Uniformity constrains innovative variants of the Sūzhōu Chinese fricative vowels

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Broad argument

Sound change is mediated by a *bias toward uniformity* of speech sounds with other speech sounds.

This is a manifestation of a more general tendency in language: speakers prefer *uniformity* in phonetic implementation.

- Learners select strategies for producing segments which *use one or more articulators in the same way* as other segments.
- Bias towards uniform implementation places a constraint on the *direction of evolution* of sound systems.
Narrow arguments

Sūzhōu Chinese **fricative vowels** show uniformity: mainly articulated with a /ɕ/-like tongue shape (in speaker-specific terms)

» Tongue shapes also occasionally resemble /s/ or /i/

Changing patterns of dialect use have led to contact-induced change in Sūzhōu Chinese, the direction of which appears constrained by uniformity

» Younger speakers’ fricative vowels show **less overall similarity** to /ɕ/

» But their innovative variants of the fricative vowels are often simply **uniform with a new series of segments**, either /s/ or /i/
Overview

Background
  » Uniformity
  » Fricative vowels
  » Suzhou Chinese phonetics and phonology

Details of ultrasound study
  » Description of methods
  » Results

Discussion
  » Young speakers’ innovative variants
  » Community-wide adoption in nearby dialects
Background: Uniformity
Uniform phonetic implementation

The phonetic implementation of a phonological feature or gesture tends to be constrained\(^1\)

» Phonetic outputs tend towards being identical on some acoustic or articulatory dimension

» Uniformity operates within-speaker: constrains a given speaker’s characteristic “target” for a series of sounds

Attested for a variety of acoustic and articulatory parameters

» Timing of aspiration in VOT\(^2\)

» Vowel height (and F1)\(^3\)

» Constriction location\(^4\)

\(^1\) Chodroff, 2017; Faytak, 2018.

\(^2\) Keating, 2003; Chodroff, 2017; Chodroff and Wilson, 2017.

\(^3\) Ménard, Schwartz, and Aubin, 2008.

\(^4\) Maddieson, 1996; Chodroff, 2017.
Example: VOT

**Tendency:** high mutual predictability within speaker\(^5\) (speakers may vary in their characteristic VOT)

\[^5\text{Chodroff, 2017; Chodroff, Golden, and Wilson, 2019.}\]
**Example: VOT**

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Example: VOT

**Tendency:** high mutual predictability within speaker\(^5\) (speakers may vary in their characteristic VOT)

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\(^5\)Chodroff, 2017; Chodroff et al., 2019.

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**Example: VOT**

**Infrequently attested**: little to no mutual predictability within speaker\(^5\)

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\(^5\) Chodroff, 2017; Chodroff et al., 2019.
Effects on language evolution

Bias toward uniformity places a constraint on the evolution of sound systems: uniform strategies should come to predominate, other factors held equal\textsuperscript{6}

» L1 learners especially favor uniform implementation: re-use is better than figuring out from scratch\textsuperscript{7}

» Cumulative effect: structured variation which may lead to formation of series\textsuperscript{8}

\textsuperscript{6}Faytak, 2018.

\textsuperscript{7}Lindblom, 1998; Ménard et al., 2008; Lindblom, Diehl, Park, and Salvi, 2011; Loeb, 2012.

\textsuperscript{8}Martinet, 1955; Maddieson, 1996; Clements, 2003.

\textsuperscript{9}Keating, 2003.
Effects on language evolution

Bias toward uniformity places a constraint on the evolution of sound systems: uniform strategies should come to predominate, other factors held equal

» L1 learners especially favor uniform implementation: re-use is better than figuring out from scratch

» **Cumulative effect:** structured variation which may lead to formation of series

But of course, other factors may counteract uniformity

» Speakers may idiosyncratically prioritize articulatory ease or other factors over uniformity

» **Contact-induced change** may cause loss of structure

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6 Faytak, 2018.
7 Lindblom, 1998; Ménard et al., 2008; Lindblom et al., 2011; Loeb, 2012.
Background: Fricative vowels
Evolution of fricative vowels

**Fricative vowels:** fully voiced syllabic segments with light sibilant or shibilant frication

One sound change which uniformity may constrain: high vowel fricativization, in which high front vowels *i, y* develop into fricative vowels\(^ {10} \)

- Due to phonologization of fricative noise and/or different constriction location
- Often result in a chain shift in which lower vowels rise to occupy the empty corner of the vowel space

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\(^ {10} \)Shi, 1998; Zhao, 2007; Zhu, 2004; Faytak, 2014.
Constriction location

Narrower and more anterior than [i], similar to strident fricative

Static palatography, Chángzhōu 常州 Wú dialect:

[pi] 边 ‘side’

[pi] 比 ‘compare’

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[pi] 边 ‘side’
[pi̯] 比 ‘compare’
In China

Fricative vowels develop from *i, *y in many Chinese dialects, mainly Mandarin and Wú.

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Elsewhere

Fricative vowels from *i, *y, and sometimes high central vowels, are also attested elsewhere

» Numerous minority languages of southwestern China\(^{12}\)
» Ryukyuan languages (far southern Japan)\(^{13}\)
» Grassfields Bantu (Cameroon)\(^{14}\)
» Debatably, Swedish *Viby-i*\(^{15}\)

\(^{12}\) M. Li and Ma, 1983; Chirkova, Wang, Chen, Amelot, and Antolík, 2015.
\(^{13}\) Aoi, 2012.
\(^{14}\) Fiore, 1987; Connell, 2007; Faytak, 2017.
\(^{15}\) Schötz, Frid, Gustafsson, and Löfqvist, 2014; Westerberg, 2016.
Case study: Sūzhōu Chinese
Sūzhōu Chinese

Northern Wú dialect closely related to Shanghainese
Some local scenery: Master of Nets Garden 网师园
Social situation

Likely 2-3 million speakers in Sūzhōu and the diaspora\(^\text{16}\)

- Younger speakers typically described as less fluent or “mixed” with Standard Chinese
- Many younger speakers are not taught the dialect and learn only Standard Chinese in the home
- Usage rates have been declining for younger generations\(^\text{17}\)

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\(^\text{16}\) Zhengzhang, 1988; Yan, 1988.

\(^\text{17}\) P. Wang, 2003.
**Vowel system**

Canonically, Sūzhōu Chinese has an unusual **six-way distinction** among rounded and unrounded high front vowels, **fricative vowels**, and **apical vowels**\(^{18}\)

<table>
<thead>
<tr>
<th>Place</th>
<th>High front</th>
<th>Fricative</th>
<th>Apical</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Dorso-palatal)</td>
<td>(varies)</td>
<td>(Apico-alveolar)</td>
<td></td>
</tr>
<tr>
<td>Unrounded</td>
<td>i</td>
<td>i(_{\varphi})</td>
<td>_</td>
</tr>
<tr>
<td>Rounded</td>
<td>y</td>
<td>y(_{\varphi})</td>
<td>ι</td>
</tr>
</tbody>
</table>

» Can be thought of as a **place contrast** for constriction location

» Apical vowels are more anterior than fricative vowels (apico-alveolar)

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\(^{18}\)Ye, 1988; X. Li, 1998; P. Wang, 2011.
Vowel system

The high front and “fricative” vowels robustly contrast

» With and without alveolopalatal onsets such as /ɕ/

» Other than the apical vowel, the unrounded vowels may co-occur with other onsets (bilabials, labiodentals, alveolars)

<table>
<thead>
<tr>
<th></th>
<th>High front</th>
<th>Fricative</th>
<th>Apical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unrounded</td>
<td>烟 i</td>
<td>衣 iₜ</td>
<td>*ɿ</td>
</tr>
<tr>
<td></td>
<td>‘smoke’</td>
<td>‘clothing’</td>
<td></td>
</tr>
<tr>
<td>Rounded</td>
<td>怨 y</td>
<td>迂 yₜ</td>
<td>*ʮ</td>
</tr>
<tr>
<td></td>
<td>‘complain’</td>
<td>‘winding’</td>
<td></td>
</tr>
</tbody>
</table>

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Vowel system

The high front and “fricative” vowels robustly contrast

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</thead>
<tbody>
<tr>
<td>Unrounded</td>
<td>掀ɕi</td>
<td>稀ɕiʑ</td>
<td>*ɕɿ</td>
</tr>
<tr>
<td></td>
<td>‘flip’</td>
<td>‘rare’</td>
<td></td>
</tr>
<tr>
<td>Rounded</td>
<td>休ɕy</td>
<td>虚ɕyʑ</td>
<td>*ɕη</td>
</tr>
<tr>
<td></td>
<td>‘rest’</td>
<td>‘weak’</td>
<td></td>
</tr>
</tbody>
</table>
Vowel system

Contrast between the apical and fricative vowels is more restricted

<table>
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<tr>
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<th>Fricative</th>
<th>Apical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unrounded</td>
<td>鲜 si</td>
<td>西 siₗ</td>
<td>丝 sɿ</td>
</tr>
<tr>
<td>‘fresh’</td>
<td>‘west’</td>
<td>‘thread’</td>
<td></td>
</tr>
<tr>
<td>Rounded</td>
<td>*sy</td>
<td>*syₗ</td>
<td>书 syₗ</td>
</tr>
<tr>
<td>‘book’</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

» Apical vowels only occur after anterior coronal fricatives and affricates, i.e. /s/, /ts/  
» /y/, /yₗ/ do not co-occur with the /s/ onset, and so the rounded apical and fricative vowels can be treated as allophones
Variation in the fricative vowels

Constrictions for \([i_{\text{z}}]\) and \([y_{\text{z}}]\) can be made with **two different tongue postures**, as seen through **linguograms**\(^{19}\)

- **Dorso-postalveolar**, further back than fricatives such as \([\varsigma]\), but still anterior to \([i]\)

- **Lamino-(post)alveolar**, further front, much more closely resembling \([\varsigma]\)
Tongue position

Same configurations can be observed in sagittal ultrasound tongue surface contours\textsuperscript{20}

\textbf{Dorso-postalveolar}: not quite [\textipa{i}], not quite [\textipa{ɛ}]

\textsuperscript{20}Faytak, 2018.
Similarly, the study by Faytak (UCLA) in 2018 demonstrated that the tongue surface contours in sagittal ultrasound imaging can be observed to show the same configurations as those observed in lamino-postalveolar sounds, which are nearly identical to [ɛ].

Faytak, 2018.
Ultrasound study
Interim summary

What we know:
» Fricative vowels contrast with high front vowels based on anterior constriction and increased fricative noise
» Multiple strategies for speakers to choose from (in Sūzhōu, at least)

What we don’t know and would like to find out:
» Which strategies actually predominate (prior study has small sample)
» Whether uniformity with [ɕ] plays a role in strategy selection
  » Uniform, [ɕ]-like laminal articulator?
  » Or non-uniform dorsal articulator?
» How contact with Standard Chinese affects this unusual system
Participants

44 speakers (16 male, ages 18-57) recruited in Gūsū district, Sūzhōu (苏州市姑苏区)

» 22 younger than age 30: 11 male, ages 18-27, mean age 21
» 22 older than age 30: 5 male, ages 37–57, mean age 48.3

<table>
<thead>
<tr>
<th>age group</th>
<th>count</th>
</tr>
</thead>
<tbody>
<tr>
<td>young</td>
<td>6</td>
</tr>
<tr>
<td>old</td>
<td>4</td>
</tr>
</tbody>
</table>

speaker age

age group
young
old

Faytak (UCLA)
Participants

Age difference is effectively a *language background* difference

» Older speakers are nearly all *sequential bilinguals*: learned Sūzhōu Chinese in home, then Standard Chinese in primary school

» Younger speakers are nearly all *simultaneous bilinguals*: learned Standard Chinese and Sūzhōu Chinese at the same time, in the home

<table>
<thead>
<tr>
<th></th>
<th>Age &lt; 30</th>
<th>Age &gt; 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequential</td>
<td>4</td>
<td>21</td>
</tr>
<tr>
<td>Simultaneous</td>
<td>18</td>
<td>1</td>
</tr>
</tbody>
</table>
Recording method

**Ultrasound video** recorded using Telemed EchoB

» PV6.5/10/128 Z-3 microconvex probe recording at 54 frames per second

» Probe stabilized with Articulate Instruments headset\(^\text{21}\)

Synchronized **audio recordings** collected at the same time

» Sony ECM-77B electret condenser microphone mounted on headset

» 44.1 kHz sampling rate

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\(^{21}\) Articulate Instruments Ltd., 2008.
Recording method

- microphone
- ultrasound probe
Stimuli

CV syllables which contain target consonants /s/, /ɕ/ and vowels

» All items in upper register, mostly level tone [44] (阴平)
» Items have **fricative onsets** (which are targets) or **non-fricative onsets**
» Contain high front vowels, fricative vowels, or apical vowels

<table>
<thead>
<tr>
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<tr>
<td><strong>fricative</strong></td>
<td></td>
</tr>
<tr>
<td>s</td>
<td>si 鲜 ‘fresh’</td>
</tr>
<tr>
<td>ɕ</td>
<td>ɕi 掀 ‘flip’</td>
</tr>
<tr>
<td>p</td>
<td>pi 边 ‘side’</td>
</tr>
<tr>
<td>Ø</td>
<td>i 烟 ‘smoke’</td>
</tr>
</tbody>
</table>

*sy

*py

Faytak (UCLA)
**Stimuli**

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<tr>
<td>s</td>
<td>*sy_z</td>
</tr>
<tr>
<td>si_z 西 ‘west’</td>
<td></td>
</tr>
<tr>
<td>ɕ</td>
<td>ɕy_z 虚 ‘weak’</td>
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<td>ɕi_z 稀 ‘rare’</td>
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<td>p</td>
<td>*py_z</td>
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<td>pi_z 比 ‘compare’</td>
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<td>Ø</td>
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<td>i_z 衣 ‘clothing’</td>
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Faytak (UCLA)
Stimuli

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<td><strong>fricative</strong></td>
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</tr>
<tr>
<td>s</td>
<td>sɿ 丝 ‘silk’</td>
</tr>
<tr>
<td>ɕ</td>
<td>*ɕɿ</td>
</tr>
<tr>
<td>p</td>
<td>*pɿ</td>
</tr>
<tr>
<td>Ø</td>
<td>*ɿ</td>
</tr>
<tr>
<td><strong>non-fric.</strong></td>
<td><strong>non-fric.</strong></td>
</tr>
<tr>
<td>ɿ</td>
<td>*ɿ</td>
</tr>
</tbody>
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Faytak (UCLA)
Ultrasound data

Midpoint frames of all target segments (fricatives, vowels) extracted, filtered to reduce noise\textsuperscript{22}

Pictured: processed [i] from Speaker 13

\textsuperscript{22}Mielke, Carignan, and Thomas, 2017.
Ultrasound data

Midpoint frames of all target segments (fricatives, vowels) extracted, filtered to reduce noise\textsuperscript{22}

Pictured: processed [i] from Speaker 13

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Faytak (UCLA)
Analysis: dimensionality reduction

**Problem:** ultrasound image data is noisy and very high-dimensional; feature extraction (i.e. contour extraction) has low reliability and is painfully slow
Analysis: dimensionality reduction

**Problem:** ultrasound image data is noisy and very high-dimensional; feature extraction (i.e. contour extraction) has low reliability and is painfully slow

**Solution:** a two-step dimensionality reduction method using principal component analysis (PCA) and linear discriminant analysis (LDA)

» Input data: tens of thousands of pixels for each observation

» PCA result: a much smaller set of PC scores expressing patterns of covariance in the data

» LDA result: score on a single metric of similarity to prototype segments /i/, /ɕ/, or /s/
Principal components analysis (PCA)

Eigenvectors for ultrasound data represent **covariation in pixel intensity** across the image; sometimes called **eigentongues**\(^{23}\)

\(^{23}\)Hueber et al., 2007; Hoole and Pouplier, 2017; Mielke et al., 2017.
Principal components analysis (PCA)

Can be related to basis data through eigenvalues/“PC scores”\textsuperscript{23}

\textsuperscript{23}Hueber et al., 2007; Hoole and Pouplier, 2017; Mielke et al., 2017.
Principal components analysis (PCA)

First **ten PC scores** are retained as a lower-dimensional representation of the data.

**Separate PCAs** are run for **each speaker**, because a single model including all speakers might also capture non-linguistic variation in PC scores:

- Morphological variation (size, palate shape, etc.)
- Ultrasound probe placement variation
- Varying image quality across sessions (is the entire tongue surface visible)
Linear discriminant analyses (LDAs)

Using **PCs 1–10** as input, carry out two **linear discriminant analyses**, both in the following manner

- **Training**, using prototype segments with **known articulation** as the classes
- **Testing**:
  - Transform **data not used in training** into linear discriminant space
  - Provides insights on segments with **unknown articulation**: which classes they resemble
Linear discriminant analyses (LDA)

Training and testing phases of LDA both yield two useful types of data

» **Classification** of each observation as **one of the training categories**
  » Training phase: self-classification (is the LDA working?)
  » Testing phase: classification of test data **in terms of training data**
  » Can be used as **index of uniformity**: more unanimous classifications are more uniform

» Linear discriminant (LD) scores for each observation (a continuous measure)
  » Can be used to **quantitatively assess degree of similarity** of training and test data
Three-class vs two-class LDA

One of two LDAs carried out on the PCA data: use /i/, /ɕ/, /s/ as training data

» Test data: fricative vowels and apical vowels as a test case (known to be /s/-like)

» Mostly for exploratory purposes: hard to compare models across participants

» This space is used to classify the fricative vowels
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» Test data: fricative vowels and apical vowels as a test case (known to be /s/-like)
» Mostly for exploratory purposes: hard to compare models across participants
» This space is used to classify the fricative vowels

The other, for for statistical analysis: simpler training set consisting of /i/, /ɕ/

» Test data: only fricative vowels
» Low end is always /i/-like, high end is always /ɕ/-like, in speaker-specific terms
» Can compare across speakers if range-normalized
**Predictions**

**Classification** of fricative vowels /iʑ/, /yʑ/ should mostly be as /ɕ/  
» In both three-class and two-class LDAs  
» Regardless of presence of onset fricative

LD for fricative vowels /iʑ/, /yʑ/ should **correlate** with LD for /ɕ/  
» In other words, fricative vowel tongue shapes are **predictable within speaker** given /ɕ/ tongue shapes  
» Here, in terms of the two-class linear discriminant  
» Regardless of presence of onset fricative
Predictions

**Classification** of fricative vowels /i̯/, /y̯/ should mostly be as /ɕ/  
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» Here, in terms of the two-class linear discriminant  
» Regardless of presence of onset fricative  
May vary by **age group**, due to changing contact situation
Predictions, as a plot

Training segment’s LD versus test segment’s LD
Results:
Speakers older than 30
Fricative vowels are mostly /ɕ/-like, whether adjacent to a fricative (top) or not (bottom).

Groups: A, never less than 90% /ɕ/; B, more than 10% /i/ in some context; C, more than 10% /s/ in some context.

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Apical vowels are almost entirely /s/-like

This reassures us that our PCA/LDA method is detecting real similarity

Apical vowels are known to have /s/-like tongue shapes
Fricative vowels are mostly /ɕ/-like, but note speaker 26: resolves as essentially /i/-like

Groups arranged as in three-class LDA
Two-class LDA: autocorrelation on LD

Moderate to strong correlations in LD which reach significance for both vowels (in both contexts) with /ɕ/’s LD (r = 0.4 to 0.6)

Correlations with median /i/ LD do not reach significance
Results:
Speakers younger than 30
Three-class LDA: classification

Much more varied than older group; notably more speakers with /s/-like classification outcomes

Note speaker 13 (in group B) and speakers 36 and 1 (in group C)
Apical vowels still classify overwhelmingly as /s/-like

» For speakers 36 and 1, fricative vowels and apical vowels are essentially the same in one context
Two-class LDA: classification

Young speakers classify as less strongly /ɕ/-like than old speakers

<table>
<thead>
<tr>
<th></th>
<th>Fricative onset</th>
<th></th>
<th>Fricative onset</th>
<th></th>
<th>Fricative onset</th>
<th></th>
<th>Fricative onset</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Proportion classified</td>
<td></td>
<td>Proportion classified</td>
<td></td>
<td>Proportion classified</td>
<td></td>
<td>Proportion classified</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11 19 34 3 10</td>
<td></td>
<td>20 13 28 44</td>
<td></td>
<td>30 41 31 5 37 42 6 2 36 43 1</td>
<td></td>
<td>20 13 28 44</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.0 0.5 1.0</td>
<td></td>
<td>0.0 0.5 1.0</td>
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<td></td>
</tr>
</tbody>
</table>

Note Speaker 31 resolves as essentially /i/-like with non-fricative onsets
Correlation

Young speakers’ correlations with /ɛ/ (and /i/) do not reach significance.
Correlation

For both segments in both contexts, older speakers have a stronger correlation with /ɕ/
Discussion
Fricative vowels are *mostly* uniform

Fricative vowel variants **qualitatively similar to /s/** predominate

» Much more **structure** than if speakers were randomly selecting from known, apparently equivalent strategies

» Suggests the influence of speaker-side uniformity bias

Some exceptions:

» A minority of speakers across both age groups have less uniform fricative vowels (mixed classification)

» Younger speakers show **similarity to /s/** at a much greater rate
Younger speakers

Many younger speakers do not adhere to this pattern

» Intensified contact disrupts the structured variation which typically holds (fewer unanimous classifications)

» **Factors other than uniformity bias** appear to influence strategy selection for these speakers

In some individual cases, new variants appear to be **mediated by existing structures**, leading to **new patterns of structured variation**

» Can be thought of as **uniform with different segments** rather than with /ə/

» Four or five out of 22 younger speakers (including speaker 35)

» **Uniform implementation mediates which strategies a speaker picks**
Community-level change

The individual innovations discussed here are "micro" sound changes\textsuperscript{24}

» Sound change in the broader speech community can be conceptualized as a shift in the "pool of variation" as a whole

We might ask ourselves: is there evidence for corresponding "macro" changes \textbf{at the community level}? 

\textsuperscript{24}Ohala, 1989.
Community-level change

The individual innovations discussed here are “micro” sound changes

» Sound change in the broader speech community can be conceptualized as a shift in the “pool of variation” as a whole

We might ask ourselves: is there evidence for corresponding “macro” changes at the community level?

Yes! Evolution of fricative vowels in neighboring dialects has frequently resulted in:

» Merger with high front vowels
» Neutralization (but not merger!) with apical vowels

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Shànghǎi and surrounding areas
Shànghǎi and surrounding areas

Greater Shànghǎi area has merged fricative vowels with high front vowels

» Proliferation of /i/-like fricative vowel variants would encourage this

<table>
<thead>
<tr>
<th>Proto-Wú²⁶</th>
<th>mid-1900s²⁷</th>
<th>post-1980</th>
</tr>
</thead>
<tbody>
<tr>
<td>衣 ‘clothing’</td>
<td>*i</td>
<td>*i</td>
</tr>
<tr>
<td>烟 ‘smoke’</td>
<td>*iê</td>
<td>...</td>
</tr>
<tr>
<td>迂 ‘winding’</td>
<td>*y</td>
<td>*y</td>
</tr>
<tr>
<td>怨 ‘blame’</td>
<td>*yû</td>
<td>...</td>
</tr>
</tbody>
</table>

²⁶ Ballard, 1969.
²⁷ Zhu, 2006; Chen and Gussenhoven, 2015.
Héféi and surrounding areas
Hefei and surrounding areas

In Hefei 合肥 and nearby cities such as Lu’an 六安, fricative vowels and apical vowels are produced identically\(^{28}\)

» Proliferation of /s/-like fricative vowel variants would encourage this

椅 ‘chair’ *i  >  *i\(\)  >  (z)ʃ

丝 ‘thread’ *sʃ  ...  >  sʃ

雨 ‘rain’ *y  >  *y\(\)  >  (z)ŋ

» “Apicalization” of fricative vowels turns out to be quite common (perhaps because it is more easily detectable)\(^{29}\)


\(^{29}\)Zhao, 2007; Hu and Ling, 2019.
Hefei and surrounding areas

The resulting structural effects are more complex than in Shanghai: not precisely merger

» Before: apical vowels after apico-alveolar onsets /s ts tsh/, fricative vowels overlapping and elsewhere

» After: apical vowels extend to all of these contexts
Héféi and surrounding areas

The resulting structural effects are **more complex** than in Shànghǎi: not precisely merger

» Before: apical vowels after apico-alveolar onsets /s ts tʃ/, fricative vowels overlapping and elsewhere

» After: apical vowels extend to all of these contexts

Available evidence also suggests that [ʮ] did not exist before “apicalization”

» Pre-existing /ʃ/ may have influenced the development of *y₇
Concluding notes

Innovative variants of fricative vowels observed in Sūzhōu Chinese can be connected to community-level change in nearby dialects.

- “Isolated”\(^{30}\) sounds are not observed at community level.
- If no series with /ɕ/, then a series with /s/ or /i/

Uniformity bias appears to mediate the development of these innovative variants.

- At the “micro” level
- Possibly in the selection of variants which propagate to the community

\(^{30}\)Martinet, 1955.
Thanks 谢谢尔笃

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References


References


Heterogeneity of three-class LDA solutions

Multiple LDs are not comparable across participants: no guarantee that variation encoded in a given LD is between the same two prototypes

» Contrast 4 versus 9, 25
What happened in about 1985?