009)	(0.009)	(0.009)
Exp. squared	-0.003	-0.002	-0.002	-0.002	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Lives in South	-0.009	-0.018	-0.126	-0.019	-0.021	-0.022
	(0.043)	(0.099)	(0.088)	(0.041)	(0.044)	(0.044)
Lives in urban area	0.006	0.004	-0.007	0.013	0.008	0.008
	(0.022)	(0.042)	(0.041)	(0.021)	(0.022)	(0.022)
Married	0.161	0.144	0.228	0.137	0.162	0.162
	(0.021)	(0.044)	(0.042)	(0.020)	(0.021)	(0.021)
Normalized AFQT	0.023	0.060	-0.005	0.016	0.025	0.025
	(0.014)	(0.034)	(0.032)	(0.013)	(0.014)	(0.014)
Cath/priv school	-0.027	-0.043	0.044	-0.026	-0.020	-0.020
	(0.039)	(0.097)	(0.097)	(0.037)	(0.039)	(0.039)
Two parents	-0.000	0.014	-0.059	-0.004	-0.001	-0.001
	(0.023)	(0.042)	(0.057)	(0.022)	(0.024)	(0.024)
Gross HH income 97	0.015	0.010	0.012	0.014	0.015	0.015
	(0.003)	(0.010)	(0.006)	(0.003)	(0.003)	(0.003)
Mom HS grad	0.065	0.052	0.126	0.056	0.061	0.062
	(0.031)	(0.048)	(0.084)	(0.029)	(0.032)	(0.032)
Mom some college	0.032	-0.031	0.109	0.039	0.027	0.027
	(0.035)	(0.055)	(0.095)	(0.033)	(0.036)	(0.036)
Mom college grad	0.132	-0.053	0.342	0.125	0.129	0.129
	(0.046)	(0.121)	(0.098)	(0.044)	(0.046)	(0.047)
Mom postgrad	0.131	0.015	0.176	0.139	0.130	0.130

	(0.053)	(0.097)	(0.127)	(0.049)	(0.053)	(0.053)
Dad HS grad	0.033	0.067	0.095	0.040	0.031	0.031
	(0.035)	(0.051)	(0.081)	(0.033)	(0.035)	(0.035)
Dad some college	0.020	0.099	0.028	0.023	0.012	0.013
	(0.042)	(0.077)	(0.097)	(0.040)	(0.043)	(0.043)
Dad college grad	0.023	0.140	0.004	0.025	0.021	0.022
	(0.048)	(0.085)	(0.133)	(0.045)	(0.048)	(0.048)
Dad postgrad	-0.072	0.150	-0.008	-0.077	-0.072	-0.071
	(0.052)	(0.093)	(0.117)	(0.051)	(0.053)	(0.053)
Observations	5,951	1,749	1,022	5,938	5,831	5,831
Adjusted R-square	0.227	0.222	0.306	0.273	0.230	0.230
Black only		yes				
Southern white only			yes			
Dummies for 2-digit occ.				yes		

Note: Standard errors, in parentheses, are clustered by worker. In addition to variables shown, the regressions include year dummies and missing value flags for region, educational attainment, urbanicity, household income, and parents' education. Missing value flags equal one when the corresponding variable is missing and equal zero otherwise. Missing values of the corresponding variable are recoded to zero.

Table 9: Regression for the availability of wages

Dependent variable	=1 if wage observed
Variable	(1)
Black	-0.031
	(0.026)
Black*mainstream speech	-0.034
	(0.037)
White*black speech	0.018
	(0.059)
South age 12	0.042
	(0.041)
South*mainstream speech	0.004
	(0.031)
Non-south*South speech	0.063
	(0.041)
Observations	7,874
Adjusted R-squared	0.026

Notes: Standard errors, in parentheses, are clustered by worker. In addition to the variables shown, the regression includes all variables included in the regressions that appear in Table 8.

Table 10: Mainstream speech in 2006 versus mainstream in 2011, by education level, for blacks and Southern whites

Blacks

Education level:	Total			HS or less			More than HS		
	Mainstream in 2011			Mainstream in 2011			Mainstream in 2011		
Mainstream in 2006	No	Yes	Total	No	Yes	Subtotal	No	Yes	Subtotal
No	36	4	40	26	2	28	9	2	11
	(90)	(10)	(100)	(93)	(7)	(100)	(82)	(18)	(100)
Yes	8	10	18	4	5	9	4	5	9
	(44)	(56)	(100)	(44)	(56)	(100)	(44)	(56)	(100)

Southern white

Education level:	Total			HS or less			More than HS		
	Mainstream in 2011			Mainstream in 2011			Mainstream in 2011		
Mainstream in 2006	No	Yes	Total	No	Yes	Subtotal	No	Yes	Subtotal
No	10	7	17	9	4	13	1	3	4
	(59)	(41)	(100)	(69)	(31)	(100)	(25)	(75)	(100)
Yes	6	20	26	3	7	10	3	13	16
	(23)	(77)	(100)	(30)	(70)	(100)	(12)	(81)	(100)

Numbers in parentheses are row percentages within education level.

Table 11: Log wage regressions to test for employer learning with statistical discrimination

Dependent variable is the log of the hourly wage Variable	(1)	(2)	(3)	(4)
Black	-0.116	-0.109	-0.118	-0.095
	(0.031)	(0.060)	(0.029)	(0.056)
Black*mainstream speech	0.110	0.145	0.110	0.132
	(0.045)	(0.076)	(0.044)	(0.075)
South age 12	-0.055	-0.067	-0.059	-0.076
	(0.030)	(0.055)	(0.029)	(0.054)
South*mainstream speech	0.094	0.192	0.097	0.187
	(0.033)	(0.059)	(0.032)	(0.058)
Black*exp		-0.000		-0.003
		(0.008)		(0.008)
Black*mainstrm. speech*exp		-0.006		-0.004
		(0.011)		(0.011)
South*exp		0.001		0.002
		(0.008)		(0.007)
South* mainstrm. speech*exp		-0.016		-0.015
		(0.009)		(0.009)
Normalized AFQT	0.035	0.022		
	(0.014)	(0.025)		
AFQT*exp		0.002		
		(0.004)		
Gross HH income 97			0.017	0.015
			(0.003)	(0.005)
HH income*exp				0.000
				(0.001)
White*black signal	-0.129	-0.120	-0.136	-0.128
	(0.044)	(0.044)	(0.044)	(0.044)
Non-south*South signal	-0.088	-0.090	-0.080	-0.082
	(0.049)	(0.049)	(0.047)	(0.047)
Years educ.	0.055	0.064	0.056	0.061
	(0.006)	(0.012)	(0.006)	(0.011)
Years educ. * exp		-0.001		-0.001
		(0.002)		(0.001)
Experience	0.047	0.073	0.048	0.066
	(0.009)	(0.028)	(0.009)	(0.027)
Exp. squared	-0.002	-0.003	-0.002	-0.003
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	5,951	5,951	5,951	5,951
Adjusted R-squared	0.199	0.201	0.212	0.212

Note: Standard errors, in parentheses, are clustered by worker. In addition to variables shown, the regressions include year dummies, a current region dummy, an urbanicity dummy, and missing value flags for region, educational attainment, urbanicity, household income, and parents' education. Missing value flags equal one when the corresponding variable is missing and equal zero otherwise. Missing values of the corresponding variable are recoded to zero. Interactions between missing value flags and experience are included whenever interactions between the corresponding variable and experience appear.

Table 12: Log wage regressions by race and region at age 12 for blacks and Southern whites, by speech pattern

Dependent variable is the log of the hourly wage	Black, distinctive	Black, mainstream	Southern white, distinctive	Southern white, mainstream
Variable	(1)	(2)	(3)	(4)
South age 12	-0.008	0.238		
	(0.093)	(0.177)		
South*non-south speech	0.051	-0.059		
	(0.054)	(0.106)		
Non-south*South speech	-0.019	0.113		
	(0.086)	(0.241)		
HS only	0.130	0.223	0.030	0.169
	(0.050)	(0.110)	(0.074)	(0.106)
Some college	0.028	0.576	-0.051	0.118
	(0.061)	(0.128)	(0.143)	(0.111)
BA or more	0.472	0.915	-0.096	0.555
	(0.114)	(0.139)	(0.175)	(0.135)
Observations	1,289	460	338	684
Adjusted R-squared	0.198	0.282	0.257	0.298

Note: Standard errors, in parentheses, are clustered by worker. In addition to the variables shown, all regressions include all variables included in the regressions that appear in Table 8.

Table 13: Log wage regressions by educational attainment

Dependent variable is the log of the hourly wage				
Education level:	HS or less	HS or less	More than HS	More than HS
Variable	(1)	(2)	(3)	(4)
Black	-0.059	-0.070	-0.044	-0.136
	(0.034)	(0.038)	(0.048)	(0.054)
Black*mainstream speech		-0.016		0.226
		(0.056)		(0.067)
White*black speech		-0.192		-0.066
		(0.055)		(0.085)
South age 12	0.100	0.026	0.030	-0.057
	(0.052)	(0.056)	(0.061)	(0.073)
South*mainstream speech		0.049		0.143
		(0.040)		(0.052)
Non-south*Southern speech		-0.147		0.120
		(0.046)		(0.097)
Observations	2,875	2,875	3,039	3,039
Adjusted R-squared	0.186	0.195	0.164	0.182

Note: Standard errors, in parentheses, are clustered by worker. In addition to the variables shown, all regressions include all variables included in the regressions that appear in Table 8.

Table 14: Mainstream speech and speech-related wage premia

Dependent variable =1 if speech is mainstream Sample	Blacks	Southern whites	Pooled
Variable	(1)	(2)	(3)
State-specific black wage gap	0.043		
	(0.219)		
State-specific premium for mainstream speech, blacks	0.249		
	(0.100)		
	[0.023]		
State-specific southern wage gap		0.419	
		(0.673)	
State-specific premium for mainstream speech, Southern whites		0.284	
		(0.269)	
		[0.216]	
State- and race/region-specific wage gap			0.206
			(0.270)
State- and race/region-specific premium for mainstream speech			0.221
			(0.100)
			[0.030]
Region at age 12: Midwest	-0.040		-0.054
	(0.077)		(0.074)
Region at age 12: South	-0.110		-0.137
	(0.052)		(0.044)
Region at age 12: West	0.155		0.116
	(0.097)		(0.087)
Urban residence age 12	-0.009	0.004	-0.011
	(0.067)	(0.078)	(0.063)
Mom HS grad	-0.032	0.164	0.018
	(0.088)	(0.183)	(0.069)
Mom some college	-0.054	0.222	0.028
	(0.124)	(0.209)	(0.079)
Mom college grad	0.034	0.070	0.011
	(0.131)	(0.199)	(0.087)
Mom postgrad	-0.012	0.274	0.143
	(0.238)	(0.161)	(0.117)
Dad HS grad	0.084	0.232	0.131
	(0.086)	(0.104)	(0.079)
Dad some college	0.046	0.159	0.077
	(0.106)	(0.169)	(0.074)
Dad college grad	0.173	0.507	0.322
	(0.159)	(0.114)	(0.073)
Dad postgrad	0.190	0.550	0.386
	(0.367)	(0.112)	(0.129)
Two parent family	0.069	-0.083	0.028
	(0.064)	(0.083)	(0.048)
Gross HH income 97	0.009	0.007	0.006
	(0.020)	(0.011)	(0.010)
Cath/priv school	0.306	0.010	0.159
	(0.071)	(0.168)	(0.083)
Black			-0.339
			(0.094)
Observations	266	161	427
N. of states included in sample	15	8	17
Adjusted R-squared	0.071	0.061	0.168

Note: Standard errors, in parentheses, are clustered by worker. Figures in brackets are p-values from wild-bootstrapped t-statistics. In addition to variables shown, the regressions include missing value flags for region, urbanicity, household income, and parents' education. Missing value flags equal one when the corresponding variable is missing and equal zero otherwise. Missing values of the corresponding variable are recoded to zero.

Appendix Table 1: Frequency distribution of listener reports that speaker is black or Southern, by speaker's race/region at age 12, for blacks and Southern whites with only three listener reports

	L reports that speaker is black		L reports that speaker is Southern	
Speaker's race/region	Number	Frequency	Number	Frequency
Black	0	1	0	12
	1	5	1	13
	2	8	2	6
	3	21	3	4
	Total	35	Total	35
Southern white	0	36	0	21
	1	4	1	9
	2	4	2	8
	3	0	3	6
	Total	44	Total	44

Appendix Table 2: Log wage regressions, deleting observations below various minimum age thresholds

Dependent variable is the log hourly wage				
Minimum age:	25	26	27	28
Variable	(1)	(2)	(3)	(4)
Black	-0.099	-0.109	-0.111	-0.099
	(0.036)	(0.038)	(0.040)	(0.045)
Black*mainstream speech	0.126	0.148	0.147	0.152
	(0.049)	(0.052)	(0.056)	(0.067)
White*black speech	-0.148	-0.171	-0.171	-0.227
	(0.064)	(0.075)	(0.082)	(0.073)
South age 12	-0.018	-0.014	-0.027	-0.039
	(0.052)	(0.055)	(0.059)	(0.068)
South*mainstream speech	0.086	0.090	0.089	0.095
	(0.036)	(0.039)	(0.043)	(0.051)
Non-south*South speech	-0.076	-0.071	-0.057	-0.048
	(0.057)	(0.062)	(0.070)	(0.083)
Observations	4,424	3,576	2,709	1,806
Adjusted R-squared	0.211	0.218	0.219	0.215

Note: Standard errors, in parentheses, are clustered by worker. In addition to the variables shown, all regressions include all variables included in the regressions that appear in Table 8.

Appendix Table 3: Log wage regressions with additional regressors

Dependent variable is the log hourly wage				
Variable	(1)	(2)	(3)	(4)
Black	-0.091	-0.033	-0.099	-0.104
	(0.031)	(0.072)	(0.031)	(0.030)
Black*mainstream speech	0.107	0.098	0.104	0.111
	(0.043)	(0.045)	(0.045)	(0.044)
White*black speech	-0.192	-0.154	-0.147	-0.142
	(0.054)	(0.052)	(0.048)	(0.049)
South age 12	-0.038	-0.026	-0.016	-0.021
	(0.049)	(0.049)	(0.046)	(0.046)
South*mainstream speech	0.079	0.080	0.082	0.080
	(0.032)	(0.032)	(0.032)	(0.031)
Non-south*South speech	-0.083	-0.038	-0.067	-0.062
	(0.046)	(0.046)	(0.047)	(0.047)
Observations	5,951	5,951	5,951	5,951
Adjusted R-squared	0.245	0.233	0.227	0.231
Personality scores	yes			
Skin color dummies		yes		
Ever-arrested dummy			yes	
Ever-incarcerated dummy				yes

Note: Standard errors, in parentheses, are clustered by worker. In addition to the variables shown, all regressions include all variables included in the regressions that appear in Table 8.