

Phonetically conditioned vowel devoicing in Chahar Mongolian



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Research Question

What predicts vowel devoicing in Chahar?

- Vowel height* is a poor predictor [1,2]
- Current study examines *consonant environment*

Background

About Chahar Mongolian

- Dialect of Peripheral Mongolian (ISO 639-3: mvf)
- Basis for Standard Mongolian in China; historically spoken in south-central Inner Mongolia

Vowel devoicing in other languages

- Widespread: Andean Spanish, [3] French, [4] Cheyenne, [5] Comanche, [6] Japanese, [7] Korean; [8] see [9] for review
- Most typical environment is a short, high vowel flanked by voiceless consonants
- Usually gradient and variable, associated with fast speech and ends of prosodic domains
- More often found in unstressed/unaccented syllables

Initial-syllable devoicing in Chahar?

Surprising because:

- Mongolian initial syllables are phonologically prominent: initial syllable is the sole locus of the full range of vowel quality & length contrasts [10], p.96; see also [11]
- Devoicing would yield onset clusters (not otherwise permitted in Mongolian) [10]
- Formal wordlist-reading task should disfavor reduction

Expected because:

- Mentioned in passing in the literature [10,12,13]
- Though initial *long* V are stressed, initial *short* V can be unstressed if followed by a long vowel [14]
- Vowel harmony reduces the information load on individual vowels

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Methods

Wordlist and recordings

- 6 native speakers of Chahar (3 male); recorded by Yurong in Hohhot [1]
- All attested word-initial C₁VC₂ sequences; short vowels only; words are di- or tri-syllabic
- Full list read 3x per talker in sentence frame [pi: __ kətʃ xələw] “I said __”
- 21558 tokens; 1204 unique words; 845 initial syllable types

Identifying devoiced vowels

Each initial-syllable vowel coded as unreduced, partially-devoiced or fully-devoiced by native Mongolian-speaking phonetician (Yurong).

- Partially devoiced:** aperiodic waveform; discernable formants; audible vocalic segment
- Fully devoiced:** vowel segment cannot be distinguished from adjacent consonants

Statistical model

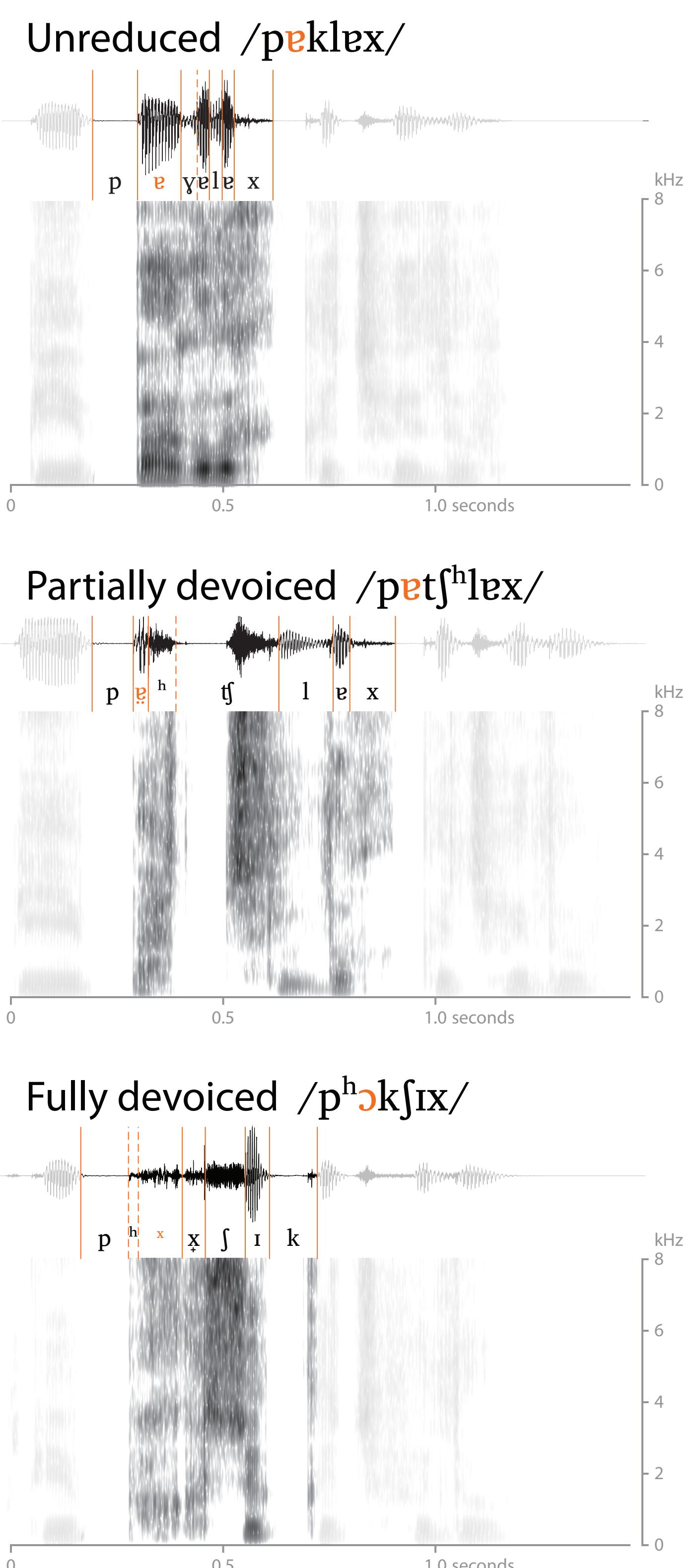
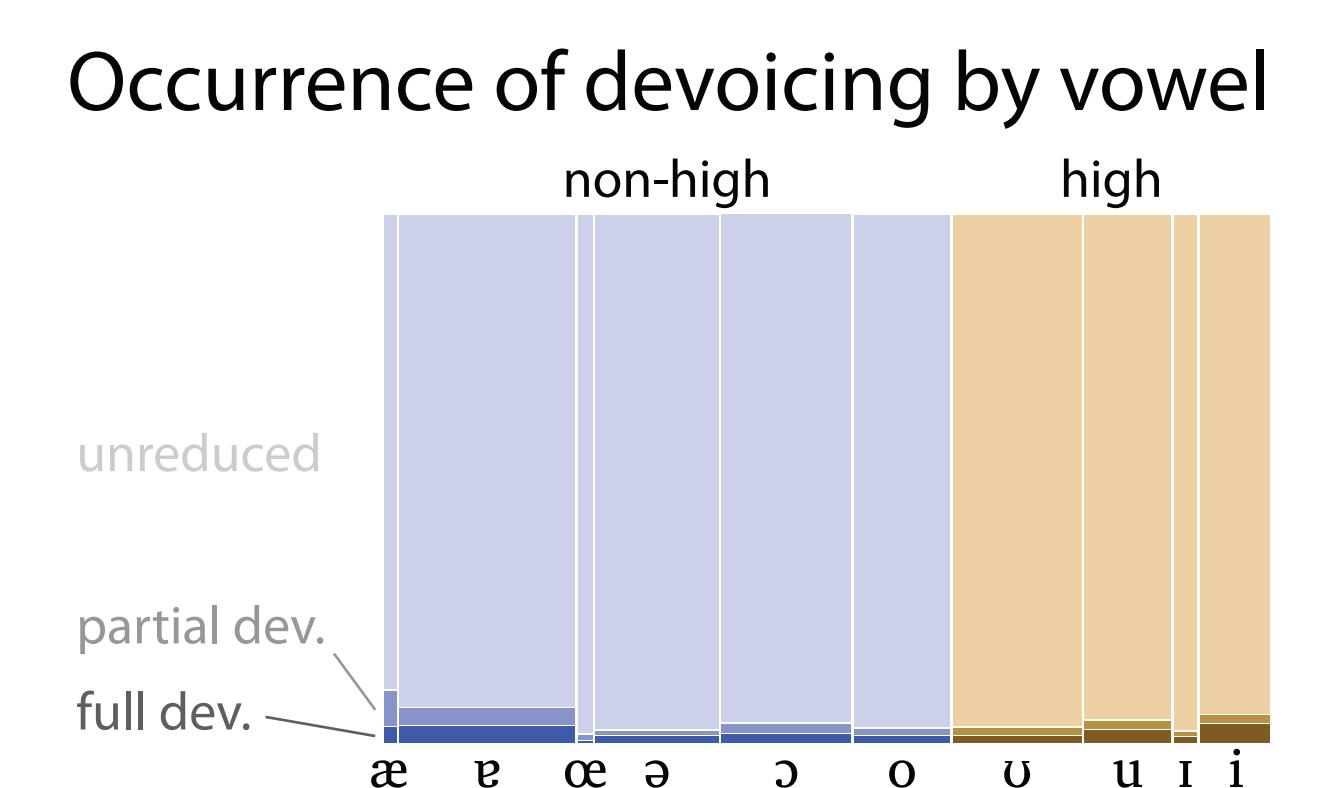
Degree of reduction modeled with proportional-odds mixed ordinal regression:

$$\text{logit}[P(Y \leq j)] = \alpha_j + \beta x + \gamma u$$

Parameterization constrained by “rare events” problem (see mosaic plots below; about 4% of vowels reduced). Consequently, *consonant manner is only parameterized for obstruents* (fricatives, affricates, stops; in Chahar “obstruents” is coextensive with the set of *voiceless consonants*).
 • Random effects: talker, word, vowel quality
 • Fixed effects: aspiration, obstruent manners of C1 & C2; whether C2 is part of cluster; list repetition number

Caveats

- Consonant & vowel features are based on *phonemic transcriptions* (i.e., they do not vary across talkers or utterances)



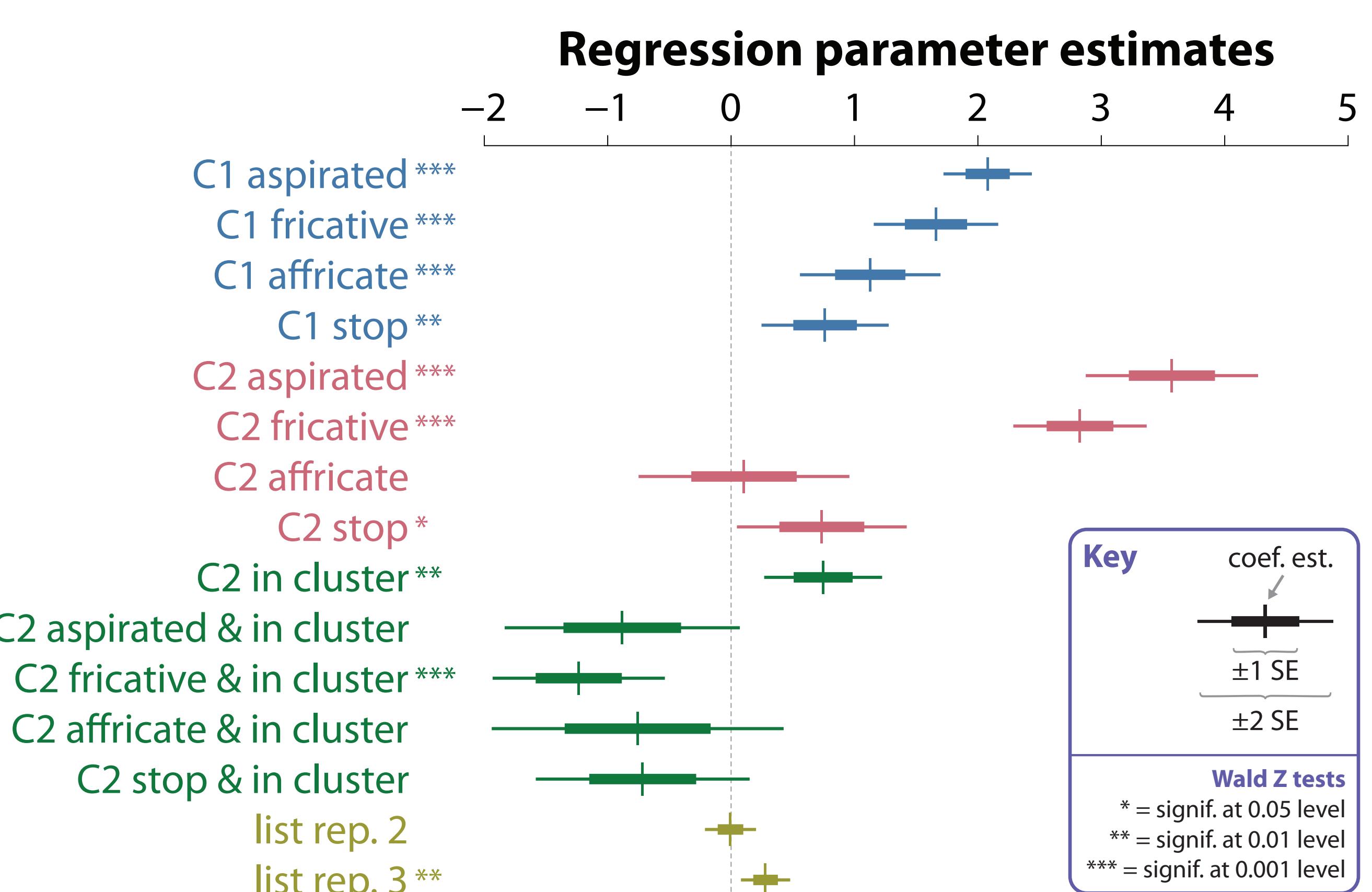
Results

Aspiration dominates. Strongest increase in likelihood of devoicing when C1 or C2 was aspirated (in Chahar, aspiration is before closure in medial and final aspirated stops/affricates, so an aspirated C2 is *preaspirated*). [15,16]

Affricate asymmetry. No effect of affricates in C2 position.

Cluster effect. Small increase in likelihood of devoicing if C2 is in a cluster, unless C2 is a fricative.

List repetition effect. Small increase in likelihood of devoicing in 3rd reading.



Discussion

Devoicing as coarticulation

Results are largely consistent with an explanation of devoicing as the *overlap of consonant laryngeal gestures* (aspiration, voiceless frication) with the vowel.

Questions for further investigation

- The varying effect of cluster C2s in our results suggests a *relationship between devoicing and syllable structure*. Research on different prosodic environments is needed; a new spontaneous speech corpus [17] may offer answers.
- Anecdotally, native speakers still “hear” fully-devoiced vowels. **What compensatory factors allow vowels to be devoiced while preserving intelligibility?**

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