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More on the Third Dialect of English: Linguistic constraints on the use of three phonological variables in Pittsburgh

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ABSTRACT

Traditional dialect boundaries in the United States have received renewed attention (Labov, 1991, 1994). Labov outlined three dialects of English (the Northern Cities Chain Shift, the Southern Chain Shift, and the Third Dialect), the boundaries of which are defined by chain shifts in the vowel system and roughly correspond to traditional dialectal boundaries defined through the bundling of lexical items (Kurath, 1949) and phonological isoglosses (Kurath & McDavid, 1961). Other research has suggested that the Third Dialect may be the most heterogeneous of these dialects, with speakers in different areas displaying widely disparate behaviors (see, e.g., Clarke, Elms, & Youssef, 1995; Di Paolo, 1988; Di Paolo & Faber, 1990; Labov, 1996; Moonwomon, 1987). The present article contributes towards a richer picture of the Third Dialect by offering the first systematic variationist analysis of speech in Pittsburgh, with a particular focus on three phonological processes: vocalization of /l/, laxing of /i/ before /l/, and laxing of /u/ before /l/. I argue that Veatch's (1991) model of English syllable structure provides a unified account of these seemingly unrelated phonological changes in Pittsburgh; the implications of this argument for further research on Pittsburgh speech are also noted.

Traditional dialect boundaries have received renewed attention (Labov, 1991, 1994, updating Labov, Yaeger, & Steiner, 1972). Labov outlined three dialects of English (the Northern Cities Chain Shift, the Southern Chain Shift, and the Third Dialect), the boundaries of which are defined by chain shifts in the vowel system and roughly correspond to traditional dialectal boundaries defined through the bundling of lexical items (Kurath, 1949) and phonological isoglosses (Kurath & McDavid, 1961). Labov's work, which provides a unified framework for understanding vocalic variations in northern cities and in the South that were previously treated separately in dialectological accounts, lays out three principles that govern chain shifting within vocalic subsystems and three principles that govern shifts across systems (Labov, 1991:4, 7–11). By identifying which of two alter-

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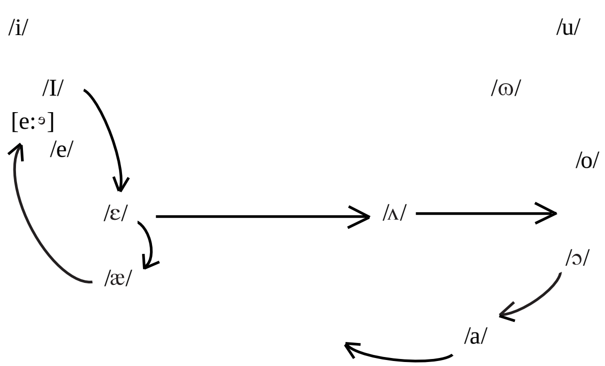
natives holds for /æ/ (i.e., whether the vowel in this position remains a single phoneme or has different forms in closed and open syllables) and for the low back position (i.e., whether the low back vowels /a/ and /ɔ/ are merged or not) and by applying the six principles, one can predict and describe the behavior of the three dialects Labov outlined. Other research has suggested that the Third Dialect may be the most heterogeneous of these dialects, with speakers in different areas displaying widely disparate behaviors (see, e.g., Clarke, Elms, & Youssef, 1995; Di Paolo, 1988; Di Paolo & Faber, 1990; Labov, 1996; Moonwomon, 1987). This article contributes towards a richer picture of the Third Dialect by offering what is, so far as I am aware, the first systematic variationist analysis of speech in Pittsburgh, a city which falls within the Third Dialect area. After briefly describing the three dialects, I present an overview of Pittsburgh dialect features and the methods used for gathering the data analyzed here. A comprehensive quantitative analysis of these dialect features is beyond the scope of this article. Instead, I focus on three phonological processes in Pittsburgh: vocalization of /l/, laxing of /i/ before /l/, and laxing of /u/ before /l/. I then draw on Veatch's (1991) model of English syllable structure to provide a unified account of these phonological changes in Pittsburgh. In particular, I argue that when /l/ vocalizes to a high back glide, it moves into a postvocalic glide slot, causing long vowels to shorten (or lax). I conclude by summarizing some of the implications this argument has for further research on speech in Pittsburgh and elsewhere.

THE THREE DIALECTS OF ENGLISH

How is the Third Dialect distinguished from the other two? In the Northern Cities Chain Shift, currently taking place in cities such as Rochester, Syracuse, Buffalo, Cleveland, Detroit, and Chicago, /æ/ is tensed and rises along the front peripheral track, as in (1)

(1)


/ɛ/ falls toward the position vacated by /æ/, and /I/ falls towards the position vacated by /ɛ/. The low back vowels /a/ and /ɔ/ remain distinct. /a/ moves forward towards the same front low target as /ɛ/, and /ɔ/ falls and moves behind

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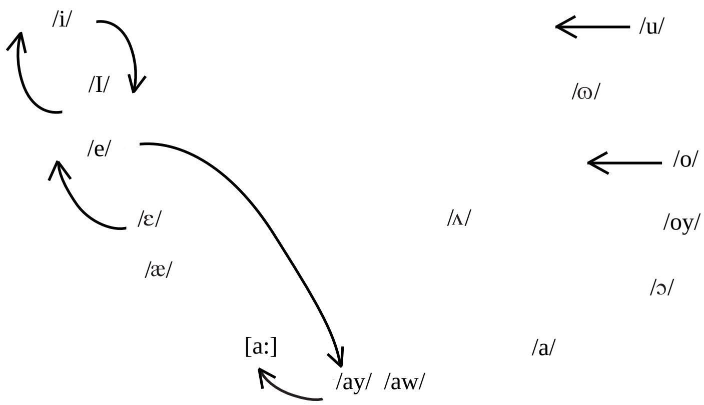
it. In some northern cities (e.g., Detroit), /ɛ/ backs towards /ʌ/, in which case /ʌ/ backs towards the position vacated by the falling of /ɔ/ (Labov, 1991:14–17).

In the Southern Chain Shift /a/ and /ɔ/ also remain distinct; /a/ does not move forward but remains back of center, and /ɔ/ moves up and back as a peripheral vowel.

(2)



The nuclei of the original tense vowels /i/, /e/, /o/, and /u/ become centralized. In some areas (e.g., the Outer Banks of North Carolina) /ay/ backs to [$ɔ^{i}$]. More commonly, however, /ay/ monophthongizes to [a:]. In the United States variations of the Southern Chain Shift have been documented in Philadelphia and in most cities in the Upper and Lower South (see Labov, 1991:22–25).[1]

Chain shifts like those in these dialects rotate features and preserve distinctions. A dialect can also be defined by mergers which neutralize features and lose distinctions (Labov, 1991:28–29). Labov argued that the Third Dialect was characterized by the absence of any major vowel chain shift pattern (although it may display fronting of the tense vowels /u/ and /o/). Its two defining features were the stable nature of the front lax vowel /æ/ and the merger of the low back vowels /a/ and /ɔ/ (Labov, 1991:30, 33–34).

The geographical distribution of the Third Dialect is much more heterogeneous and discontinuous than that of the other two dialects. In the United States the low back merger radiates outwards from two urban centers, one in Boston and the other in Pittsburgh (Labov, 1991:31). It also extends across most of the western United States (see Figure 1). Canada is also included in the Third Dialect area. It is therefore perhaps not surprising that, as researchers have begun to look more closely at various areas within the Third Dialect, they have found that it is less homogenous than was previously supposed, and that the Third Dialect may also be associated with certain kinds of vowel shifts. For instance, DiPaolo and Faber (1990:199–200) noted that the conditioned mergers of tense–lax vowel pairs in Salt Lake City may be linked to the initiation of a Southern-type shift, while Clarke et al. (1995) suggested that there may be a substantial vowel shift taking place in Canada—one which includes all of the vowels involved in the Northern

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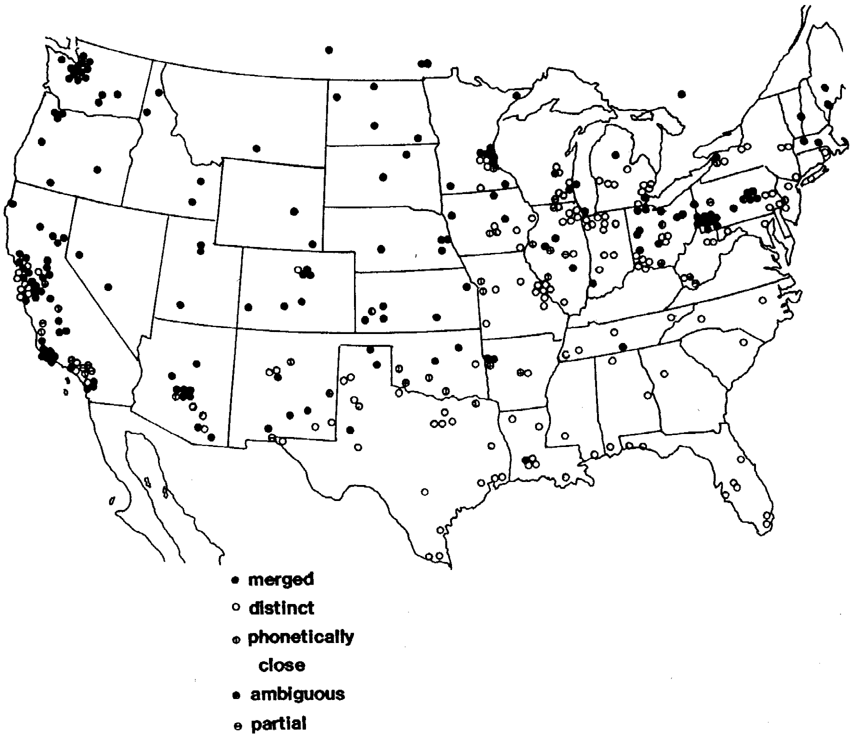

FIGURE 1. The Third Dialect of English. (From Labov, 1991:Figure 12. Reprinted with permission from Academic Press.)

Cities Chain Shift.[2] In contrast to these studies, speech in Pittsburgh seems much closer to the picture of the Third Dialect originally offered by Labov. The phonological phenomena of most interest here are precisely those which Labov identified as common in the Third Dialect: conditioned mergers before consonants, especially before liquids (Labov, 1991:33).[3] Here we focus on the laxing of tense vowels before /l/. What makes this process of particular interest in Pittsburgh is that /l/ is variably vocalized. The complex interaction of these variables raises intriguing questions about conditioning and historical precedence, which will be considered in the course of the article.

THE THIRD DIALECT OF ENGLISH: PITTSBURGH

Pittsburgh is located in the dialect region traditionally known as the Northern Midlands (see Figure 2). The northern boundary of the region is defined by a close-knit bundle of lexical, phonological, and morphological isoglosses that runs through northern Pennsylvania, approximately 30 miles below the New York/Pennsylvania state boundary (Kurath, 1986:103).[4] At the eastern end of Pennsyl-

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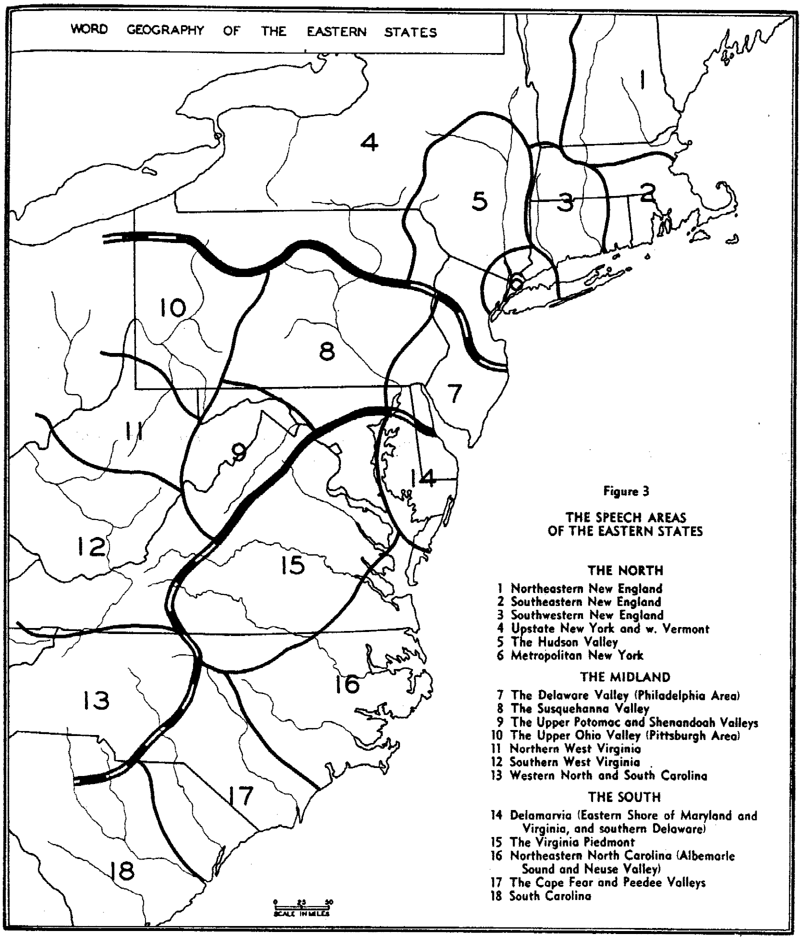

FIGURE 2. Map of dialect regions of the eastern United States. (From Kurath, 1949:Figure 3. Reprinted with permission from The University of Michigan Press.)

vania near Scranton, the isoglosses fan out, some swerving southeastward through New Jersey and others passing north of New York City. The isoglosses continue westward through northern Ohio, Indiana, and Illinois, largely petering out west of the Mississippi. This boundary clearly reflects European American settlement history, channeled by topography.

> While the Pennsylvania settlements expanded up the Susquehanna Valley to the forested area in the northern part of the state, westward across the Alleghenies to the upper Ohio and its tributaries (Pittsburgh) and southwestward into the valleys of the Appalachians, New Englanders migrated westward into the basin of the Great Lakes, skirting the Dutch settlements in the Hudson Valley. New Englanders also moved

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> southward into eastern New Jersey . . . [and] southward into the wooded hill country of northern Pennsylvania. (Kurath, 1986:103)

The Northern Midlands dialect region is separated from the Upper South region by the Southern Midlands, a transitional area encompassing West Virginia, the northern part of Maryland, and the part of Virginia west of the Blue Ridge Mountains which manifests some of the linguistic features of the Upper South and some of the features of the Northern Midland.[5] This area is largely coterminous with the northern part of the Appalachian Speech region described by Wolfram and Christian (1976). I return to the distinction between Northern and Southern Midlands speech later, for some of the phonological variation currently evident in Pittsburgh was previously thought to occur only in Southern Midlands speech. The Southern Midlands is distinguished linguistically from the Upper South by the nonvocalization of postvocalic /r/, among other features. Though Appalachian speech does have some postvocalic /r/-lessness, it is much less frequent than in the Upper South and is restricted to word-final position in unstressed syllables (Wolfram & Christian, 1976:46). The Midlands and the South are also distinguished historically in their settlement histories. The boundaries of the Upper South are defined by the expansion of tobacco plantations worked by white indentured Irish workers and African American slaves and run by a plantation aristocracy from the Chesapeake Bay, while the Southern Midlands was settled largely from Pennsylvania by Ulster Scots and Germans engaged in general farming (Kurath, 1986:108).

Although there have been few scholarly accounts of Pittsburgh speech, there is no dearth of popular accounts characterizing Pittsburgh speech, including McCool's (1982) *Pittsburghese: How to Speak like a Pittsburgher*, a publication organized like a phrase-book for "foreigners" visiting Pittsburgh, a set of four Pittsburghese mugs sold in 1991–1992 by *The Pittsburgh Press*, and assorted newspaper articles. Table 1 includes some of the features that have been picked out in these sources and by Pittsburghers with whom I conducted more extensive interviews on language—features that I have also observed independently.[6] Many of these features are not unique to Pittsburgh. To say that they constitute the Pittsburgh dialect is simply to say that Pittsburgh is one of the places where they occur, and that perhaps this particular grouping of features is unique to Pittsburgh. There are a variety of discursive, grammatical, and phonological analyses to pursue in Pittsburgh. This article focuses on the quantitative analysis of three phonological processes—vocalization of /l/, laxing of /i/ before /l/, and laxing of /u/ before /l/—with fieldwork and analysis described in more detail in the following section.

DATA COLLECTION AND ANALYSIS

The analysis of Pittsburghese described in this article is based on the speech of eight people working as Pittsburgh police officers (four white women, and four white men). The officers range in age from mid-20s to mid-40s. Each officer is represented by at least an hour of speech, drawn from a wide variety of interactional activities (taking reports from complainants, shouting out the window to kids on the corner, ethnographic interviews with the author). This data is part of

TABLE 1. *Pittsburgh dialect and vernacular features*

Lexical		
soda	pop	
rubberband	gumband	
you (plural)	yinz	
clean up	redd up	
nosy	nebby	
slippery	slippy	
very thinly sliced ham	chipped ham	
couch	davenport	
Syntactic		
Deletion of infinitival copula	That car needs washed.	
Semantic		
positive *anymore*	He smokes a lot anymore. 'He didn't use to smoke a lot but now he does'	
Discourse marker		
. . . and that [naet]	Used as sentence-final tag. Discourse function as yet unknown.	
Phonological variables		
Vocalization of /l/	pal	[paʷ]
Laxing of /i/ before /l/	feel	[fIl]
Laxing of /u/ before /l/	pool	[pɷl]
Monophthongization of /ay/	iron	[a:rn]
Monophthongization of /aw/	downtown	[da:nta:n]
Intrusive /r/	wash	[wɔrʃ]

a corpus of 182 hours of police officer interaction recorded during a year (September 1991–August 1992) of participant–observation research with the Pittsburgh police department (see McElhinny, 1993, for further details). The larger project examines, among other questions, the discursive and other strategies used by women to integrate themselves into this traditionally masculine and traditionally white working-class workplace (McElhinny, 1993, 1994, 1995, 1996, 1997).

Clearly a large-scale sociolinguistic survey of Pittsburgh speakers—one that would allow a comparison of the linguistic features found in these speakers with speakers representing other economic groups, other occupations, and other age groups—is called for. In the absence of a sociolinguistic survey, however, a close analysis of these speakers' language can yield some insights into which linguistic phenomenon may be of interest in Pittsburgh. Because all of the speakers considered here would be conventionally categorized as working-class, because their job often requires them to display some kind of street smarts, and because working-class speakers have been of particular interest for sociolinguists studying vernacular speech, such a sample may be more informative than, say, a sample of Pittsburgh professionals. Given the expenditure of time and effort required for most sociolinguistic projects, it is incumbent upon us to mine each data source for as much information as it can yield.

Quantitative analysis of the three phonological processes—vocalization of /l/, laxing of /i/ before /l/, and laxing of /u/ before /l/—is done using VARBRUL. The version of the VARBRUL program used here is Susan Pintzuk's implementation of David Sankoff's VARBRUL-2S package for the Unix environment. I consider each of the three phonological variables in turn before turning to their interactions.

PITTSBURGH PHONOLOGICAL VARIABLES

This section offers a detailed analysis of phonological phenomena that Labov identified as common in the Third Dialect: conditioned mergers before consonants, especially before liquids (Labov, 1991:33). I begin with a detailed analysis of /l/, since it provides a conditioning environment for the laxing of /i/ and /u/, and then turn to a consideration of how the variable vocalization of /l/ affects these laxing processes.

Vocalization of /l/

In American English word-initial /l/s (as in *leaf*) are made by touching the tongue tip to the alveolar ridge and raising the back of the tongue towards the hard palate. These /l/s have traditionally been called "clear" or "light" /l/s. Word-final or "dark" /l/s (as in *feel*) have been defined as /l/s made with an optional alveolar contact and the extreme raising of the tongue towards the soft palate, usually resulting in contact (Ladefoged, 1982:61–62).[7] The vocalization of /l/ "occurs when the tongue does not rise in the mouth far enough to contact the hard palate, either on the alveolar ridge as is typical for syllable-initial and intervocalic /l/ in most dialects of American English, or with raising of the back of the tongue, giving the velarized /l/ of syllable-final position" (Ash, 1986:330). The result has been variously described as "a voiced glide articulated far back in the mouth" (Ash, 1986:330) or "some kind of back vowel in the speech of some English speakers" (Ladefoged, 1982:63).[8] In Pittsburgh, *pill* may be pronounced [pI^{w}], *well* may be pronounced [wɛ^{w}], and *role* may be pronounced [ro^{w}]. Occasionally the segment is also deleted entirely.

There is, as yet, no reliable way to obtain acoustic measurements of /l/ that alone regularly distinguishes between vocalized and unvocalized variants. There are clear acoustic correlates linked to the transition from a light initial /l/ to the following vowel—most notably a sudden movement of F1 from a target around 400hz to the following vowel locus (Lehiste, 1969). However, dark /l/s demonstrate no such abrupt acoustic discontinuity. Often the formant measurements of final /l/ closely approximate those of the preceding vowel, particularly when that vowel is a high back vowel (Lehiste, 1969). The loss of apical content from dark /l/, which results in vocalized /l/, does not manifest itself acoustically, though it is measurable in laboratory studies using electropalatography (see Wright, 1986). Sproat and Fujimura (1993) distinguished canonical dark /l/s from canonical light /l/s in the following three ways. First, although both light and dark /l/s display retraction of the dorsum and lowering of the middle of the tongue, canonical dark /l/s display a greater degree of retraction and lowering. Second, for light /l/s the tongue tip reaches the extreme of its forward motion before the tongue dorsum reaches its extreme of lowering and retraction; for dark /l/s the tongue dorsum reaches its extreme first. Third, F2–F1 is significantly lower for dark /l/s than for light ones. Note that Sproat and Fujimura were able to obtain their articulatory measures by using a Microbeam System, which allowed the tracking of pellets placed on the articulators of subjects, a practice clearly impractical for analyzing speech obtained outside laboratory settings. All analyses of (1) presented here are therefore based on auditory coding.

Vocalization of /l/ can occur in almost any environment in which /l/ occurs, including intervocalically, postconsonantally, word-initially, syllable-initially, preconsonantally, and word-finally. It appears in a variety of English dialects, including Cockney English, Cambridge English, Black Vernacular English, as well as the dialects of North Carolina, Tennessee, the Upper Midwest, southern West Virginia, and the Northern Midlands. In most of these dialects, /l/ is vocalized preconsonantally. For instance, Wolfram and Christian (1976:48) found that Appalachian English manifests very little /l/-vocalization, but where the "following segment is a labial sound such as *p*, *b*, or *f*, *l* may be completely deleted . . . [as in] *wolf*, *help* or *shelf*, making words such as *woof* and *wolf*, *hep* and *help*, or *chef* and *shelf* homophonous."[9] Throughout the history of English, /l/ has been lost in these environments (as in *half*, *stalk*, *behalf*, *should*, *would*).

In the most detailed treatment to date, Ash (1982) described a qualitatively and quantitatively different phenomenon in Philadelphia: the widespread and systematic vocalization of intervocalic and word-final /l/. I found little evidence of intervocalic vocalization of /l/ in Pittsburgh and so therefore focus on Ash's data on vocalization of word-final /l/ here.[10] Ash noted word-final vocalization of /l/ in a number of cities in the United States, especially in the Northern Midlands dialect region and in western extensions of it (1982:247).[11] She noted that the vocalization of /l/ in the Midlands is a dialect feature that does not appear in data gathered for the Linguistic Atlas of the Atlantic States in the 1930s and 1940s (published as Kurath & McDavid, 1961). In Philadelphia Ash found age differences in the vocalization of /l/, with the oldest speakers showing least vocalization and each subsequent generation showing more (with the exception of the youngest generation) (1982:111). This suggests a change in progress, though more evidence comparing different historical periods would be necessary to confirm this. I consider other similarities and differences between Pittsburgh and Philadelphia as I review and analyze two linguistic constraints on the vocalization of word-final /l/ that proved significant in Ash's (1982) study as well as in the present study: preceding phonological environment and following phonological environment.[12]

Analysis of vocalization of word-final /l/

Preceding phonological environment. In Philadelphia Ash found that the preceding high and mid front vowels [I], [i], [e], and [ɛ] and the back mid short vowels ə, /ʌ/, and [ɷ] disfavored vocalization, while the low vowels [ae], [aw], and [ay] and the back high and mid long vowels [u] and [o] favored vocalization (1982:62).[13] She offered an articulatory explanation, arguing that high and mid front vowels disfavor vocalization because the position of the tongue close to the palate for these vowels promotes palatal contact in the production of the /l/, while the low vowels, back high vowels, and mid long vowels favor it because the

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distance between palate and tongue is relatively great (1982:90). This does not explain, however, why mid back vowels favor vocalization while mid front vowels do not, nor does it explain the puzzling difference in the effects of [ɷ] and [u].

I decided to analyze the effects of preceding environment on /l/ without any theoretical assumptions about which categories of vowels would favor vocalization. In my initial analysis I considered the following environments: i, I, e, ε, æ, ay, aw, a, u, ɷ, o, ɔ, oy, ə, and consonant. In subsequent runs I combined vowels that were phonetically similar and had similar effects on the vocalization of /l/, using the log-likelihood test before each combination to ensure that the distinction eliminated was not significant (see Guy, 1988:133; Sankoff, 1988:15). In coding preceding vowels, I used the vowel's phonetic value and not its phonemic value within the Pittsburgh vowel system. In the cases where the /l/ followed a consonant in words such as *battle* or *puddle*, I could have coded the preceding segment as ə or as consonant (syllabic /l/); in all such environments, I coded /l/ as following a consonant.

Preceding consonant has a significant disfavoring effect on vocalization that makes it look quite different from other preceding environments (see Table 2). Although it is not the only disfavoring phonological environment ([ε] and [o] also fall into this category), it is the environment that favors vocalization the least. Given that most vowels do in fact favor vocalization, it is quantitatively justifiable to treat postconsonantal /1/ differently from postvocalic /1/. There is strong linguistic evidence for doing so as well: postconsonantal /1/ is also by definition syllabic /l/ (i.e., /l/ serves as the syllable nucleus), whereas postvocalic /1/ falls into the syllable coda (Mohanan, 1986:31–32).

In articulatory explanations of which vowels might favor vocalization, vowel height is often seen as significant; the assumption is that when the tongue is raised to near the roof of the mouth, it is more likely to make contact with the alveolar ridge. Using the log-likelihood test it is possible to combine some of the linguistically and quantitatively similar vowels to produce the picture in (3).

(3)

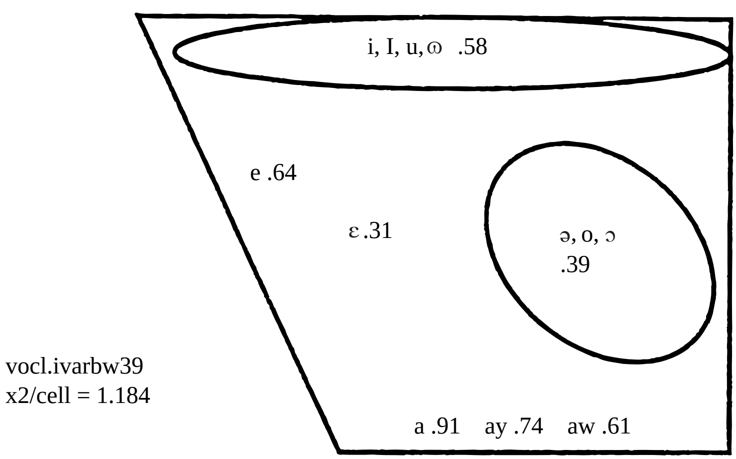

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TABLE 2. *Effect of preceding phonological segment on (l)*

	% Vocalized	Probability	*N*
Favor vocalization			
a	79	.94	56
r	63	.85	8
ay	40	.81	57
ɷ	47	.74	45
e	46	.70	41
I	39	.69	181
i	39	.67	95
aw	25	.64	4
u	33	.57	42
Neither favor nor disfavor			
ɔ	25	.48	294
ə	30	.47	128
Disfavor vocalization			
ɛ	29	.42	146
o	21	.35	47
consonant	13	.23	365
ae	0	—	1
oy	0	—	2
Total	30		1,512

Overall χ^2/cell = 1.095, Run vocl.ivarbw1
Input probability .26

The distinction between the high vowels and [e] is not statistically significant, but I have kept them distinct to illustrate the marked difference between the effects of [ɛ] and [e]. The distinctions between [ay], [aw], and [a] are statistically significant, though they all favor vocalization and are linguistically similar. High and low vowels, then, favor vocalization. It may be argued that the two diphthongs favor vocalization because their offglides are also high vowels; this argument seems a bit strained. Instead, it seems preferable to consider when exactly arguments based on articulatory constraints are useful and when they are post hoc.[14] As Veatch (1991:5) pointed out,

> "[p]hysically motivated" processes are usually not physically necessary, and can vary stylistically, so that the most natural, physically easiest and most simplified phonetic forms are restricted to certain styles; similarly, there are differences in these details across dialect. . . . "Hard" coarticulation does exist, since the tongue cannot move infinitely fast. But there is a large realm of "soft" coarticulation, which is not due to absolute physical constraints. . . . Speakers must learn these patterns because it is part of what differentiates one dialect or language from another.

Articulatory constraints on vocalization of /l/ may be understood as belonging to the latter category.[15]

There is, however, a general pattern structuring the effect of preceding phonological environment among European American speakers: the length/tenseness

TABLE 3. *Effect of vowel length on probabilities of vocalization of /l/*

Long/Tense			Short/Lax	
i	.67	<	I	.69
e	.70	>	ε	.42
u	.57	<	ω	.74
aw	.64	<	a	.94
ay	.81	<	a	.94

of vowel. "Tense" is a label for a bundle of complicated properties of vowels, including length. In four of the five pairs of long–short (tense–lax) vowels, the lax variant favors vocalization more, if in one case only slightly more (the exception is e–ε; see Table 3).[16]

When I consider interactions of phonological processes, I return to this pattern. In the conclusion I suggest that short, or lax, vowels allow vocalization more frequently because they do not occupy the glide slot in the English syllable nucleus, and /l/ is therefore free to occupy it. By contrast, long vowels do occupy this slot.[17]

Following phonological environment. Work by Sproat and Fujimura (1993) on allophonic variation in /l/ suggested that the phonological environment most significant in influencing the clarity of /l/ is the strength of the phonological boundary after /l/.[18] They argued that dark and light /l/ are not categorically different either phonologically or physiologically, but rather that all /l/s in English have both a dorsal and apical component, with lighter and darker /l/s distinguished by the degree to which these gestures (particularly the dorsal gesture) are realized and by the timing of the two gestures, which is linked to the phonetic duration of the rhyme containing it (Sproat & Fujimura, 1993:298–300). In the longest rhymes the tongue dorsum is able to reach the full extent of the target for the dorsal retraction gesture, and /l/s will be darker; but where the boundary is weaker and the rhyme shorter, there is not enough time for the dorsal retraction gesture to reach its full target, and /l/s will be lighter (Sproat & Fujimura, 1993:307). The duration of the syllable rhyme is linked to the strength of phonological boundaries, with stronger boundaries (e.g., the end of intonational phrase) having longer rhymes than weaker boundaries (e.g., morpheme boundary).[19] These phonological boundaries (intonation, word boundary, morpheme boundary) have syntactic correlates in many instances. However, they are also distinguishable by prosodic characteristics alone, so that it is not necessary to postulate that phonetic interpretations directly access syntactic structure. Though Sproat and Fujimura do not consider vocalized /l/, their model accommodates such a consideration, since vocalized /l/ is a kind of dark /l/ (the "darkest" kind). As we shall see in the results obtained for following phonological environment, the prosodic explanation offered by Sproat and Fujimura seems to provide a unified account for the vocalization of /l/, since boundary strength provides a strong effect on /l/-vocalization among European Americans.

TABLE 4. *Effect of following boundary strength on (l)*

	% Vocalized	Probability	*N*
_pause (intonation boundary)	47	.64	191
_# (word boundary)	37	.49	884
_+ (morpheme boundary)	26	.29	118
Total	37		1,193

Overall χ^2/cell = 1.197, Run vocl.ivarbw18
Input probability .37

Sproat and Fujimura (1993) tested a large set of finely graded boundaries with different strengths. From strongest to weakest these included: (1) before a major intonation boundary, (2) VP-internal phrase break, (3) before morpheme boundaries (derivational and inflectional boundaries considered separately), (4) intervocalically, (5) word-initially, and (6) before /h/ (Sproat & Fujimura 1993:295–296). Not all of these categories are relevant for the vocalization of /l/ in Pittsburgh. I used a simplified scheme that considered morpheme, word, and intonation boundaries (with the latter signified by pause).[20]

Although some observers (e.g., Wells, 1982:313–315) have claimed that vocalization of /l/ is restricted to preconsonantal and phrase-final environments, this is not true in Pittsburgh. There is no significant difference between the effect of following consonant and following vowel in the speech of European Americans.[21] There is, however, a marked difference between following segment and following pause. This difference is best understood as the effect of the strength of the phonological boundary upon (l): vocalization occurs more frequently before stronger boundaries, as shown in Table 4.

Sproat and Fujimura's explanation for the effects of boundaries on the production of /l/s continues to hold here for vocalized /l/s: stronger boundaries are linked with longer rhymes, and longer rhymes allow the time for the tongue body to lower and retract (i.e., to attain the tongue position linked to darker /l/s, as well as vocalized /l/s).

The vocalization of /l/ interacts with other phonological processes in Pittsburgh, perhaps most strikingly conditioning the merger of tense and lax vowels. In the following section I explore these processes.

Laxing of tense vowels before (l)

Conditioned mergers of vowels are common in English. Examples of mergers occurring in a specific environment include the merger of *pin/pen* in Black Vernacular English, Appalachia, and the South, *merry/Murray* in Philadelphia, *Mary/merry/marry* in California, *bear/beer* in Rhode Island, and *haggle/Hegel* in southeast Wisconsin (for reviews, see Labov, 1994; Veatch, 1991). Many of these mergers in English occur before /r/ or /l/.

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Labov et al. (1972:236–242) first noted the tense–lax merger in Albuquerque and in the working-class, Mexican American section of Salt Lake City; they named it the *fool–full* merger because in the areas they studied the merger of /u/ and /ʊ/ seemed most general.[22] That merger is primarily of interest as a false merger (i.e., as a merger in which speakers' production is at odds with their perception). Speakers produce a slight distinction between the lax and tense vowels but do not always perceive one when presented with minimal pairs or commutation tests. (Speakers from other dialects also do not generally perceive any distinction when faced with the same tests.) Labov et al. (1972) speculated that the merger was a sound change in progress, though their exploratory studies did not establish that fact with any certainty.

The variable laxing of tense vowels before /l/ in Pittsburgh (Brown, 1982) is a tense–lax merger also found in Alabama (Feagin, 1987), Virginia (Shores, 1985), Texas (Sledd, 1987), the western states (Di Paolo, 1988; Di Paolo & Faber, 1990; Hartman, 1984; Labov et al., 1972), New Zealand (Bauer, 1986), and southern Australia (Gregory Guy, personal communication). In these dialects the tense variant of vowel pairs /i/ and /I/, /u/ and /ʊ/, and/or /ɛ/ and /e/ may merge with the lax variant in the conditioning environment. Thus, *feel* and *fill* are sometimes both [fIl], *pool* and *pull* are sometimes both [pʊl], and *fell* and *fail* are sometimes both [fɛl]. The occurrence of the tense–lax merger before /l/ can be partly explained in phonetic terms: dark /l/ tends to cause lowering and centralizing of preceding vowels, especially front vowels (Ladefoged, 1982:87–88).[23]

Di Paolo (1988:86–87) demonstrated that laxing is a change in progress in Utah, with the laxing of /u/ perhaps being older than that of /i/ and /e/.[24] Strikingly, however, even some of the speakers who do not produce merged vowels show evidence of a new phonemic target. On a task where they were asked to match the vowel of a given word with the vowel in one of a variety of words pronounced by the interviewer, they sometimes matched words that had unmerged vowels in their own speech with a set of words that contained lax vowels (Di Paolo, 1988:90). Di Paolo and Faber (1990) further complicated the pronunciation/categorization picture by demonstrating that, even when F1 and F2 contrasts between the tense and lax vowels are lost, voice quality of the vowels may still distinguish them: breathier vowels are judged by listeners as tense and creakier ones are perceived as lax. Furthermore, in Salt Lake City reversals in F1 for the front vowels /il–Il/ and /el–ɛl/ and in F2 for the high back vowels /ul–ʊl/, along with reversals in the vocal quality of those vowels, suggest that the eventual outcome of the merger will not be a merger but a reversal of the sort noted by Labov et al. (1972) and Labov (1991, 1994) in the Southern Chain Shift. In that shift, the lowering and centralizing of front tense vowels and the raising of front lax vowels to peripheral position is effecting a reversal of the position of front tense and lax vowels. Di Paolo and Faber (1990:199–200) suggested that the reversals in Utah are preliminary evidence that Salt Lake City is beginning to participate in the Southern Chain Shift.

In coding for (i) and (u) I occasionally found diphthongal variants like [I^{æ}]. I considered these as lax if the nucleus of the diphthong was lax.[25] I also occasion-

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TABLE 5. *Effect of preceding phonological environment on (i)*

	% Laxed	Probability	*N*
Labiodental	21	.47	33
Alveolar	36	.44	217
Alveopalatal	33	.81	3
Velar	54	.78	13
Glottal	75	.95	12
Total	37		278

Overall χ^2/cell = .721, Run i.ivarba9
Input probability .33

TABLE 6. *Effect of following phonological environment on (i)*

	% Laxed	Probability	*N*
Vocalized /l/	49	.61	84
Unvocalized /l/	31	.45	195
Total	37		279

Overall χ^2/cell = .632, Run vocl.ivarba9
Input probability .34

ally found /i/-laxing past [I] to [æ]. I also coded these as applications of the laxing process. In the speech of three speakers I observed tensing of /I/ to [i] in three words (*build*, *fill*, and *still*, which they pronounced as [bild], [fil], and [stil]). Had this process been more widespread, it would have suggested the sort of reversal of positions of /i/ and /I/ occurring in the Southern Chain Shift.[26]

I considered two linguistic constraints on (i) and (u): preceding phonological environment and following phonological environment. I coded for place of articulation of preceding segment with bilabial, dental/labiodental, alveolar, palatal, and velar.

Laxing of /i/ before /l/. The laxing of /i/ to [I] is backing. I predicted that places of articulation that were ⟨+back⟩ would favor laxing more than those that were ⟨−back⟩ segments.[27] Indeed, laxing of /i/ was favored by segments that were further back. It should be noted, however, that these included not only the segments phonologically known as ⟨+back⟩ but also alveopalatal segments (see Table 5). With regard to following phonological environment, I found that vocalized /l/ favored /i/-laxing (see Table 6).

Laxing of /u/ before /l/. Preceding segment and following segment significantly affect laxing of /u/. The laxing of /u/ to [ɷ] is fronting, and so preceding front segments should favor. And indeed they did here. Only preceding velars disfavored (see Table 7). Again, vocalized /l/ strongly favored laxing (see Table 8).

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TABLE 7. *Effect of preceding phonological environment on (u)*

	% Laxed	Probability	*N*
Bilabial	0	—	2
Labiodental	100	—	1
Alveolar	83	1.00[a]	6
Palatal	17	.91	12
Velar	21	.11	34
Total	27		55

Overall χ^2/cell = .461, Run u.ivarb2
Input probability .05
[a]In the version of VARBRUL used here, probabilities are occasionally rounded up or down. This 1.00 value is the result of such a rounding.

TABLE 8. *Effect of following phonological environment on (u)*

	% Laxed	Probability	*N*
Vocalized /l/	42	.95	24
Unvocalized /l/	16	.09	31
Total	27		55

Overall χ^2/cell = .461, Run u.ivarb2
Input probability .05.

The following section turns to a unified phonological explanation of the interaction among variable phonological processes described here.

DISCUSSION

In conventional accounts of syllable structure, an onset is followed by a rhyme. Within the branching rhyme, a coda follows a nucleus. Veatch's (1991) revision of this model of syllable structure combined structuralist insights with contemporary phonological theory for English syllable structure to account for a number of facts about historical change in English as well as contemporary dialect variation. Among these is the fact that there was no long/short contrast before /r/ after its vocalization in earlier English dialects, that in dialects in which monophthongization has occurred tautosyllabic /r/ is possible, and that /r/ cannot co-occur with glides. As Veatch (1991:49) argued,

> when a phonetic change occurs so that a post-vocalic consonant becomes vocalic, and is phonologically reanalysed as a glide, all the contrasts among vowels that precede the new glide, which depended formerly on the presence of glide features to distinguish them, must either be re-analysed, or lost, depending on the phonetic forms of the relevant sound classes.[28]

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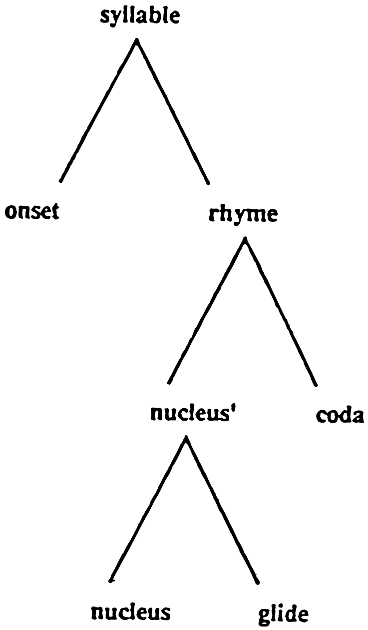
Veatch concluded that there is a glide slot in the English syllable nucleus, as in (4).

(4)



Although Veatch most extensively considered how this model might explain facts related to /r/, the model clearly makes some strong predictions for what might happen in dialects with /l/-vocalization, a fact he was quick to recognize. Veatch (1991:50) went on to develop a formal description of what would happen in the event of such a change:

> /l/ shifts into the glide slot from its former coda position. . . . At the same time, the glide slot into which the /l/ has moved had formerly represented the long–short distinction; if /l/ now occupies the post-vocalic glide slot next to formerly long as well as short nuclei, the formal distinction between the long and short vowels disappears; this accounts for the long/short mergers. The same logic accounts for the coalescence of glides with the realization of /l/.[29]

The particular utility of such an explanation is that it provides a unified account of a number of otherwise unrelated changes in the speech of European Americans in Pittsburgh. According to this model, when /l/ vocalizes to a high back glide, it moves into a postvocalic glide slot, causing long vowels to shorten. All tense vowels are long. Shortening them is by definition laxing them. As we have seen, there is a clear relationship between the laxing of vowels and /l/-vocalization. In four of the five pairs of long–short (tense–lax) vowels, the lax variant favored vocalization more. Vocalized /l/ also favored the laxing of /i/ and /u/.

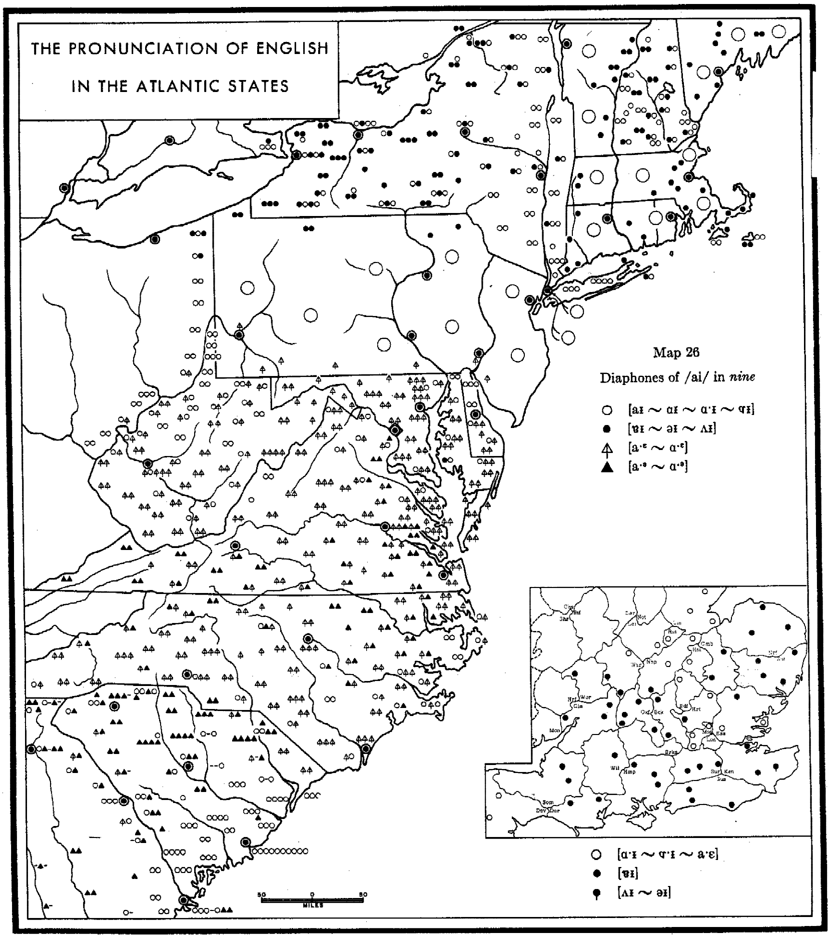


FIGURE 3. Variants of /ay/ in the eastern United States. (From Kurath & McDavid, 1961: Map 26. Reprinted with permission from the University of Alabama Press.)

This model makes another prediction that seems to be partly borne out by sociolinguistic facts in Pittsburgh. Diphthongs are also, by definition, long. When /l/ moves into the glide slot, one might expect monophthongization, which one does indeed observe in Pittsburgh. The variable monophthongization of /ay/ appears to be a long-standing characteristic of Pittsburgh speech.[30] As Kurath and McDavid (1961:109–110) noted, the northernmost point at which "slow" /ay/ (i.e., a diphthong with a short up- or in-glide) occurs is Pittsburgh (see Figure 3).

"Slow" diphthongs occur before voiced and voiceless consonants in the southern Appalachians, the Blue Ridge Mountains, and parts of North Carolina.[31] Monophthongization is particularly common, and widely noted, before /r/ in

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Appalachia. It is more likely to occur before word-final /r/ (as in *tire* and *fire*) than before /r/ that follows a morpheme boundary (as in *buyer* and *flyer*). Wolfram and Christian (1976) also located a nucleus somewhere between [æ] and [ɔ] for the monophthongized version of (ay). The variants in use before apical nasals in Pittsburgh in the 1930s and 1940s were [aᵋ] and [ɑᵋ] (Kurath & McDavid, 1961:Map 26). More variation is evident in the vowels that appear before /r/: the Pittsburgh variants include /ay/, /a/, and /ɑ/, with the diphthongal variant preferred by Kurath and McDavid's cultured speakers (Kurath & McDavid, 1961:Map 47). According to Kurath and McDavid (1961:122), "the merging of /ɑi/ with /ɑ/ before tautosyllabic /r/, which makes *fire*, *tired* homophonous with *far*, *tarred* is a characteristic feature of Midland speech." Since the vowel of *fire* and *tired* is now more centralized (to [a:]) than in the 1930s and 1940s, the homophony between these particular sets of words no longer seems to exist in Pittsburgh. Although Kurath and McDavid (1961:122) believed the monophthongal variant of (ay) was clearly recessive in Pittsburgh, Hankey (1965) noted that variation in the pronunciation of (ay) still existed in western Pennsylvania twenty or thirty years later. He described a tendency for alternation between /ay/ and /æ/ in words such as *tire*, *wire*, *tile*, *silo*, *nine* and in other preliquid and pre-nasal environments. He also noted the use of /æ/ before the voiced velar stop /g/ in one word (*tiger*). From these two accounts one might cautiously extrapolate that monophthongization is becoming more widespread: Hankey noted it before /l/ as well as in the pre-/r/ and pre-nasal environments noted by Kurath and McDavid.

The variable monophthongization of /aw/ is also a long-standing variable pattern in Pittsburgh. Kurath and McDavid (1961:123) noted that "a few speakers in eastern and western Pennsylvania have the /ɑ/ phoneme in *flower*, pronouncing the word as [flɑər] so that it rimes with *car* /kɑr/." As with (ay), however, the monophthongal variant is now [a:]. When I elicited tokens of this variant from one Pittsburgh speaker, she first pronounced the word *file* as [fayl] and then said, "But I'm pronouncing it that way cause I'm paying attention, normally I'd say [fa:l]. Yeah, just like *fowl* [she pronounced it as [fa:l]], you know, the bird." Monophthongization thus collapses (ay) and (aw) to [a:], at least before /l/. Kurath and McDavid described monophthongization of /aw/ before /r/ and /l/ in *fowl*, *owl*, and *hour*. I have also observed it before nasals (*down*, *town*), /s/ (*house*), and /t/ (*out*), though it did not occur in these environments in the 1930s and 1940s (see Kurath & McDavid, 1961:Maps 28 and 29). Labov (1991:34) believed that the monophthongization of /aw/ in Pittsburgh, since it inserts a third low vowel between /æ/ and /ɔ/, may create the conditions for further linguistic change and chain shifting of a sort as yet undescribed. A more comprehensive quantitative consideration of the monophthongization of both /aw/ and /ay/ requires further investigation. Veatch's model of syllable structure is supported by the co-occurrence of the vocalization of /l/ and the monophthongization of /aw/ and /ay/ in Pittsburgh, but the precedence of monophthongization and indeed its occurrence before /r/ and nasals as well as /l/ suggest that these processes, rather than /l/-vocalization, might be causing the restructuring.

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CONCLUSION

This article has considered three phonological processes in the speech of European American Pittsburghers: vocalization of /l/, laxing of /i/ before /l/, and laxing of /u/ before /l/. Postulating a glide slot in English syllables seems to provide a unified account for these seemingly unrelated changes. Some questions remain, however, for future research. In Veatch's account there is some conflation of the development of a formal model with predictions about the order in which changes will appear (see especially 1991:50–51). It is not at all clear that vocalization of /l/ appeared earlier than, or even simultaneously with, the other changes. Rather, it is monophthongization of /aw/ and /ay/ that appears to have a longer history. Kurath and McDavid described monophthongization of /ay/ and /aw/ in a range of environments in Pittsburgh in the 1930s and 1940s.[32] Other complications arise from the observation that, among African Americans in Pittsburgh, (l), (ay), and (i) are found as sociolinguistic variables, but (aw) and (u) are not. If the vocalization of /l/ is conditioning the laxing of /i/ and monophthongization of /ay/, it becomes difficult to explain why the same is not true of /aw/ and /u/. It is possible, however, that it is actually monophthongization and laxing that initiate the vocalization of /l/. The answer to some of these questions will have to await further investigation of Pittsburgh speech. In particular, a study of apparent and real-time differences in the use of the variables might clarify the relative age of the different changes within the city.

The question also arises whether there is a necessary relationship between these phonological processes, of the kind that exists in the Northern Cities Chain Shift and Southern Chain Shift, where changes affecting the pivot points necessarily affect other parts of the vocalic system. Further investigation of other dialects with vocalization of /l/ (e.g., Cockney, Western American dialects) may also shed light on this problem. If laxing and monophthongization tend to precede vocalization, and if these are necessarily related, one would expect to find vocalized /l/ co-occurring with the other processes wherever it occurs.

Finally, the work reported here suggests another interesting line of investigation. Many Pittsburgh speech processes seem to be closely related to Appalachian processes (see especially the description of (aw) and (ay)), perhaps because of the migration of people from Appalachia to work in Pittsburgh steel mills. Wolfram and Christian's (1976) investigation of Appalachian speech in West Virginia suggested that speakers there are participating in some version of the Southern Chain Shift. Though they did not provide a comprehensive description of the vowel system, they did report finding /I/-raising to [i^{æ}] and /u/-fronting even as far as [i]. Interestingly, both of these processes are more common before /l/ and ʃ (1976:67–68). Pittsburgh and West Virginia, then, have complementary parts of the vowel shifts observed in the Southern Chain Shift, with the changes conditioned in both cases by /l/. A more detailed comparison of these dialects with each other and with southern dialects is called for to ascertain if these regional systems, like the Canadian Third Dialect, might be implicated in incipient chain shifts.

NOTES

1. It has also been observed in southern England, Australia, and New Zealand.

2. Labov (1996) pointed out that cities such as Pittsburgh, Columbus, Dayton, Saint Louis, and others seem to follow more diverse principles than regions involved in the Northern Cities Chain Shift and Southern Chain Shift.

3. Labov noted other parallels among Third Dialect regions. For instance, the monophthongization of /aw/ in Pittsburgh to a low front-central [a:] inserts a third vowel between /æ/ and /ɔ/, while in Boston the vocalization of /r/ in /ahr/ produces the same low front-central vowel (1991:34).

4. See Labov (1974:231–233) for a discussion of average daily traffic flow across the dialect boundary. Though his study of traffic flow was conducted approximately two decades after the dialect survey described in Kurath (1949) and also published in Kurath and McDavid (1961), Labov still found that the North Midlands isogloss falls at a point where traffic on existing highways between the two areas is least frequent.

5. See Frazer (1986:142) for a description of some of the features shared by the Upper South and the Southern Midlands and for a discussion of the western extension of the Northern and Southern Midlands region.

6. Popular accounts do not, of course, refer to the features in these terms but tend to offer illustrative examples. There are some marked discrepancies between what such popular accounts tend to pick out as characterizing Pittsburgh speech and what linguists might say characterizes the speech of the region. Rather than simply dismissing popular accounts as a linguistic hodgepodge, linguists could analyze them to gain further insights into ideologies of standard language and resistance to that standard, in line with the recent surge of interest in studies of linguistic ideology in European sociolinguistics and North American linguistic anthropology (see Woolard & Schieffelin, 1994).

7. Dark /l/s have also been called "velar" or "velarized" /l/s, a description contested in Sproat and Fujimura's (1993) articulatory and acoustic study of dark and light /l/s. They argued that "velarized" is an inappropriate term, since a velarized sound should show significant raising of the tongue dorsum towards the velum. Instead they found dorsum retraction without raising (1993:309).

8. Lenition processes are common in syllable-final position in English. Witness the many dialects of English in which the apical articulation of /t/ is stronger in syllable-initial position than in syllable-final position, in the latter case even reducing to a glottal stop or zero in some dialects. Ladefoged (1982:62) argued that strictly speaking the loss of apical contact in the /l/s of some speakers means that /l/ is no longer an alveolar consonant but a back vowel for those speakers. Sproat and Fujimura made a similar argument: "The dorsal retraction gesture is a vocalic gesture since it does not produce a radical constriction in the vocal tract" and since "dark /l/s have a more significant dorsal retraction gesture and a less extreme apical gesture than light /l/s, it makes sense they should be considered more vocalic" (1993:304, 305). This, they argued, explains why it is often asserted that dark /l/s, and especially syllabic /l/s, are really vocalic. Gestures involving non-peripheral articulators like tongue dorsum retraction are attached to syllabi nuclei, while gestures involving peripheral articulators like the tongue tip (which are more consonantal in nature) are attracted to syllable margins. Dark /l/s are more vocalic and more attracted to vowel nuclei.

9. Wolfram and Christian (1976:48) noted the occasional vocalization of syllabic /l/ in words such as *battle*, *table*, and *candle*.

10. By word-final I mean either at the end of a stem or at the end of a stem followed by an inflectional morpheme. Pittsburghers vocalize /l/ when it is followed by an inflectional morpheme (as in the verbs *feeling* or *feels* or the noun *mills*). There are isolated tokens of /l/ vocalized in other environments in the speech of some Pittsburghers, as in *realized* or *wild*. Usually vocalized /l/ only appears once or twice in such environments in the speech of any given speaker. Intervocalic /l/ (in, say, *realized*) does vocalize occasionally in Pittsburgh, as does preconsonantal /l/ in words like *wild*, but vocalization in these environments seems to be quite rare. There is some difference from city to city in the phonological environments in which /l/ can be vocalized and the extent to which the phenomenon is noticed. In Pittsburgh, for example, vocalization seems to occur only word-finally and goes largely unnoticed, whereas one of the distinctive characteristics of Philadelphia speech is vocalization of /l/ in all environments, with intervocalic vocalization of /l/ receiving at least some public comment. Note that in Pittsburgh this is true even though (or perhaps because) the vocalization of /l/ occurs more frequently than in Philadelphia: vocalization of /l/ occurs 40% of the time among African American Pittsburghers and 30% of the time among European American Pittsburghers. Two widely distributed popular descriptions of Pittsburghese, McCool's *Pittsburghese* and a set of mugs printed with Pittsburgh dialect items distributed by the *The Pittsburgh Press*, include only one token of a word with vocalized /l/, although the other Pittsburgh phonological variables are much more

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widely exemplified and commented upon. McCool's entry in full reads: "CAW: trying to get somebody's attention; or, telephoning him, as in 'I cawd but you weren't home"' (1982:6).
11. The same process seems to occur in Cambridge English (see Wright, 1986, 1989).
12. Grammatical category was significant in Ash's study and in this one, but its effects are less germane to my principal argument concerning the interaction of laxing of tense vowels and the vocalization of /l/. The grammatical condition of vocalization of /l/ is straightforwardly explained. Usually phonological variables are only affected by grammatical category when the segment bears a functional load. I coded for the following grammatical categories: auxiliary *will*, adjective, adverb, conjunction, discourse marker *well*, noun, and verb. The only case in which coda /l/ carried a functional load is in the auxiliary *will*, and indeed *will* strongly disfavored vocalization in the speech of African Americans and European Americans. For a more detailed discussion, see McElhinny (1993:256–258).
13. The effects of preceding vowel on vocalization of /l/ in Philadelphia are as follows (Ash, 1982:62):

aw	.76	ɷ	.46
æ	.73	e-ɛ	.45
oh	.67	oy	.37
u	.66	r-colored ə	.37
ay	.63	ow	.34
/ʌ/	.57	i-I	.34
ə	.54	a	.14

14. Hardcastle and Barry (1985:41–42) found the following difference between front and back vowels on the vocalization of /l/ among six southern British and Australian speakers:

	Vocalized /l/	Unvocalized /l/
Preceding front V	28 (38%)	44 (62%)
Preceding back V	20 (28%)	52 (72%)

They used a Wilcoxon-Wilcox matched pair comparison to find that preceding vowel context is significant ($T = 0$, *df* 5, $p < .05$). Preceding front vowels favor vocalization more than do preceding back vowels. According to another kind of articulatory account (Sproat & Fujimura, 1993), one primary articulatory gesture in vocalization is a dorsal retraction gesture. Under this articulatory account, one might expect back vowels to favor vocalization. Veatch's comments on when articulatory arguments are post-hoc seems appropriate here.
15. Citations drawn from Veatch (1991) are based on a single-spaced version of his thesis. The official UMI version is double-spaced; thus citations may not correspond. For ease of cross-referencing, I will also include references to the section of his thesis from which citations are drawn. The quotation here is drawn from Chapter 1.
16. Although the differences between i–I are quite small (.58 and .60, respectively), they do tend to support the general pattern. At the very least, they do not contradict that pattern.
17. Because I adopted a coding procedure of coding for the phonetic value of the preceding vowel (rather than for its phonemic status), I do not distinguish between preceding vowels that are phonemically lax (/ɷ/ → [ɷ]) and the lax phonetic variant of a phonemically tense vowel (/u/ → [ɷ]). As a point of interest, it would be worth comparing the effects of the lax and tense variants of a phonemically tense vowel (e.g., to compare the effects of [i] and [I] on (l) in words like *feel*).
18. Sproat and Fujimura were rather casual about describing the linguistic variety spoken by their five subjects. Four were described as speaking "Midwestern American English," and another was a speaker of "British English with a fair amount of American English influence" (1993:294). The importance of dialect, as well as other factors, in shaping the results they arrived at should not be overlooked. It should be noted that they only considered the effects of phonological boundary in the context of /i–I/.
19. Though Sproat and Fujimura (1993) focused on lengthening effects associated with phonological boundaries, other sources of variation in duration are stress and speaking rate. Although I did not code for stress, the effect of /ə/ on vocalization can give us a rough indication of the effect of lack of stress on vocalization. Because stress would also increase the duration of the onset, one would expect stress to allow dorsal retraction and to be more frequently correlated with the production of a darker /l/ (including vocalized /l/—the darkest /l/ of all). In unstressed syllables, where there is less time to achieve the back target, one would expect vocalization to be disfavored. This turns out to be true in the case of European Americans but not in the case of African Americans.

Work by Wright (1986, 1989) on connected speech processes (also known as fast speech processes) on Cambridge English suggested that rate of speech also affects the rate of vocalization of /l/, with faster rates of speech associated with higher rates of vocalization (Wright 1986:7, 19). In Cambridge other connected speech processes (e.g., syllable reduction/deletion, alveolar place assimilation, glottalization of stops) are even more sensitive to rate of speech. Interestingly, however, those connected speech processes most affected occur less frequently than vocalization of /l/. They occur with 20% to 40% frequency, while /l/-vocalization occurs 60% to 70% of the time. Wright argued that, because the rate of /l/-vocalization is so high, it is a connected speech process that has to some degree become phonologized in Cambridge English (Wright, 1986:20–21). As a result, it is less affected by external factors (like rate of speech) than other connected speech processes. In Pittsburgh English, however, /l/-vocalization occurs at a rate of 40% in the speech of African American officers and 30% in the speech of European American officers. Thus /l/-vocalization in Pittsburgh looks more like the non-phonologized fast speech processes in Cambridge that are most affected by rate of speech. In further investigations of (l) in Pittsburgh it would be important to take into account the rate of speaking as a factor affecting the rate of vocalization as well as the duration effects associated with other prosodic phenomena described here. If fast speech favors /l/ vocalization, one would expect unstressed words to favor /l/ vocalization too, since they occur more frequently in rapid speech. There is contradictory evidence on whether this is true in Pittsburgh. The favoring effect of ə in African American speech would fulfill this prediction, but the disfavoring effect in European American speech would counter it.

20. I do not distinguish here between pauses at intonational boundaries and pauses before dysfluencies (e.g., following self-interruptions).

21. In Ash's study, following vowel or pause favored vocalization, while following consonant did not (1982:93). This seems surprising, since it leads to vowels in hiatus, a condition generally avoided in English. Ash argued that the vocalization of /l/ to a glide was favored by following vowel because glide–vowel patterns are well established in English.

22. Labov et al. (1972:236–237) offered several hypotheses about what might be influencing this merger: (1) the influence of Spanish (since in their data the merger seemed strongest in the Spanish contact area), (2) changes analogous to mergers before /r/, and (3) /l/ interacting with (and holding back) a chain shift. Although it is not impossible that this conditioned merger has different initiating effects in different English dialects, the fact that the merger is so widespread in English suggests that the more general explanation will lie with English phonological structures, such as those suggested in (2) and (3). There is no Spanish substrate effect in Pittsburgh.

23. Curiously, following /l/ does not have a consistent effect on lowering of vowels involved in the Canadian Shift (Clarke et al. 1995:214–215). Further understanding what blocks this effect may facilitate what favors it elsewhere.

24. In Pittsburgh a rapid anonymous survey conducted by Cynthia Brown (1982) provided a preliminary report on the state of the conditioned merger in Pittsburgh. Brown elicited vowels before liquids in words such as *fourth floor*, *sale*, *corner*, *store*, and *sheer* (curtains). Although her results were not statistically significant for any of the social categories she examined (class, sex, ethnicity), this is probably because she combined the /l/ and /r/ environments. There is no contrast between tense and lax vowel pairs in syllables closed by /r/ in American English (Ladefoged, 1982:81). The variable laxing effect of /l/ is thus obscured by the categorical laxing effect of /r/. Even taking this into account, however, Brown did find slight differences between men and women in laxing (men laxed slightly more) and according to the type and location of store studied (employees in stores catering to a wealthier clientele laxed vowels less, and employees in stores in the suburbs used it less than did speakers in downtown stores). The correlation of laxing with age of the speakers is difficult to interpret in Brown's data, but it seems to suggest that laxing may be disappearing. Speakers over 60 laxed most, followed by speakers between 30 and 50 years of age and then speakers between 20 and 30 years of age, with those between 50 and 60 years of age laxing least. However, since Brown did not provide any information on the size of her sample, the significance of her findings remains impossible to determine.

25. A large number of the tokens of (i) come from the words *real* and *really*. Although I separated these tokens from the others to see if the patterns of constraints were different for them and to determine if the rates of laxing were more frequent, they closely matched that of the rest of the data; therefore I have included them.

26. All analyses of (i) and (u) are based on auditory codings.

27. Although I did not code for the effects of stress on (i) and (u), I did note that laxing occurs in both stressed and unstressed segments.

28. Quotation from Section 3.3.6 of Veatch (1991).
29. Quotation from Section 3.3.6 of Veatch (1991).
30. The variables (aw) and (ay) were the focus of Labov's famous studies of Martha's Vineyard (1972:1–42) and of New York City (1972:287). The phenomenon under investigation here is quite different from those that he investigated. I am describing glide reduction or deletion, while Labov focused on changes in the nucleus of the diphthong in both studies.
31. Elsewhere in the South and South Midland (except along the coast of South Carolina, Georgia, and Florida) the "fast" diphthongs (i.e., those with a swift nucleus and prominent upglide) and "slow" diphthongs are positional allophones, with the fast diphthong [aI] occurring before voiceless consonants and the slow variant [a:] before voiced consonants and word-finally. Wolfram and Christian (1976:64–65) noted the persistence of glide reduction in Appalachia into the 1970s. They noted that glide reduction is more likely to occur when (ay) occurs word-finally or before voiced consonants than before voiceless consonants. Wolfram and Christian also noted glide reductions in another upgliding diphthong, /oy/, in Appalachia (1976:64). This does not occur in Pittsburgh.
32. Of course, this does not necessarily mean that no vocalization existed, but on the whole the phonetic records of dialectologists have proved fairly reliable.

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