

**BAG, BEG, BAGEL:
Prevelar raising and merger
in Seattle Caucasians**

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NWAV 43, Chicago
October 25, 2014

Problem & Goal

- Pacific Northwest English (PNWE) project noticed /æ/ and /ɛ/ raising before /g/ (BAG, BEG classes)
 - But didn't target prevelars specifically, so need more data
- Describe prevelars in PNWE: merger or just raising?
 - Seattle Caucasians
 - Target prevelar words
 - Add /eg/ words (BAGEL class)
 - If /eg/ raises, prevelar raising predicted by phonetic factors
 - If /eg/ lowers, evidence of phonological merger

/æɪg/-Raising

○ /æɪg/-raising in other regions:

- Wisconsin, Minnesota (Zeller 1997; Labov, Ash, & Boberg 2006; Bauer & Parker 2008; Benson, Fox, & Balkman 2011)
- US North (Upper Midwest to PNW) (Labov, Ash, & Boberg 2006)
- Western Canada (Boberg 2008)



○ /ɛɪg/-raising rarely formally described

○ PNWE only dialect described as having both /æɪg/- and /ɛɪg/-raising

- Both /æɪg, ɛɪg/ (variably) raised and diphthongal (Reed 1952, 1961; Wassink et al. 2009; Squizzero 2009)

Subjects

- 20 Seattle Caucasians
- 2 age groups x 2 genders

Generation	Males	Females
Middle-aged “Gen 2” born 1951-1976 (age 37-62)	5	5
Younger “Gen 3” born since 1977 (age 18-36)	5	5

Elicitation

- Interviewed in field in dyads or alone
- Conversation, Demographics, Linguistic Questionnaire
- Reading Passage, Word List

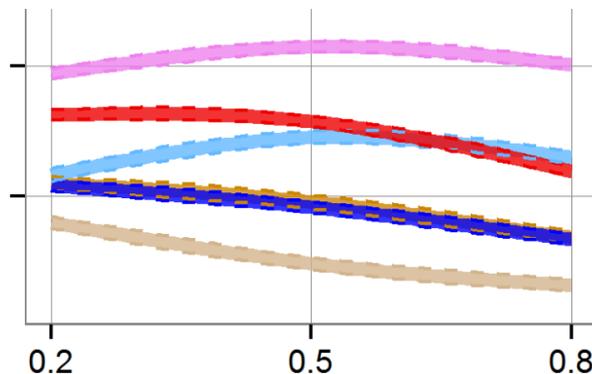
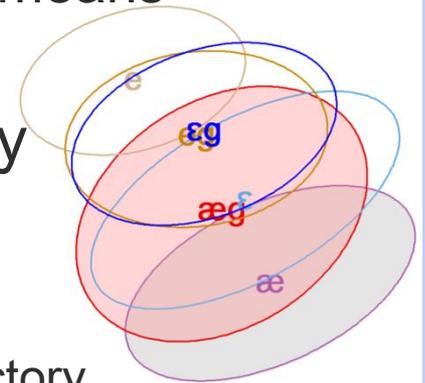
- Target words selected for analysis
 - From Reading Passage & Word List
 - Non-high front vowels before /g/
 - Non-high front vowels in neutral C contexts
 - Exceptions: post-liquids to match *plague* (*lag, leg, drag...*)

Measurement

- Transcripts force-aligned (P2FA)
- Vowel boundaries hand-corrected (Praat)
- Vowel measures (extracted via Praat script):
 - Duration (ms)
 - f0, F1, F2, F3 at onset, midpoint, offset
 - 20%, 50%, 80% of vowel duration
- Measures verified/corrected by hand (~1/4 of total 2556)
 - Plotted F1xF2 in Hz, checked if $> 2 \sigma$ from mean
 - Excluded 89 tokens from 20% measure due to aspiration
- F1, F2 normalized with Bark Difference Metric (NORM)
 - Z-score normalized F3-F2 (front-back) and F3-F1 (height)

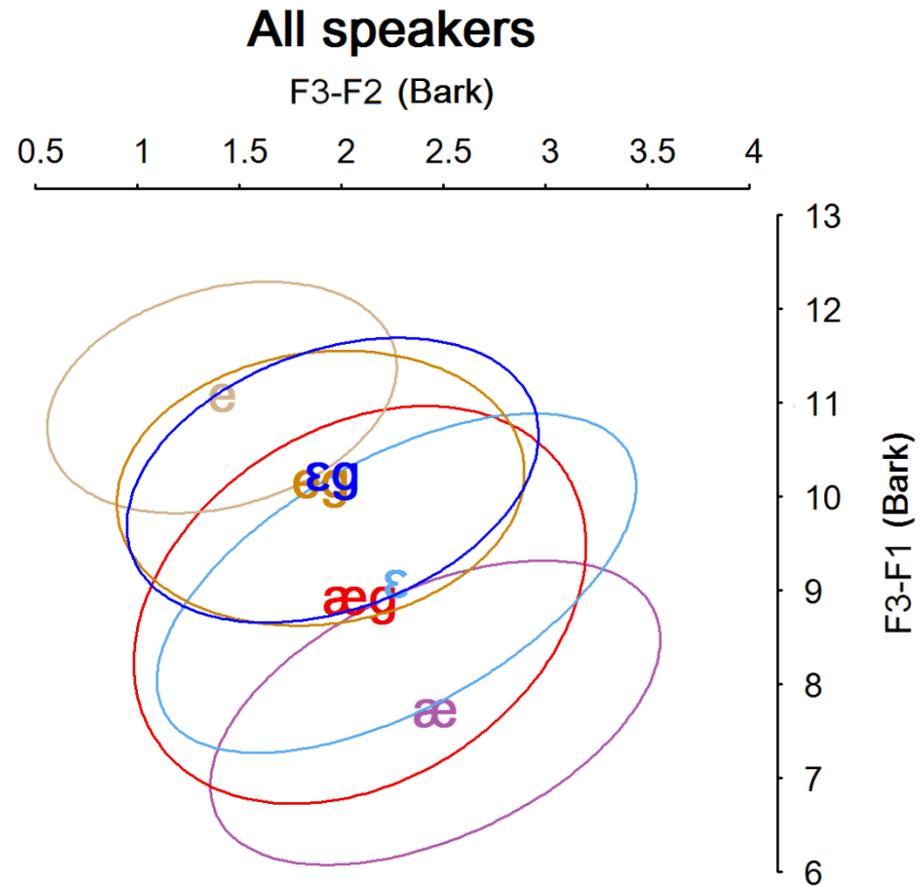
Overlap & Trajectory

- VOIS3D: Overlap fractions of vowel distributions
 - Area/volume of smaller distribution contained within larger
 - 2D: F1 x F2 ellipses of 2σ around means
 - 3D: F1 x F2 x duration ellipsoids of 2σ around means
- Smoothing-Spline ANOVA: Models trajectory
 - Best-fit curve connects mean F1 or F2 between time points (onset, midpoint, offset)
 - 95% confidence intervals around means along trajectory



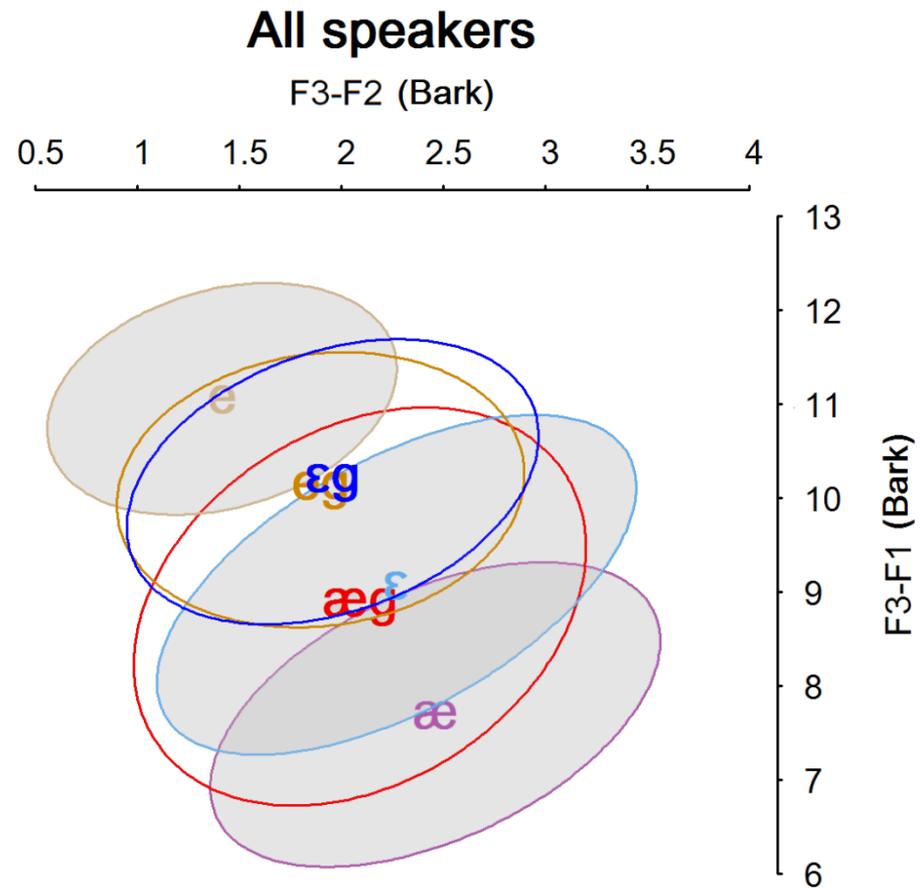
Results: Midpoint

- 2556 tokens
- Bark-normalized
- Ellipses of 2σ around means



Midpoint: Plain Vowels

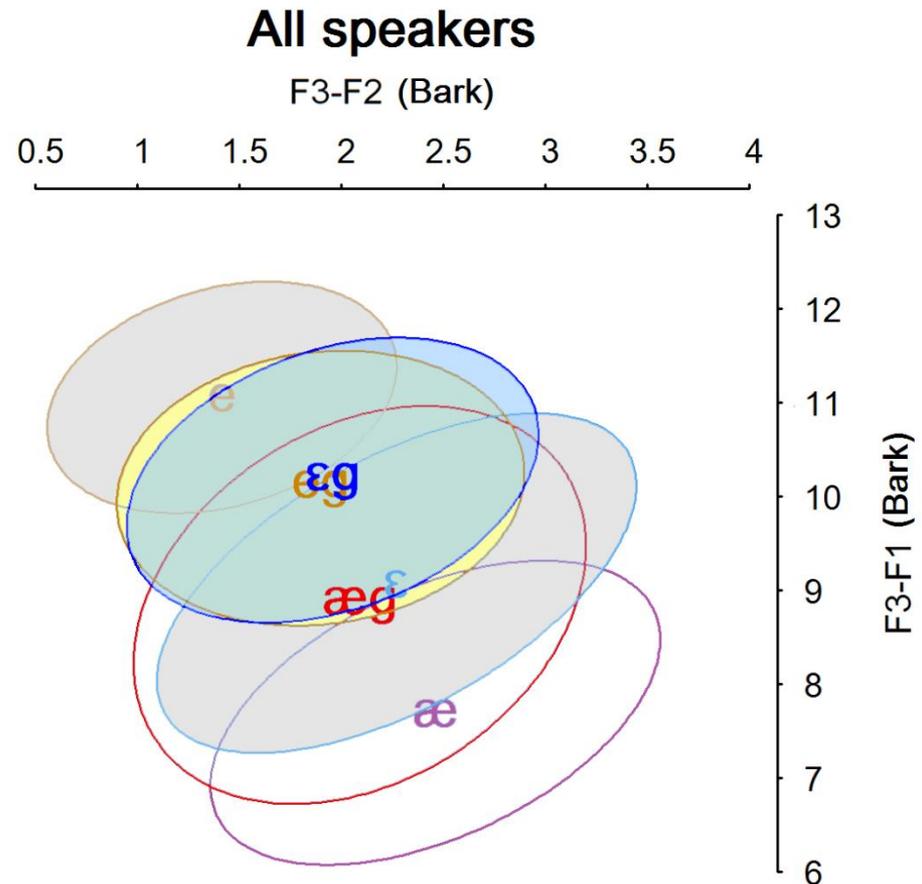
- /æ/ and /ɛ/ overlap
 - 39% 2D
 - 23% 3D
 - /ɛ/ shorter



Midpoint: BEG-BAGEL

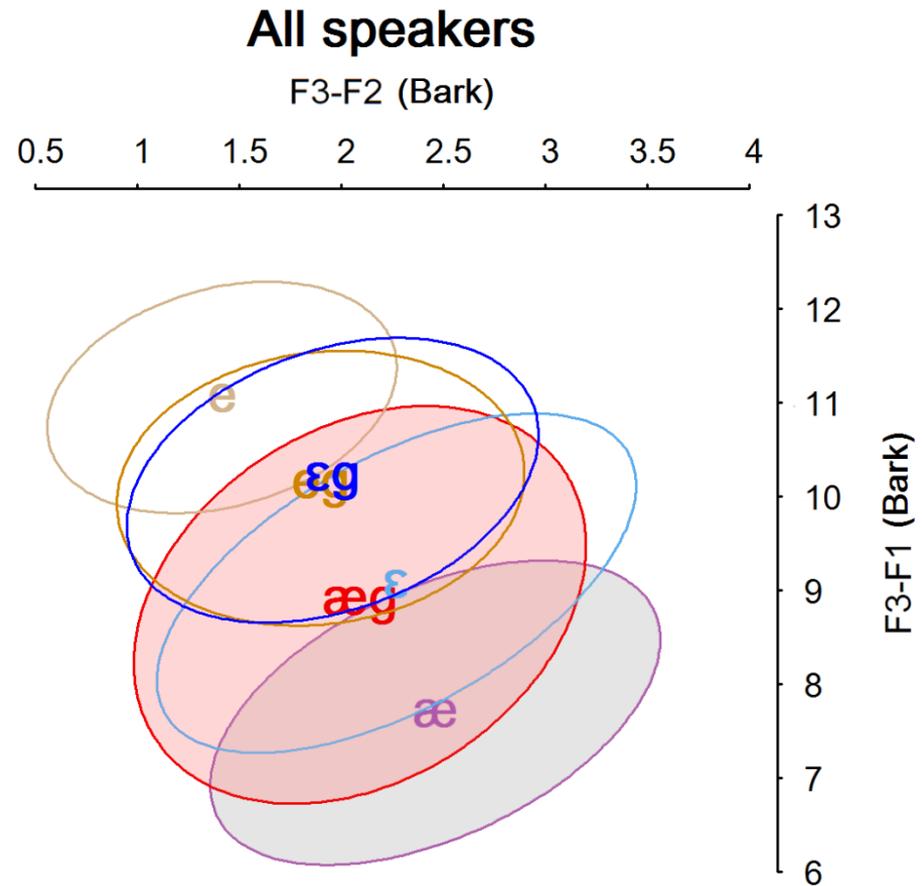
- /eg/ and /ɛg/ merged between /e/ and /ɛ/

- 91% 2D
- 87% 3D
- /ɛg/ shorter



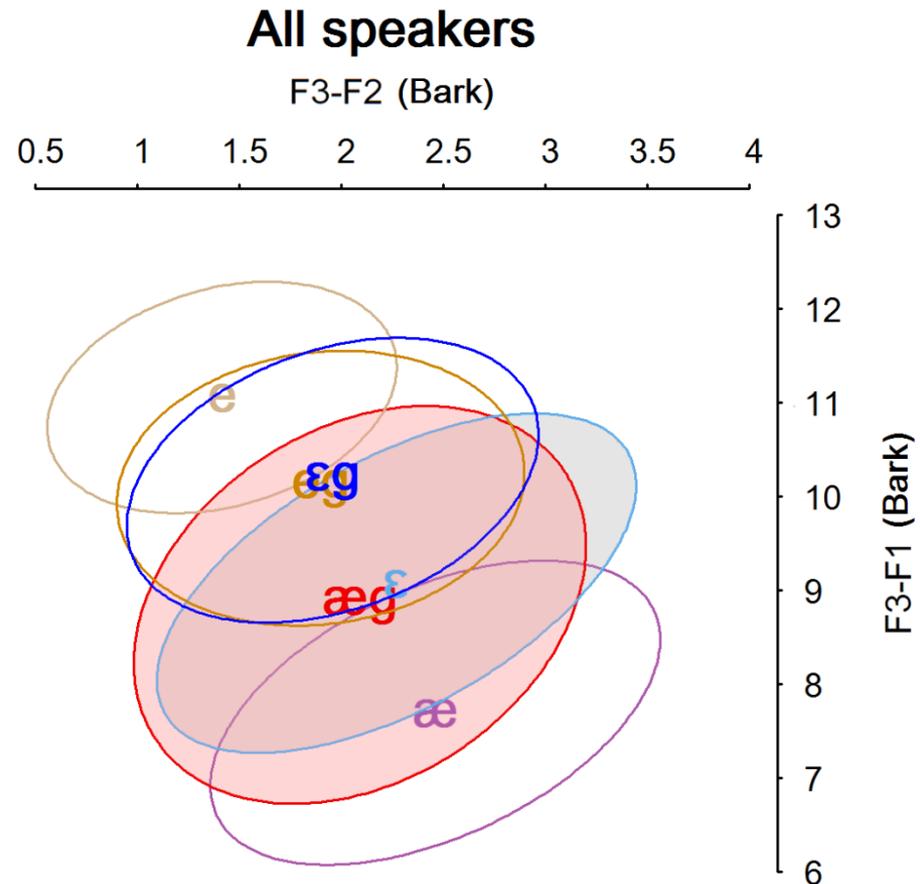
Midpoint: BAG

- /æɪg/ raised from /æ/
- 58% 2D
- 48% 3D
- /æɪg/ slightly shorter



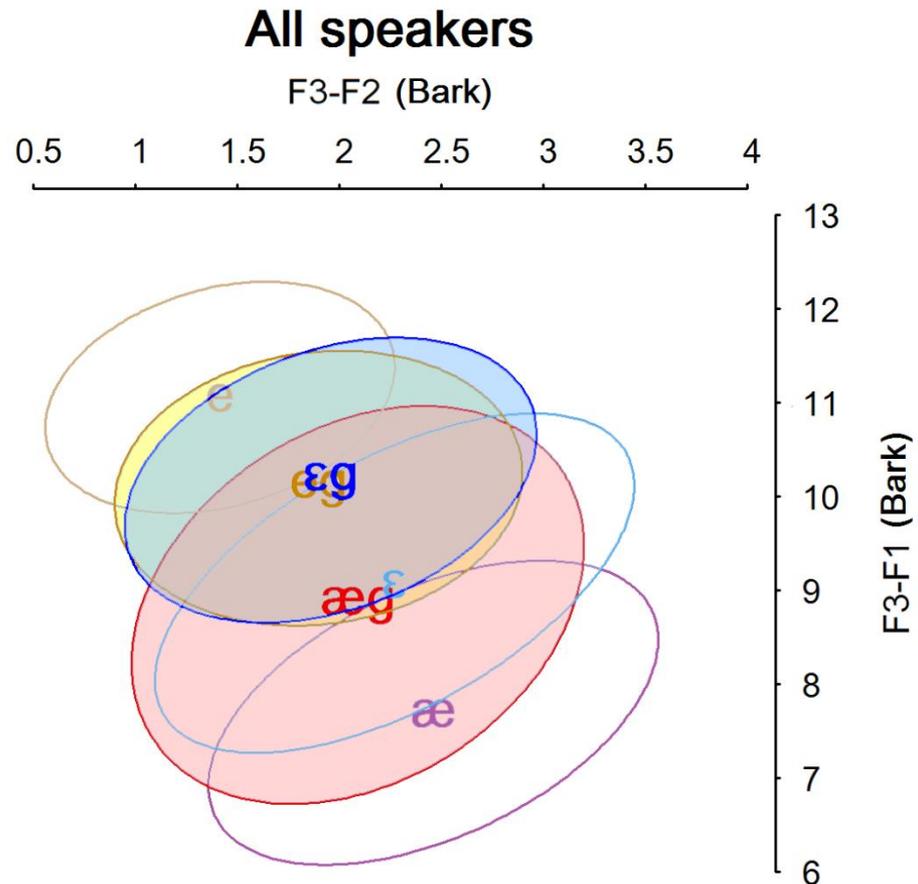
Midpoint: BAG

- /æɪg/ raised from /æ/
 - 58% 2D
 - 48% 3D
 - /æɪg/ slightly shorter
- /æɪg/ overlaps /ɛ/
 - 95% 2D
 - 91% 3D
 - /ɛ/ shorter



Midpoint: BAG

- /æɪg/ raised from /æ/
 - 58% 2D
 - 48% 3D
 - /æɪg/ slightly shorter
- /æɪg/ overlaps /ɛ/
 - 95% 2D
 - 91% 3D
 - /ɛ/ shorter
- /æɪg/ overlaps merged /ɛg-eg/
 - 60%+ each 2D
 - 6-14% less in 3D
 - /ɛg/ shorter

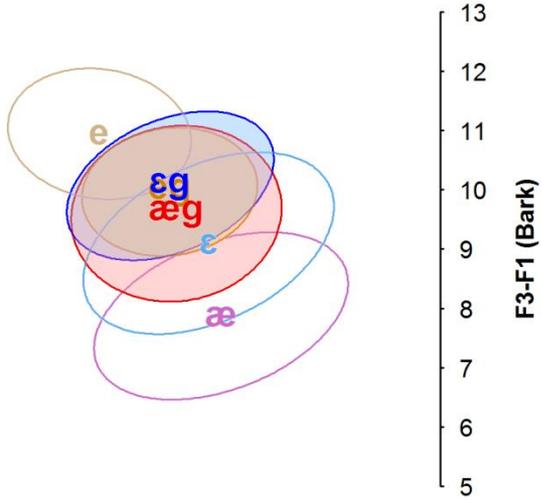


Gen 2 Males

F3-F2 (Bark)

0 0.5 1 1.5 2 2.5 3 3.5 4

vague
beg
bag

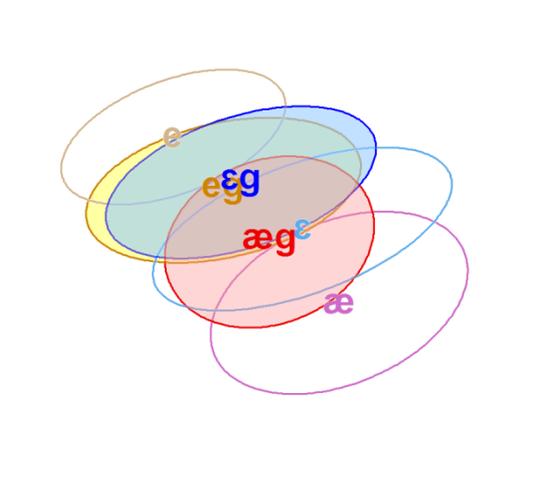


Gen 2 Females

F3-F2 (Bark)

0 0.5 1 1.5 2 2.5 3 3.5 4

F3-F1 (Bark)



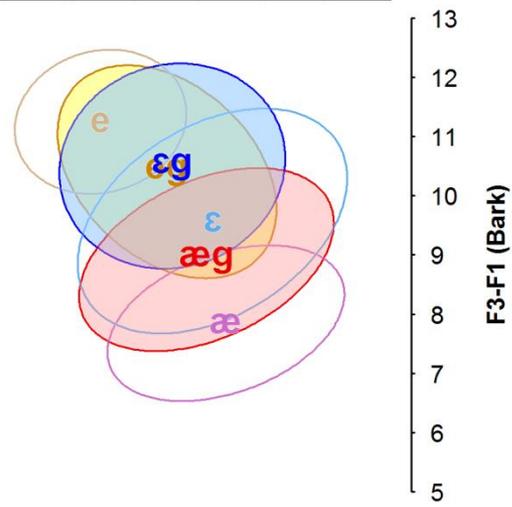
F3-F1 (Bark)

Gen 3 Males

F3-F2 (Bark)

0 0.5 1 1.5 2 2.5 3 3.5 4

F3-F1 (Bark)

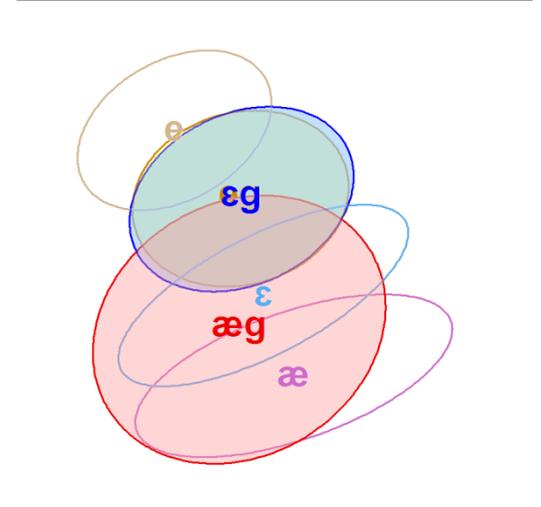


Gen 3 Females

F3-F2 (Bark)

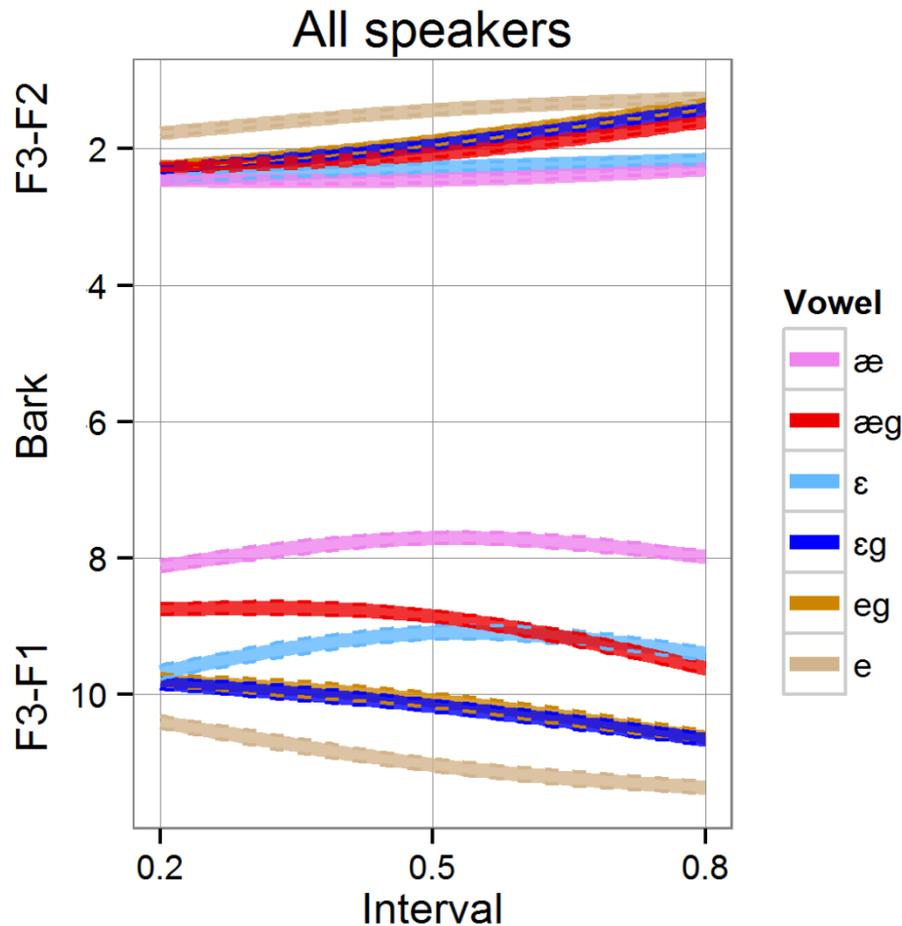
0 0.5 1 1.5 2 2.5 3 3.5 4

F3-F1 (Bark)



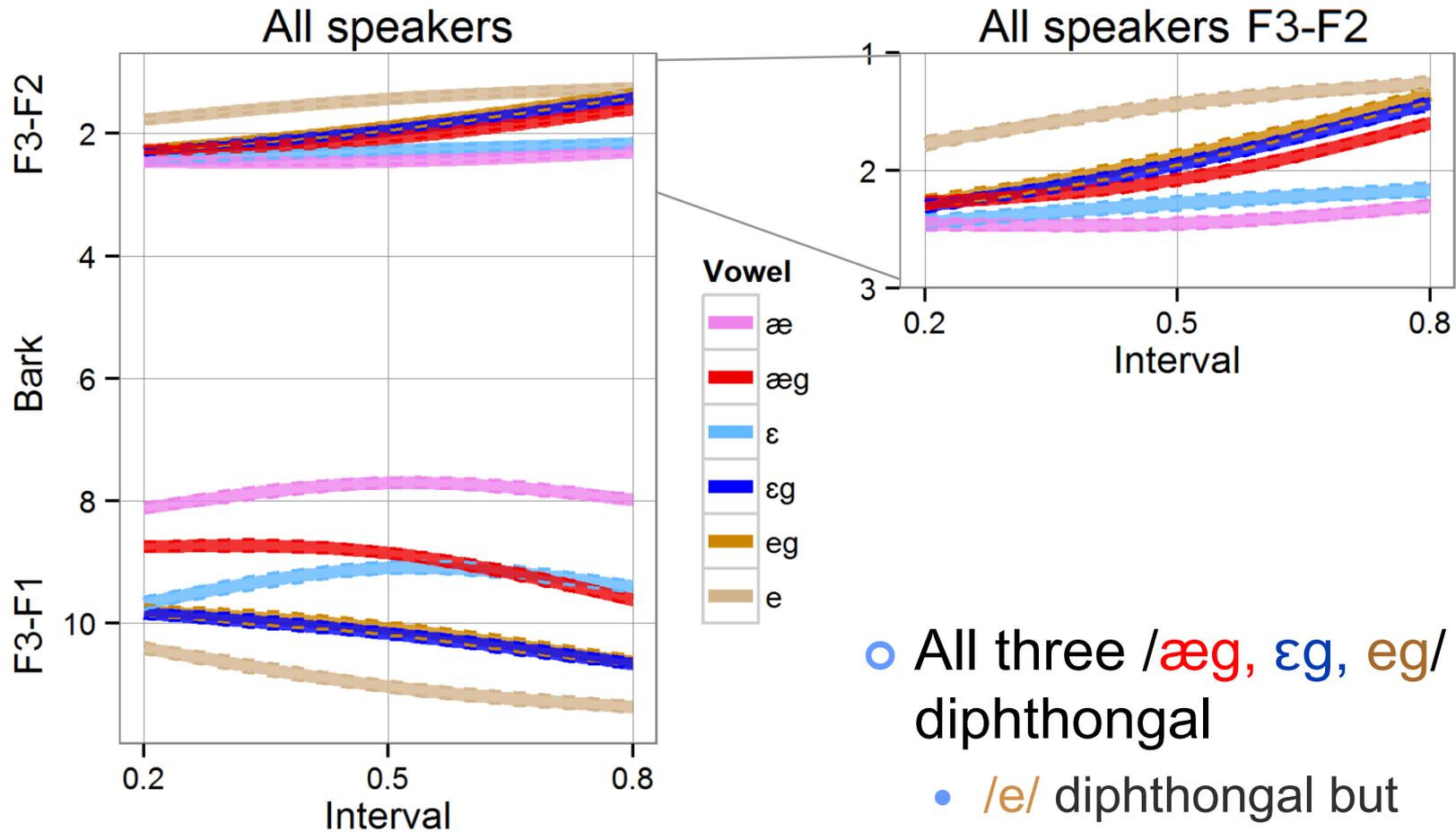
vague
beg
bag

Results: Trajectory



- /eg/ and /εg/ overlap throughout
 - Onsets overlap /ε/
 - Rise, front
- /æeg/ raised from /æ/
 - Rises, fronts
 - Starts near /æ/
 - F3-F1 crosses, ends near /ε/
- All three /æeg, εg, eg/ diphthongal
 - /e/ diphthongal but less change in F2

Results: Trajectory



- All three /æ^g, ε^g, e^g/ diphthongal
 - /e/ diphthongal but less change in F2

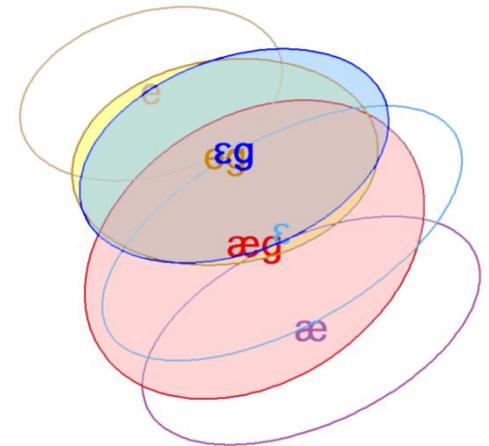
Results: Duration

- /ɛg/ remains shorter
 - /ɛ/ doesn't lengthen, even when diphthongal /ɛɪg/
 - Prevelars merged in F1xF2 might be distinguished by duration

	Vowel duration (ms)		
Following Environment	<i>/æ/</i>	<i>/e/</i>	<i>/ɛ/</i>
C (plain)	168	167	130
<i>/g/</i>	151	153	132

Patterns Summary

- All three prevelars are upgliding diphthongs
- /ɛg/ and /eg/ are spectrally merged between /ɛ/ and /e/ throughout their trajectories
 - But /ɛg/ is slightly shorter in duration
- /æɛg/ raises to overlap with /ɛg/ and /eg/
 - Potential merger target = /eg/
 - Consistent with “failure” to reach height of /e/
- /æɛg/ more variable; age x gender effects:
 - Middle-aged men spectrally merge /æɛg/ with /eg-ɛg/
 - Young speakers raise /æɛg/ the least



Phonetic Underpinnings

- Velar pinch (Zeller 1997; Baker et al. 2008; Purnell 2008; Wassink & Riebold 2013)
 - F2 rises, F3 (and F1) lowers as dorsum rises to velum
 - F2 rising + F1 lowering also occur in upgliding
 - Velar pinch elongated before voiced segments
 - Implicational scale (Baker et al.): raising most common before /ŋ/ (velar pinch exaggerated), then before /g/; not found before /k/ (cf. Freeman 2015 ADS poster)

Phonological Reanalysis

- Phonological reanalysis
 - Velar pinch sounds like upglide
 - Reanalyze phonetic diphthong as nearest phonemic diphthong /e/ (Bauer & Parker 2008)
 - /eg/ lowers to meet raised /ɛg/ – predicted to raise if only subject to effects of exaggerated velar pinch
- Few minimal pairs
 - /eg/ class tiny, /ɛg/ class small, few minimal pairs with /æɪg/
 - Merging wouldn't create many homophones
 - Allows /æɪg-ɛg-eg/ to be treated as one phonological system, potentially a three-way (near-)merger in progress

Social Variation

- BEG-BAGEL (spectral) merger complete
 - For Seattle Caucasians born after 1950 (and other groups, cf. Riebold's 2014 NWAV talk)
 - Shorter duration of /εg/: sign of near-merger, incomplete change in progress?
- Middle-aged men most advanced in BAG-raising
 - Might be receding/reversing
 - Older speakers raise somewhat (Wassink & Riebold 2013)
 - Middle-aged speakers raise the most
 - Younger speakers raise the least
 - Local value and/or stigma that youth/women avoid?

Future Work

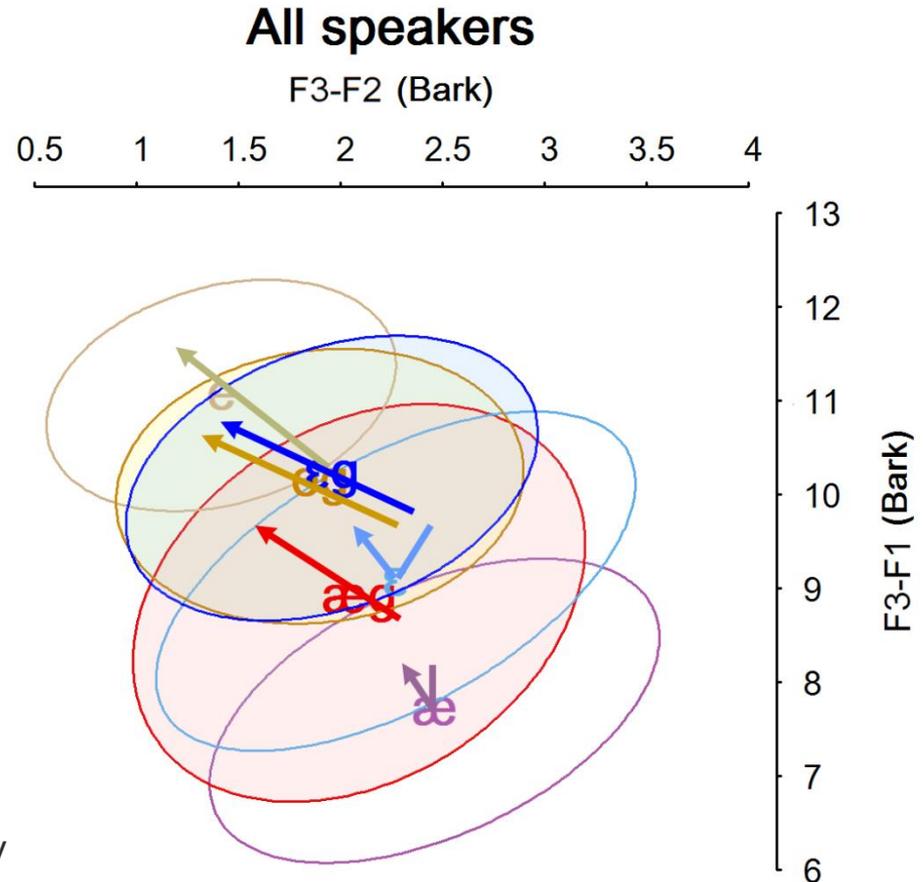
- Phonetic factors
 - Before velar nasal (hyper-raising); before /k/ (backing); before back vowels, /n/ (cf. Freeman 2015 ADS poster)
- Perception test
 - Do perceptual categories correlate with production?
 - Manipulate F1xF2, duration, glide, prosody
- Discourse factors
 - Interactions with stance, involvement, audience (cf. Freeman 2015 dissertation, ATAROS project)
- Social, style factors
 - Urbanness/insularity, network strength, social class...
 - Analyze, compare informal tasks (cf. Riebold 2015 dissertation)

Questions?

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Working paper available at:
depts.washington.edu/uwwpl

- Special thanks
 - Alicia Wassink, John Riebold
 - Dan McCloy, Meghan Oxley
 - Richard Wright, Gina-Anne Levow
- Portions of this research were supported by National Science Foundation grants BCS-0643374 and BCS-1147678 to PI Alicia Wassink
- Travel to NWA V partially supported by the International Phonetic Association



References

- Baker, A., Mielke, J., & Archangeli, D. (2008). More velar than /g/: Consonant coarticulation as a cause of diphthongization. In Charles B. Chang and Hannah J. Haynie (Eds.), *Proceedings of the 26th West Coast Conference on Formal Linguistics*, 60-68. Somerville, MA: Cascadilla Proceedings Project.
- Bauer, M., & Parker, F. (2008). /æ/-raising in Wisconsin English. *American Speech*, 83(4), 403-31.
- Benson, E.J., Fox, M.J., & Balkman, J. (2011). The bag that Scott bought: The low vowels in northwest Wisconsin. *American Speech*, 86(3), 271-311.
- Boberg, C. (2008). Regional phonetic differentiation in Standard Canadian English. *Journal of English Linguistics*, 36(2), 129-154.
- Freeman, V. (2014). Bag, beg, bagel: Prevelar raising and merger in Pacific Northwest English. *University of Washington Working Papers in Linguistics*, 32. Available online: <http://depts.washington.edu/uwwpl>
- Freeman, V. (*to appear*). "The prevelar vowel system in Seattle." Poster to be presented at the American Dialect Society (ADS) Annual Meeting, Portland, OR, Jan. 8-11, 2015.
- Labov, W., Ash, S., & Boberg, C. (2006). *Atlas of North American English: Phonetics, Phonology, and Sound Change*. Berlin: Mouton de Gruyter.
- Purnell, T.C. (2008). Prevelar raising and phonetic conditioning: The role of labial and anterior tongue Gestures. *American Speech*, 83(4), 373-402.

References

- Reed, C. (1952). The pronunciation of English in the state of Washington. *American Speech*, 27(3), 186-189.
- Reed, C. (1961). The pronunciation of English in the Pacific Northwest. *Language*, 37(4), 559-564.
- Riebold, J. (2014). “The ethnic distribution of a regional change: /æg, ɛg, eg/ in Washington State.” Presented at New Ways of Analyzing Variation (NWAV 43), Chicago, Oct. 23-36.
- Squizzero, R. (2009). Fronting of /æ/ and /ɛ/ before /g/ in Seattle English: Effects of style and gender. Unpublished undergraduate honors thesis, University of Washington.
- Wassink, A.B., & Riebold, J.M. (2013). “Individual variation and linguistic innovation in the American Pacific Northwest.” Presented at the Chicago Linguistic Society (CLS 49) Workshop on Sound Change Actuation, Apr. 18-20. Manuscript in preparation for *Language Variation and Change*.
- Wassink, A.B., Squizzero, R., Schirra, R., & Conn J. (2009). “Effects of style and gender on fronting and raising of /e/, /e:/ and /æ/ before /g/ in Seattle English.” Presented at NWAV 38, Ottawa, Oct. 22-25.
- Zeller, C. (1997). The investigation of a sound change in progress: /æ/ to /e/ in Midwestern American English. *Journal of English Linguistics*, 25(2), 142-155.

Extra Slides

Grand Summary

- Prevelar /ɛg/ and /eg/ (BEG and BAGEL):
 - Upgliding diphthongs
 - Merged in F1xF2 space between non-prevelar /ɛ/ and /e/ throughout their trajectories (at onset, midpoint, offset)
 - But BEG is slightly shorter in duration
- Prevelar /æg/ (BAG):
 - Raised and upgliding
 - Variation in height between social groups:
 - Middle-aged men raise to merge with BEG-BAGEL in F1xF2
 - But BEG is shorter
 - Middle-aged women raise less, partially overlap BEG-BAGEL
 - Young speakers of both genders raise the least

Target Words

Following Environment	/æ/	/e/	/ɛ/
C ("plain")	bad dad hatch	bait pace	bed dead test
/g/	bag brag drag dragon lag magnet nag zag	bagel pagan plague vague	beg egg leg leggings negative peg regular

Data Set

Speakers	Vowel	N	F1 (Hz)	F2 (Hz)
All speakers N = 2556	e	400	424	2283
	eg	297	514	2076
	εg	490	505	2043
	ε	339	601	1870
	æg	542	622	1901
	æ	488	743	1737

Overlap Fractions

Vowel Pairs	2D overlap	3D overlap
æ-ε	39%	23%
εg-eg	91%	87%
εg-ε	49%	40%
εg-e	49%	36%
eg-ε	52%	38%
eg-e	55%	44%
æg-ε	95%	91%
æg-æ	58%	48%
æg-eg	62%	56%
æg-εg	61%	47%
æg-e	9%	7%