A chain shift and the initial syllable prominence in Seoul Korean

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Questions

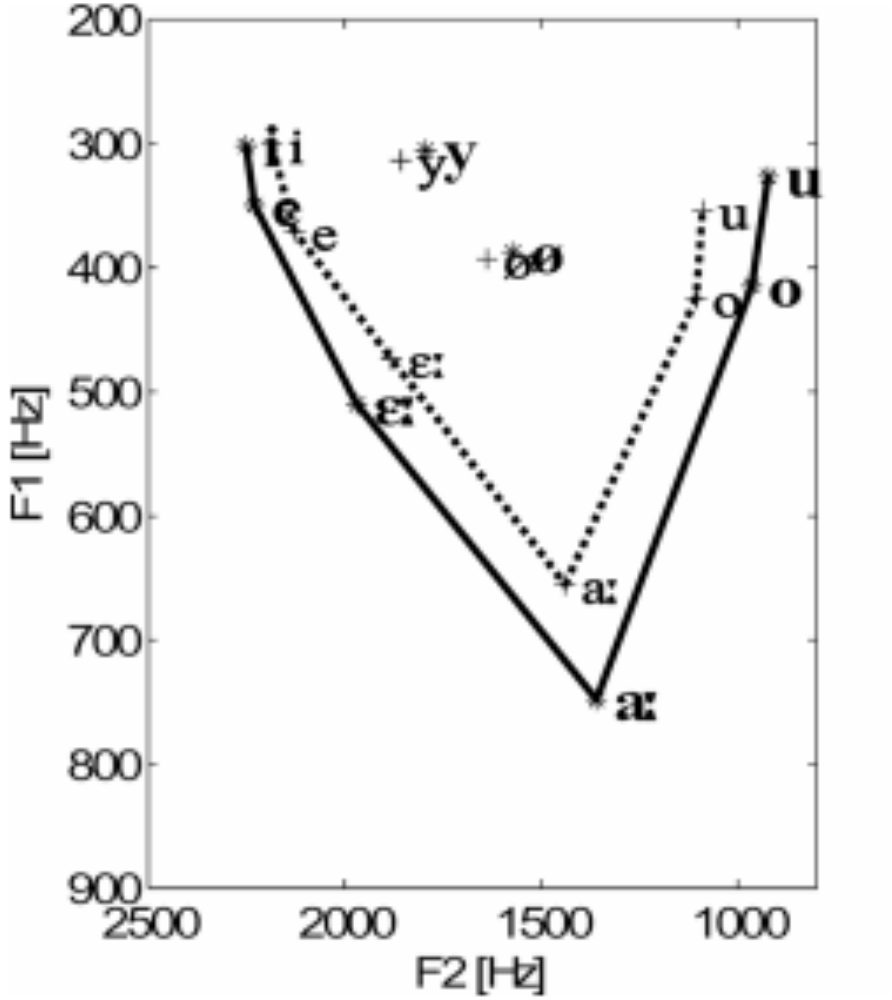
- How does the prosodic prominence interact with vocalic chain shifts?
- Do prosodically prominent positions lead the change? Or do prosodically weak positions lead the change?
- What can we learn about the mechanism of a sound change by examining prosodically conditioned variation?

Stress

- **Stressed** vowels:
  - tend to be longer and more likely to reach the articulatory target (Hyperarticulation)
  - show a more peripheral realization
- **Unstressed** vowels:
  - tend to be shorter and are less likely to reach the articulatory target (Hypoarticulation).
  - show a more centralized realization.

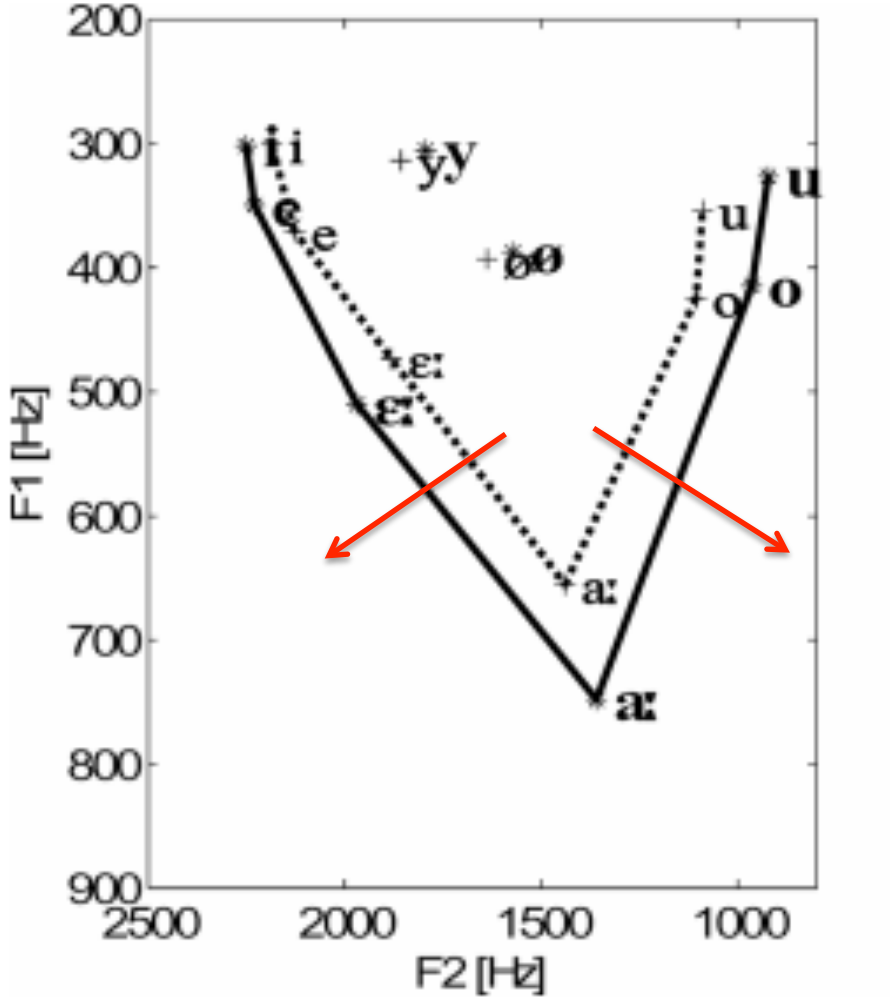
(Lindblom 1963, Flemming 2004, 2005, Barnes 2006, Giavazzi 2010)

German vowels



Mooshammer and Geng (2008, JIPA)

German vowels



Mooshammer and Geng (2008, JIPA)

Hyperarticulation as a phonetic target

- Most clearly articulated speech is most relevant to phonological analysis.

(Jakobson and Halle 1956; Hockett 1955)

- A phonetic target is hyperarticulated and hypoarticulated speech is due to an undershoot of the phonetic target.

(Johnson et al. 1993, *Language,* p.506)

Sound change and phonetic target

- What is the phonetic target of a sound undergoing a change?
- Conservative target?
  - Prominent position = older form
  - Weak position = newer form
  - Change is led by hypoarticulated forms.
  - Phonology lags behind the phonetic change.
- Innovative target?
  - Prominent position = newer form
  - Weak position = older form
  - Change is led by hyperarticulated forms.
  - Phonology leads the change and production follows.

Labov (1994, *PLC*)

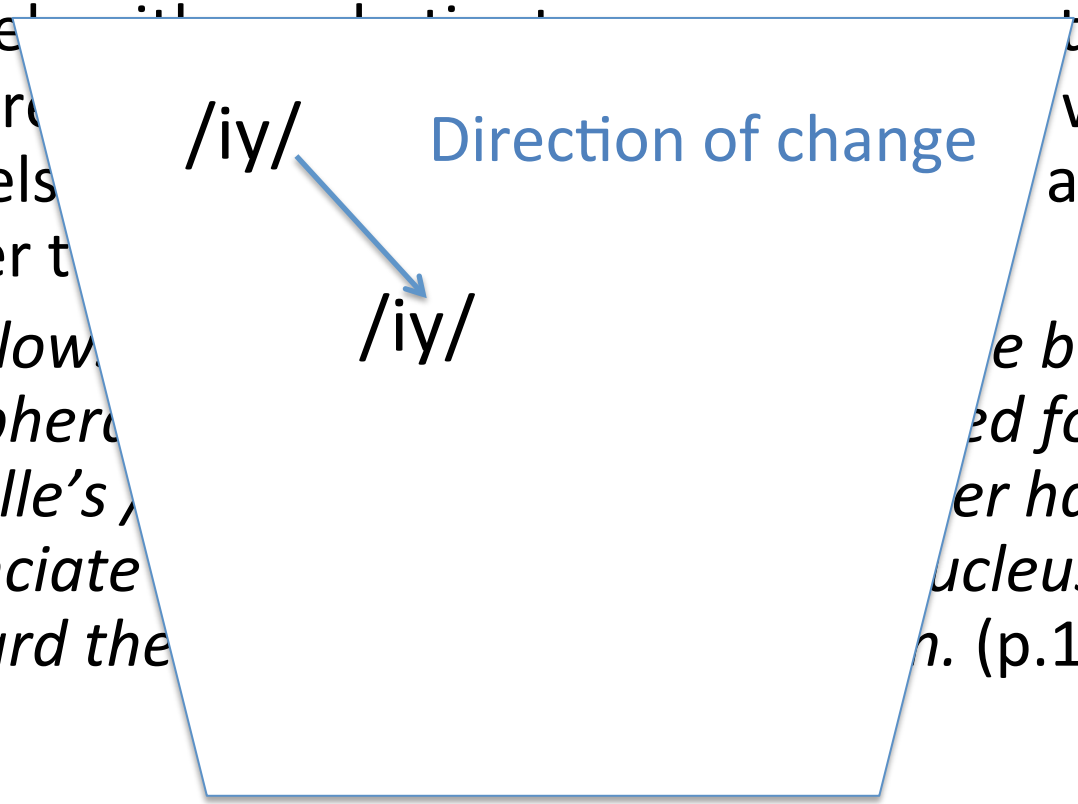
- *"[T]he most highly stressed vowels tend to move farther in the direction of the change in progress."* (p.195)
- This is the case even when the direction of change is not toward a more peripheral position.

Non-peripheral target

- /iy/ centralization and lowering in the speech of Marie Corville (39, London 1968) (p. 173-4)
  - Vowels with emphatic stress are more centralized and lowered (=the target direction of change), while vowels with secondary and tertiary stress are found closer to the periphery.
  - *It follows that the connection often made between peripheral position and length is reversed for Marie Colville's /iy/. The more time the speaker has to enunciate the vowel, the farther the nucleus extends toward the center of the vowel system.* (p.174)

Non-peripheral target

- /iy/ centralization and lowering in the speech of Marie Corville (39, London 1968) (p. 173-4)
  - Vowe… …tralized and lower… …while vowels… …are found closer t…
  - *It follow… …e between periphera… …ed for Marie Colville's /… …er has to enunciate… …ucleus extends toward the… …n.* (p.174)



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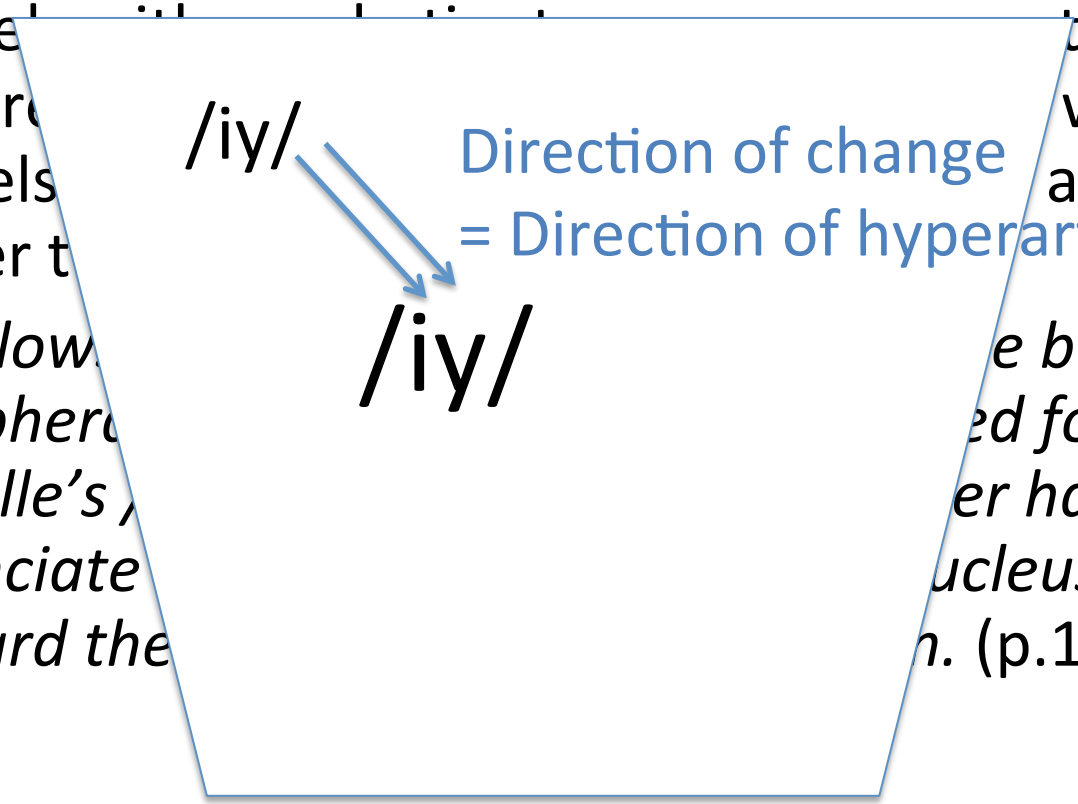
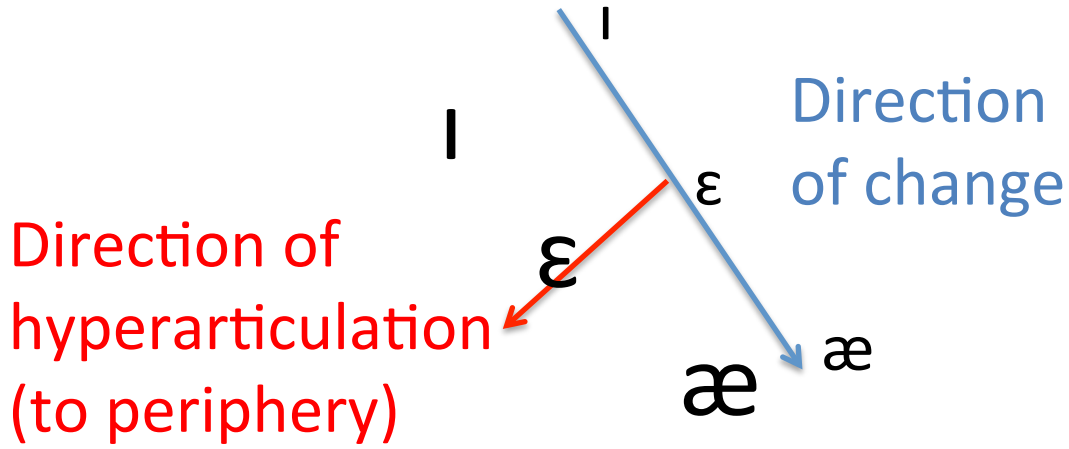


Emphatic vs. non-emphatic stressed vowels

- Jacewicz et al. (2006, *LVC;* 2011, *JPhon)*
  - Canadian shift-like change in OH, NC, and WI: Lowering and retraction of /ɪ, ɛ, and æ/
  - Emphatic (Hyperarticulated) forms are more peripheral, a pattern expected in the absence of change



Hyper ~ Hypoarticulation

	Hyperarticulation	Hypoarticularion
Stress/Accent	Stressed/Accented	Unstressed/Unaccented
Prosodic boundary	Domain-initial	Domain-medial
Word frequency	Low frequency	High frequency
Semantic predictability	Unpredictable	Predictable
Speech style	Careful/Formal	Casual
Speech material	Word list	Reading passage

Other types of hypo-hyperarticulation continuum and chain shift

- Speech style
  - Formal vs. casual
    - Chambers and Hall 2014: hyperarticulation toward ***change*** (Canadian shift)
  - Word list vs. reading passage
    - Hall 2014: hyperarticulation to ***periphery*** (Canadian shift)
    - **Hall-Lew, et al. 2015: hyperarticulation toward *change* (California shift)**
  - Clear vs. casual speech
    - Leung et al. 2015: hyperarticulation toward ***periphery*** (u-fronting, Western Canada)

Other types of hypo-hyperarticulation continuum and chain shift

- Lexical frequency
  - Hay et al. 2015 (New Zealand shift)
    - ***Low frequency words are more advanced in change***
    - hyperarticulation toward ***change*** (Not author's interpretation)
  - Dinkin 2008 (Northern Cities Shift)
    - *Low frequency words are more peripheral*
    - hyperarticulation toward ***periphery***
- Semantic predictability
  - Clopper and Pierrehumbert 2008 (Northern Cities Shift)
    - high predictability words are more advanced in change
    - *hypo*articulation toward change

Interim summary

- Not enough research on the interaction of prosodic prominence and chain shift.
- What's available is inconsistent… But, maybe this is as expected?

Hypothesis

- For sounds undergoing change, two types of pressures are at play:
  - Duration-conditioned variation: physiological and universal
    - Hyperarticulation to periphery (=Hypoarticulation to centre)
  - Prosodically-conditioned variation: may have physiological origin but grammaticalized
    - Hyperarticulation toward change (=Hypoarticulation to centre)
- To see the effect of the latter, the first should be controlled.

Prosodic prominence in Seoul Korean

- Korean does not have “stress” in the sense of English.
- Rather, boundaries of prosodic domain is the locus of prosodic prominence (Cho and Keating, 2001).
  - Longer duration, stronger articulation
- Also, phonologically, word-initial position is a position of prominence (Kang, 2014).
  - retaining more contrasts and acting as a trigger of phonological processes.

Seoul Korean vowels

i	ɨ	u
e	ʌ	o
(ɛ)	ɑ	

The Reading-Style Speech Corpus of Standard Korean

- The National Institute of the Korean Language (2002)
- 60 male, 60 female, Seoul-Kyeoungki area
- Age/Year of Birth distribution

Year of Birth	**1930s**	**1940s**	**1950s**	**1960s**	**1970s**	**1980s**
Male	4	12	4	8	27 (26)	5
Female	2	10 (9)	25	3	11	9

- A total of > 1 million monophthongal vowel tokens

Exclusions

- Functional words or morphemes
- Phrase/word-final syllables
- Phonemic long vowels (only found in 1st syllable)
- Formant outliers (>2.5 SD for speaker)
- Super long vowels (>200ms): likely an alignment error
- File errors

- **n=587,516**

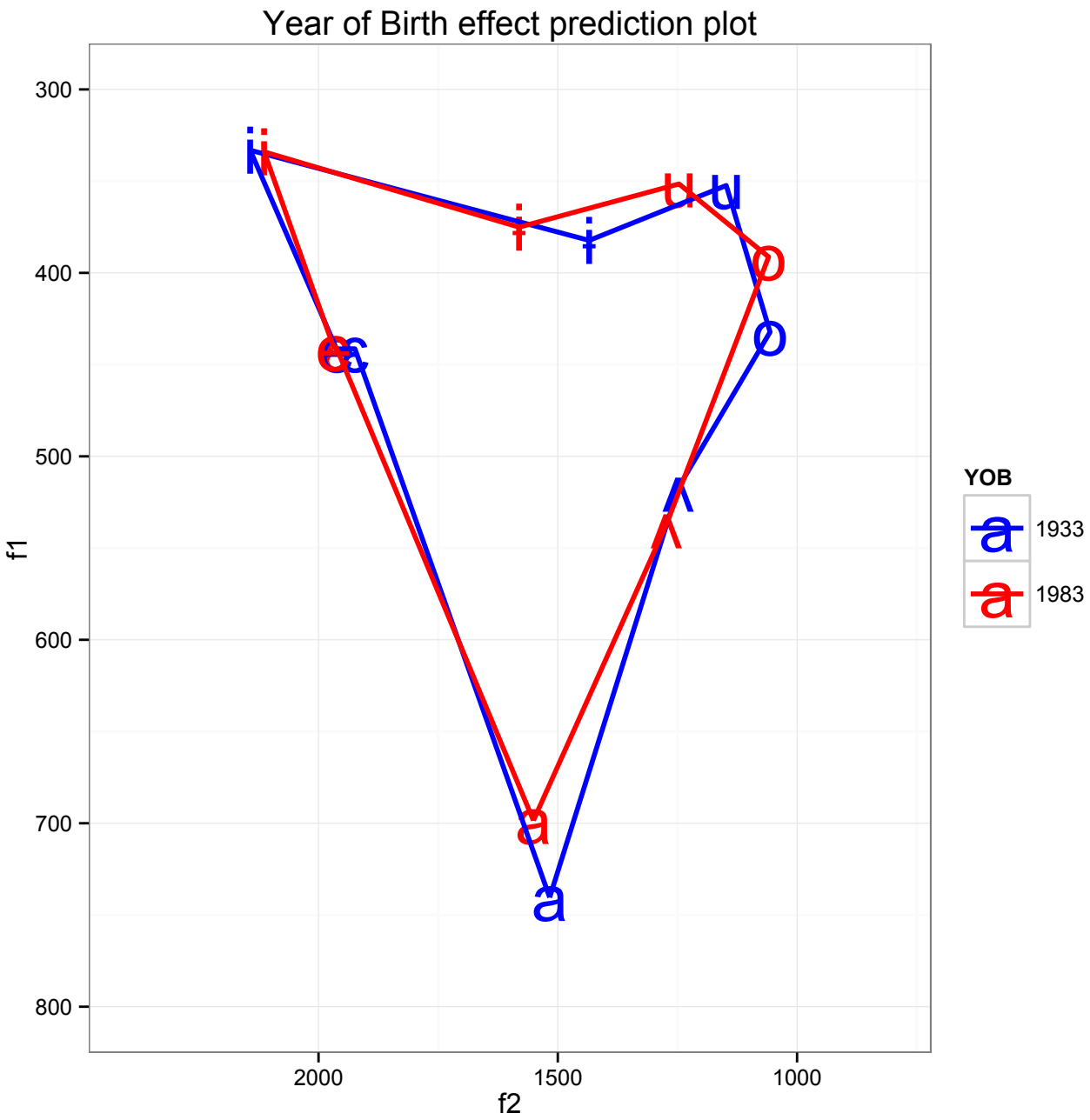
Acoustic analysis

- Vowels were automatically located using a custom-made automatic phone-aligner (Yoon and Kang 2012)
- Formants were measured using a gender and vowel-specific formant ceiling settings to minimize formant tracking errors (Kang 2014, Yoon and Kang 2015).
- Average of formant measurements from mid 20% of vowel duration
- Labov normalization (Kendall 2014)

Statistical analyses

- Separate F1 and F2 models for each vowel
- Dependent variable: F1, F2 (normalized)
- Predictor variables
  - **Year of birth (YOB)**
  - **Duration**
  - **Position (initial syllable vs. medial syllable)**
- Control variables
  - Gender
  - Preceding C place, Following C place
- Random effects
  - Speaker: intercept, *position, *duration
  - Lexical item

Year of Birth Effect


Year of Birth effect prediction plot
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f1
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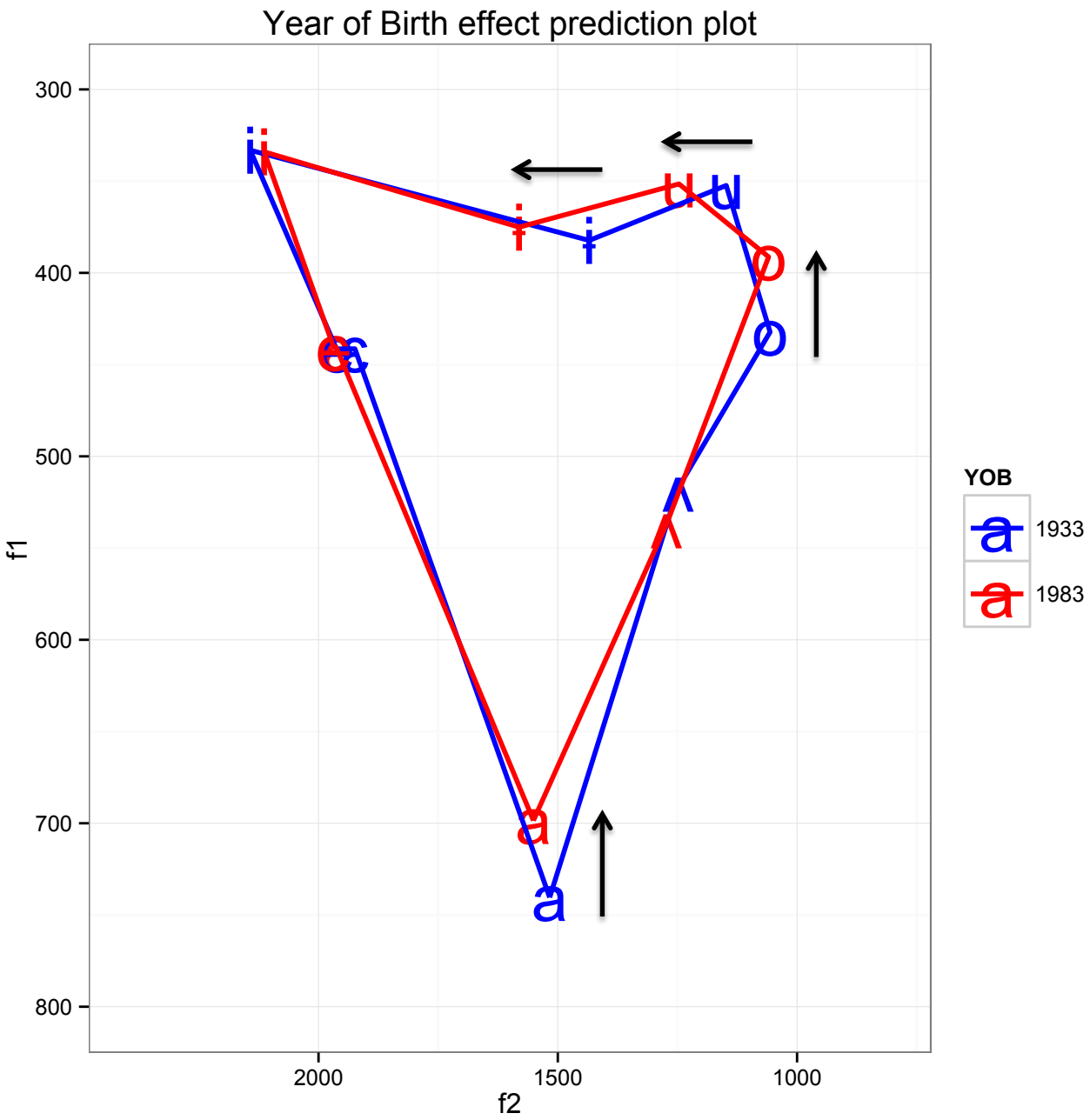
f2
YOB
1933
1983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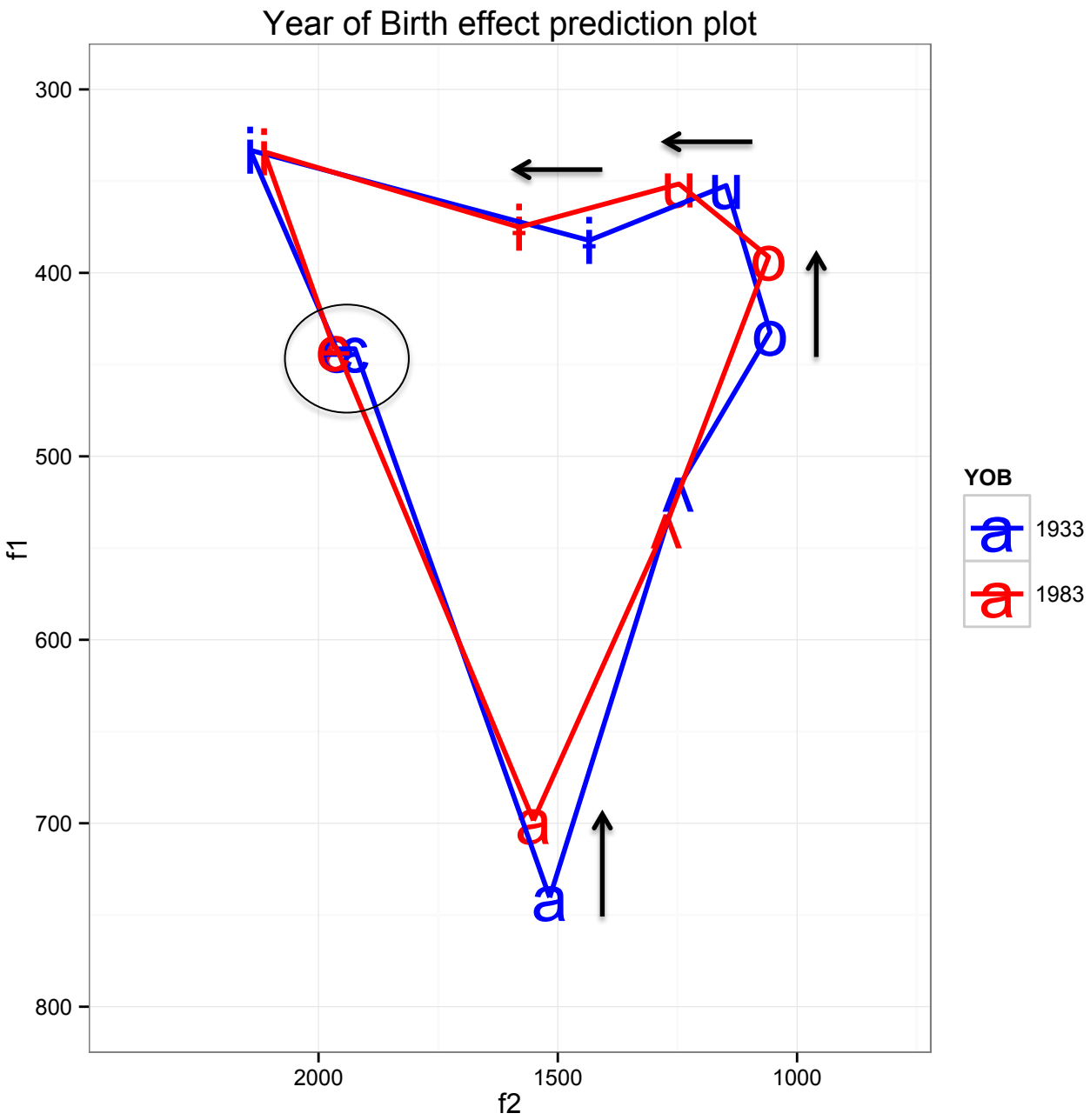
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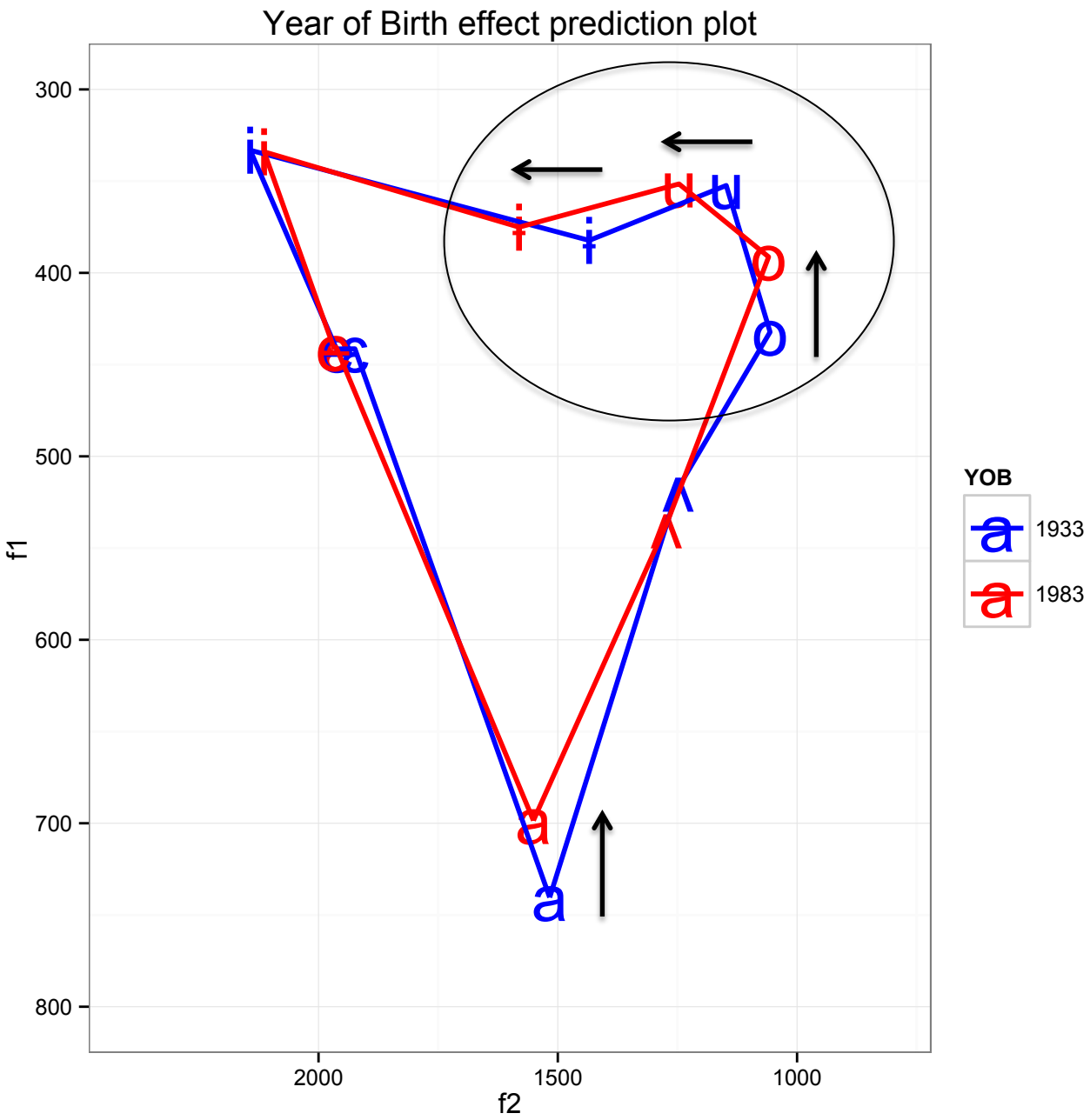
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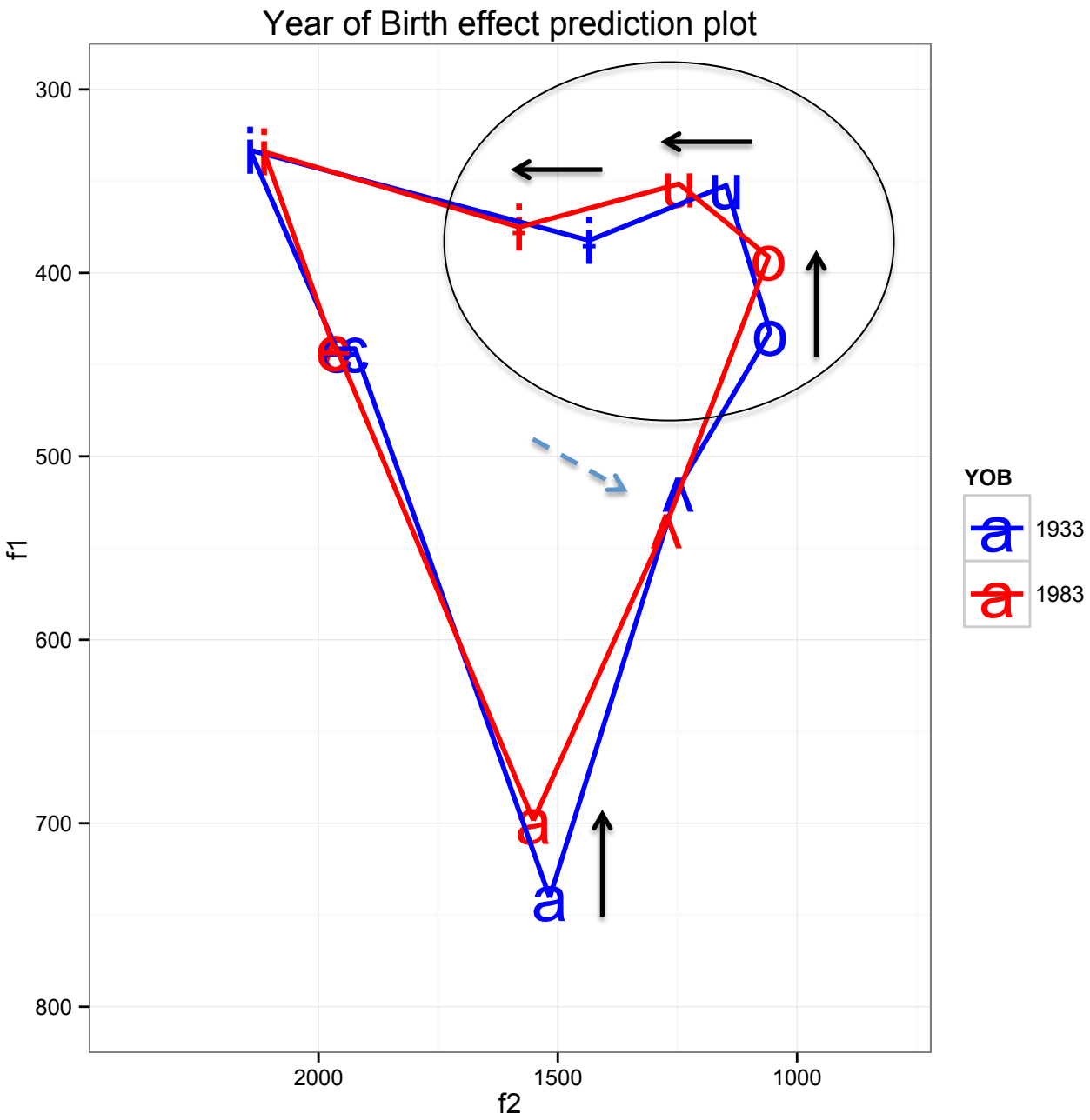
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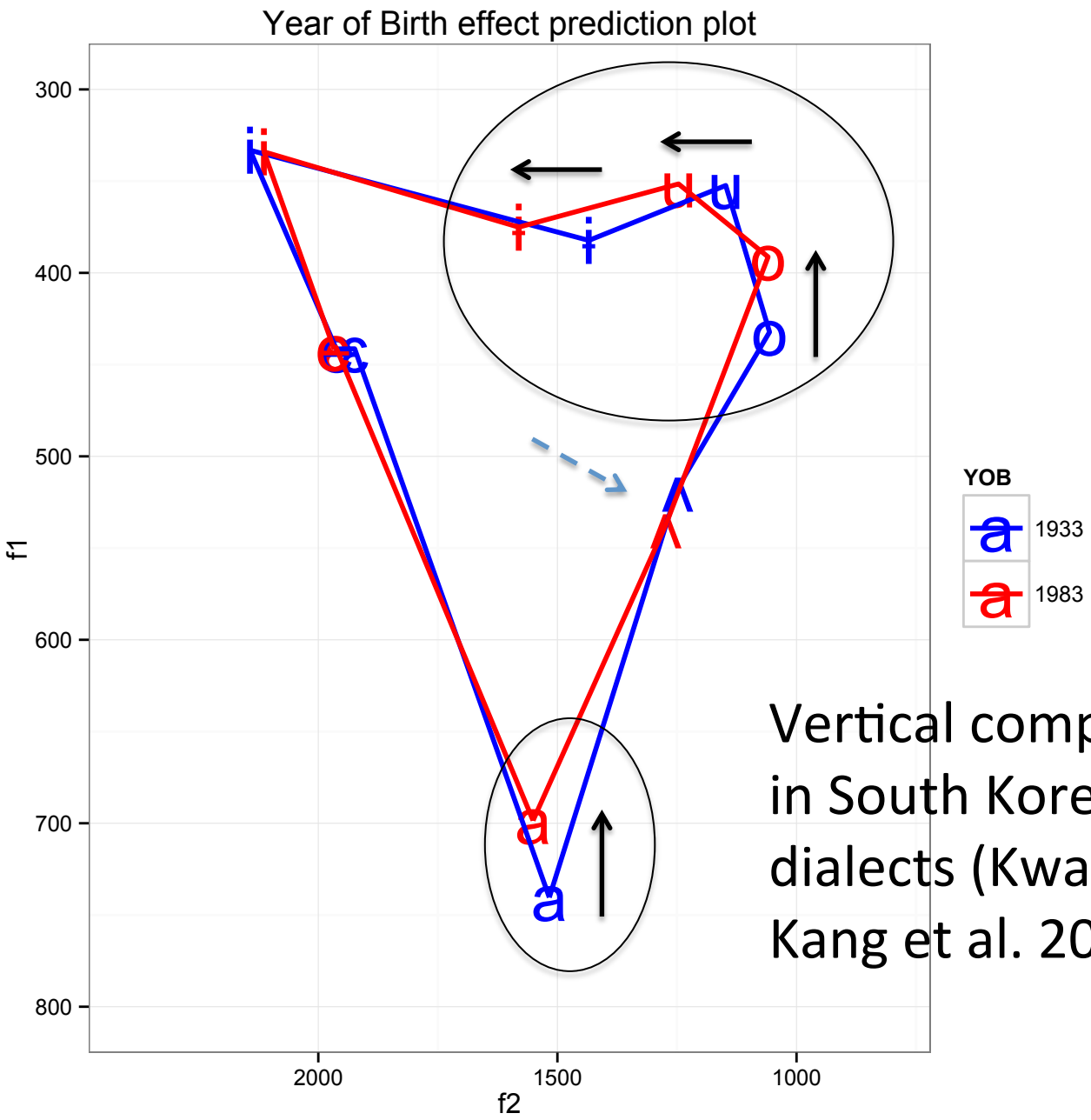
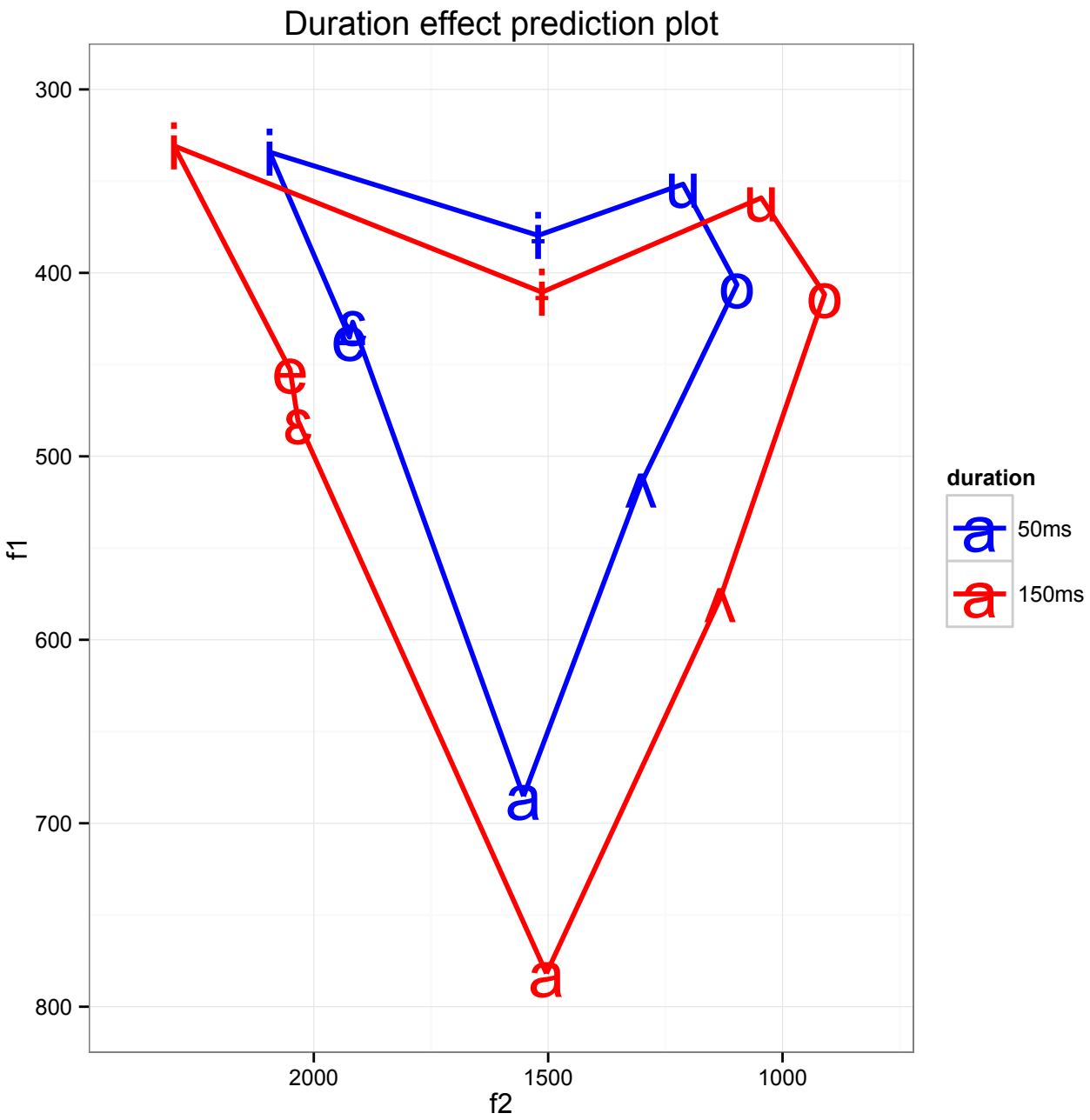


Vertical compression in South Korean dialects (Kwak 2003, Kang et al. 2014)

Duration-induced hypo-hyperarticulation


Duration effect prediction plot
300
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f1
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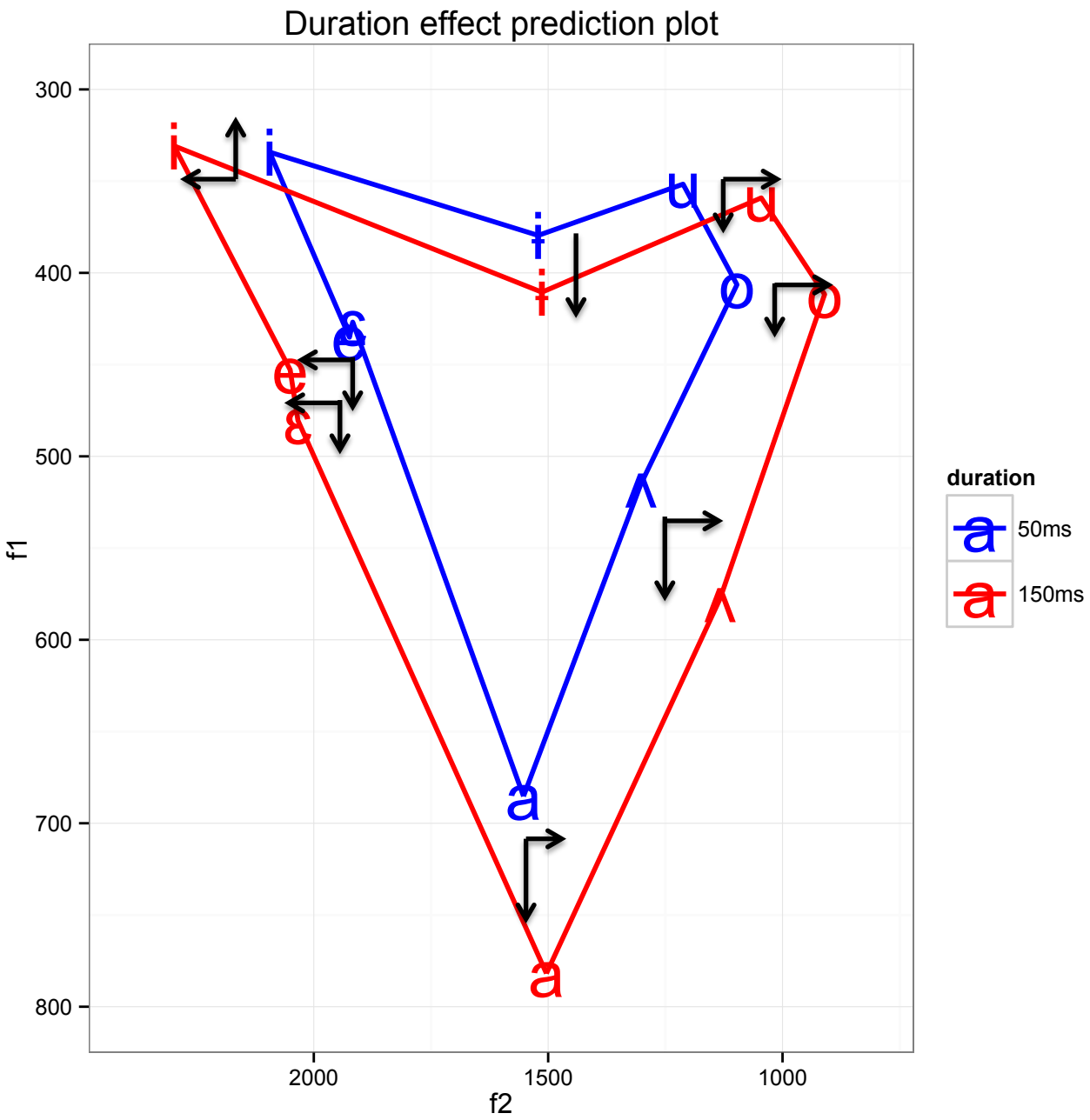
1500
1000
f2
duration
50ms
150ms


Duration effect prediction plot
300
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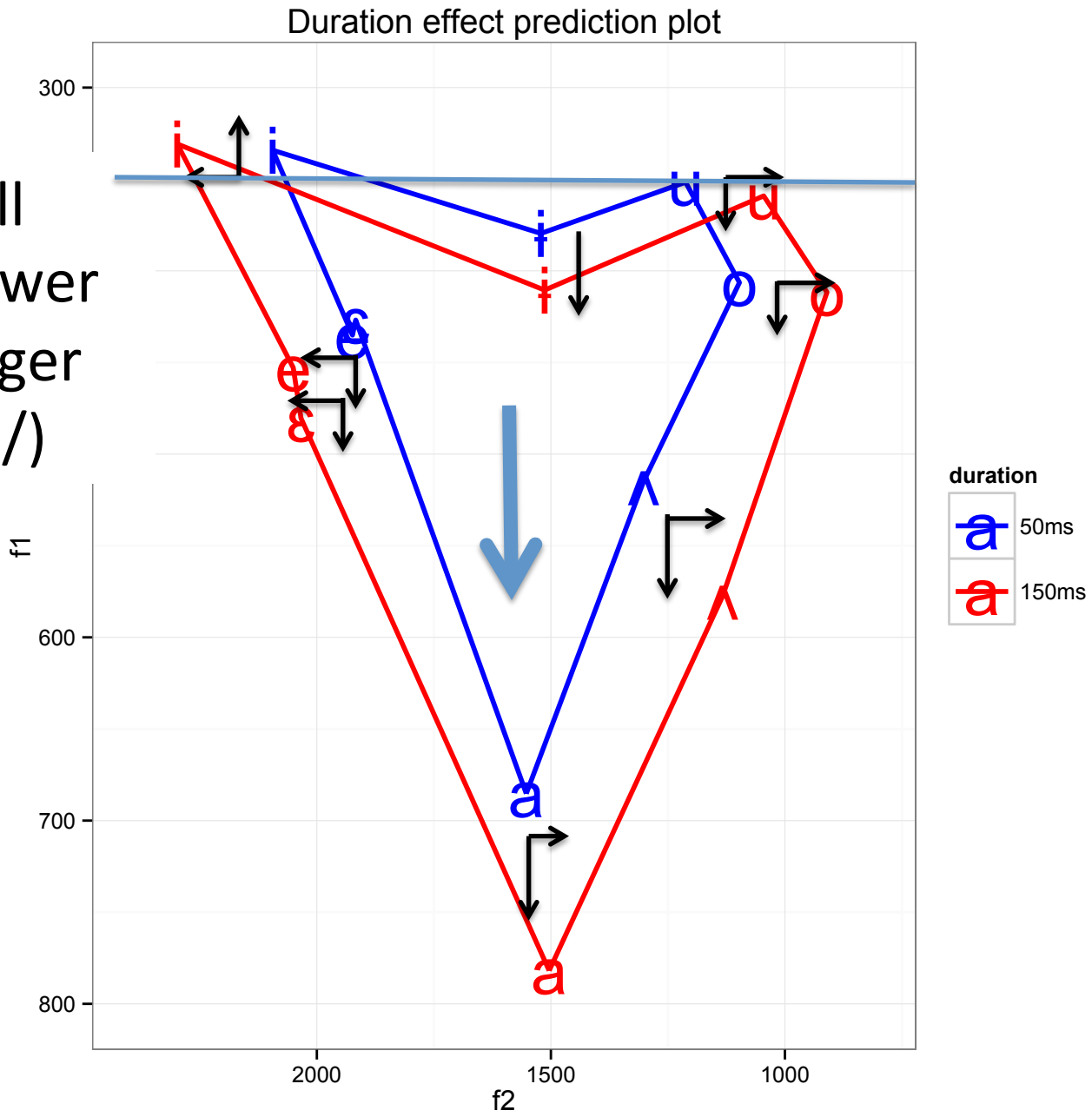
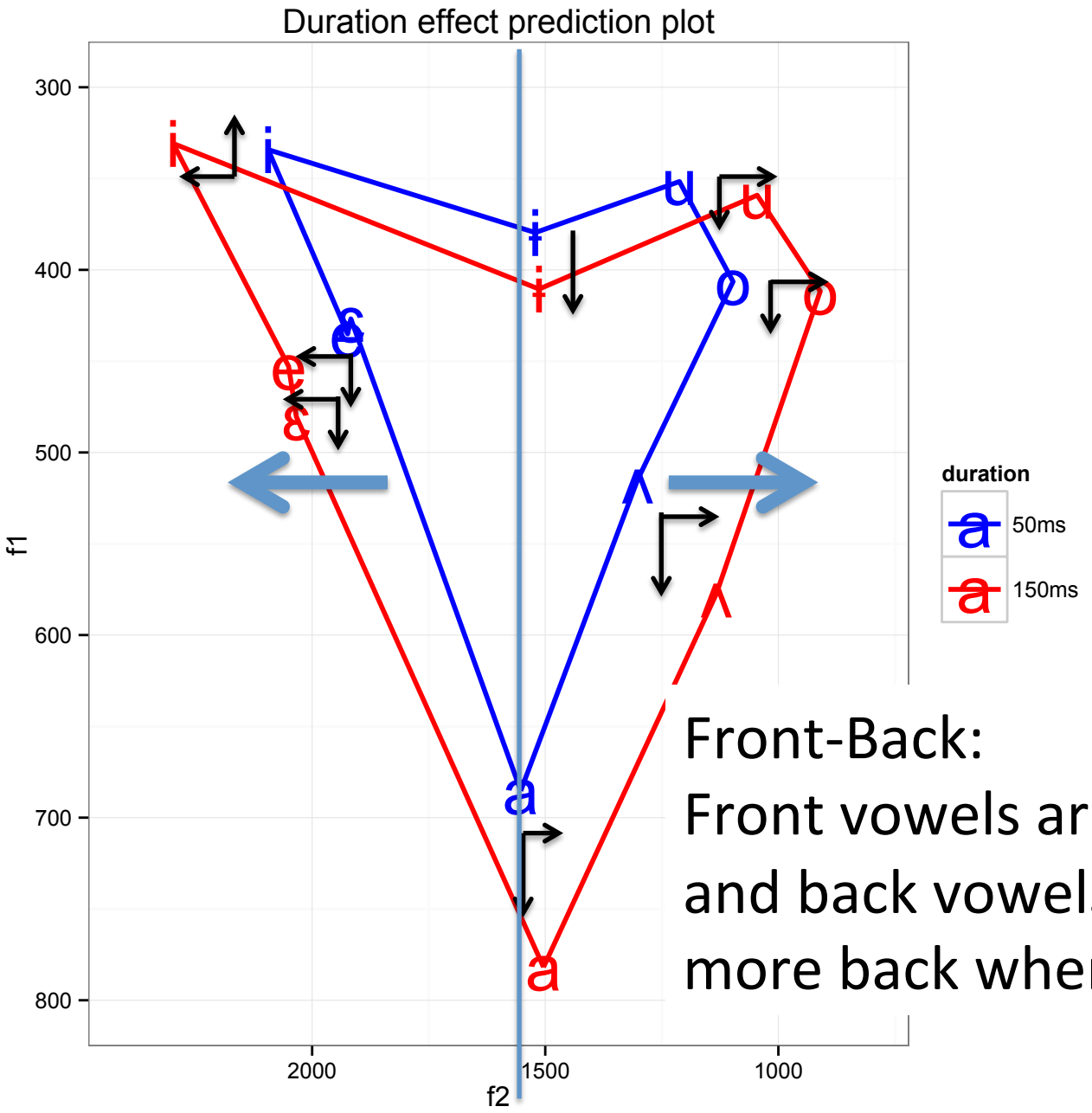
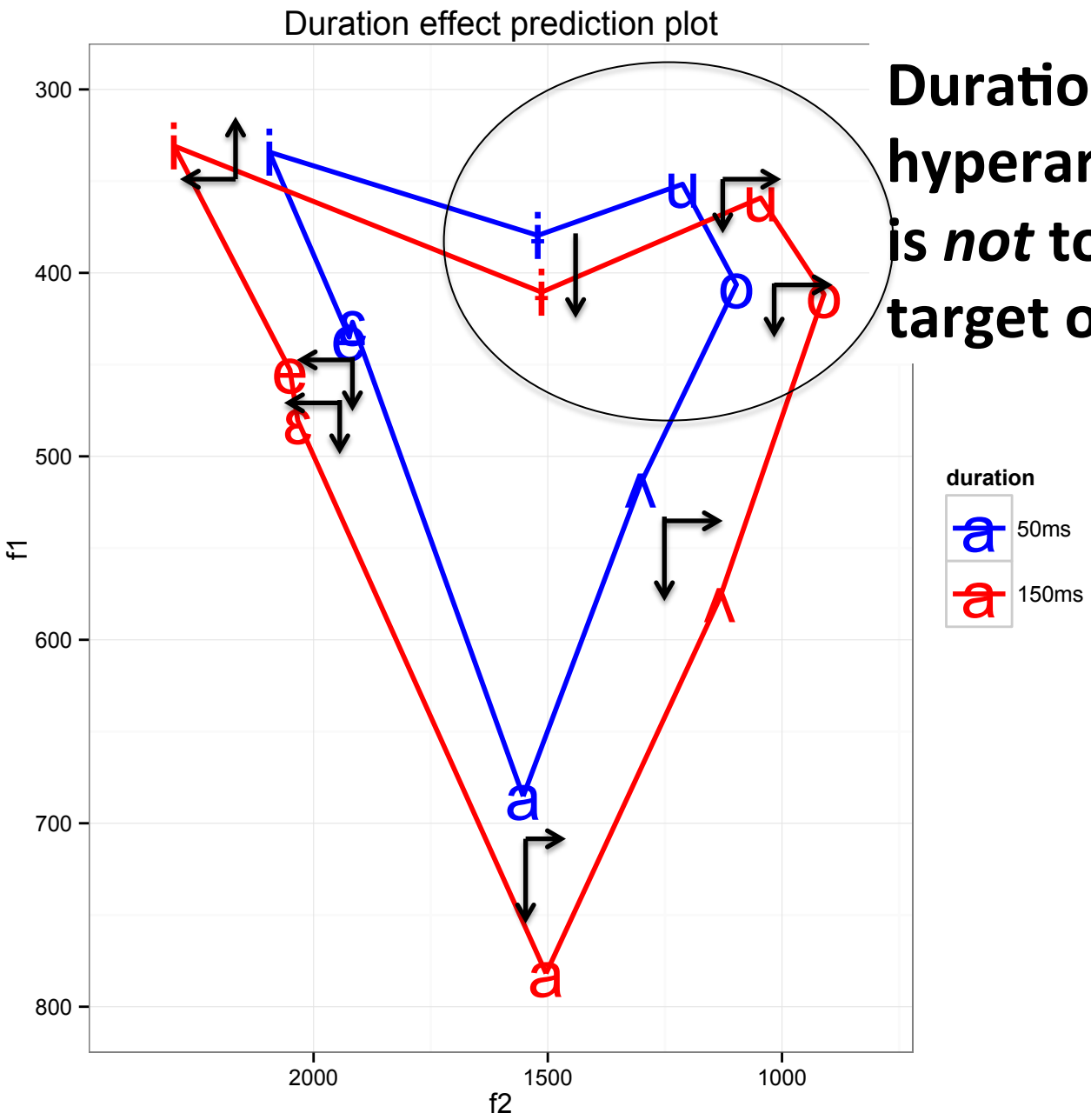
f2
duration
50ms
150ms

Height: All vowels lower when longer (except /i/)



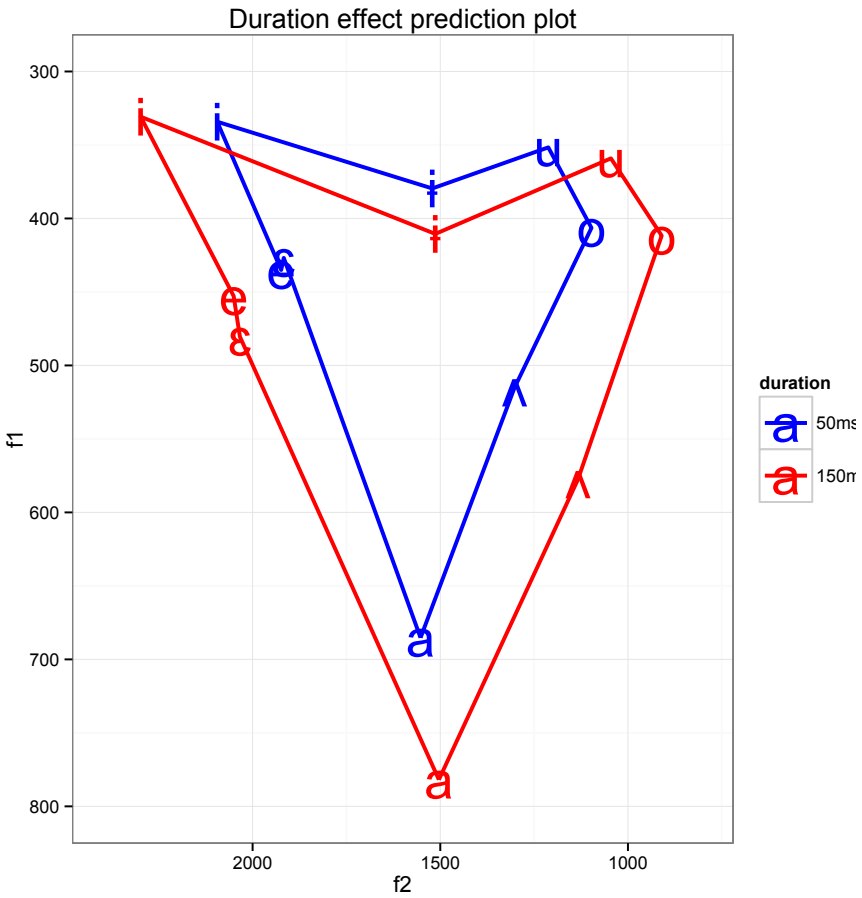


Front-Back:
Front vowels are fronter and back vowels are more back when longer.



Duration-based hyperarticulation is *not* toward the target of change.

Position-induced hypo-hyperarticulation


Duration effect prediction plot
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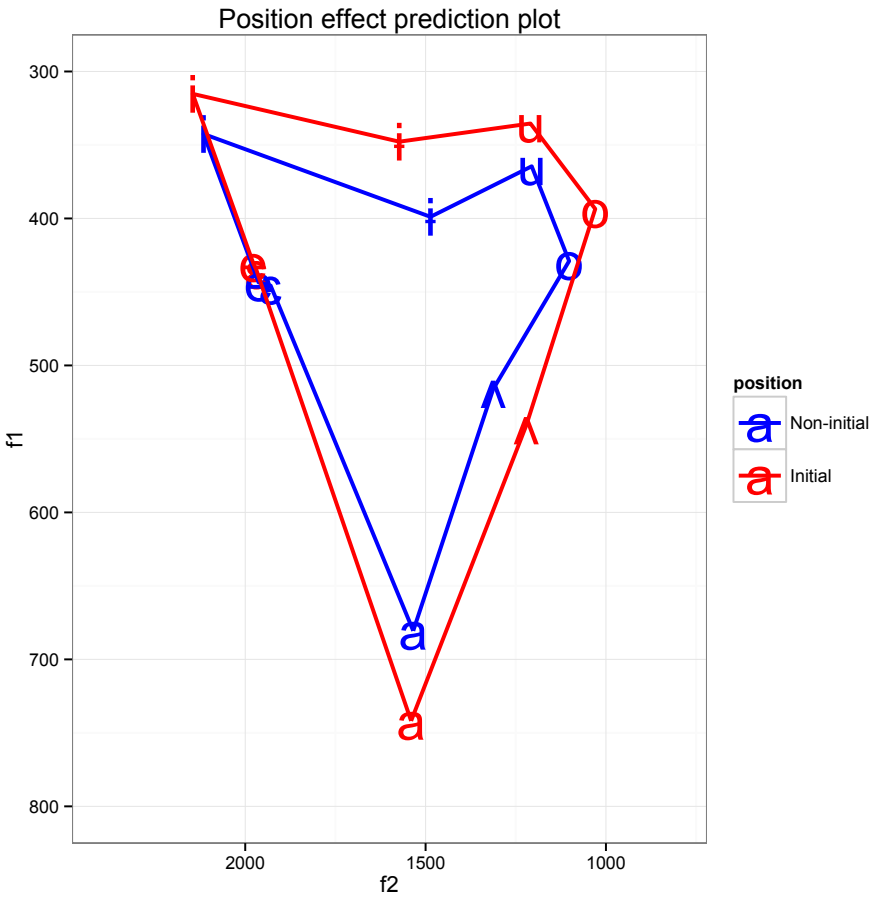
1000
f2
duration
50ms
150m


Position effect prediction plot
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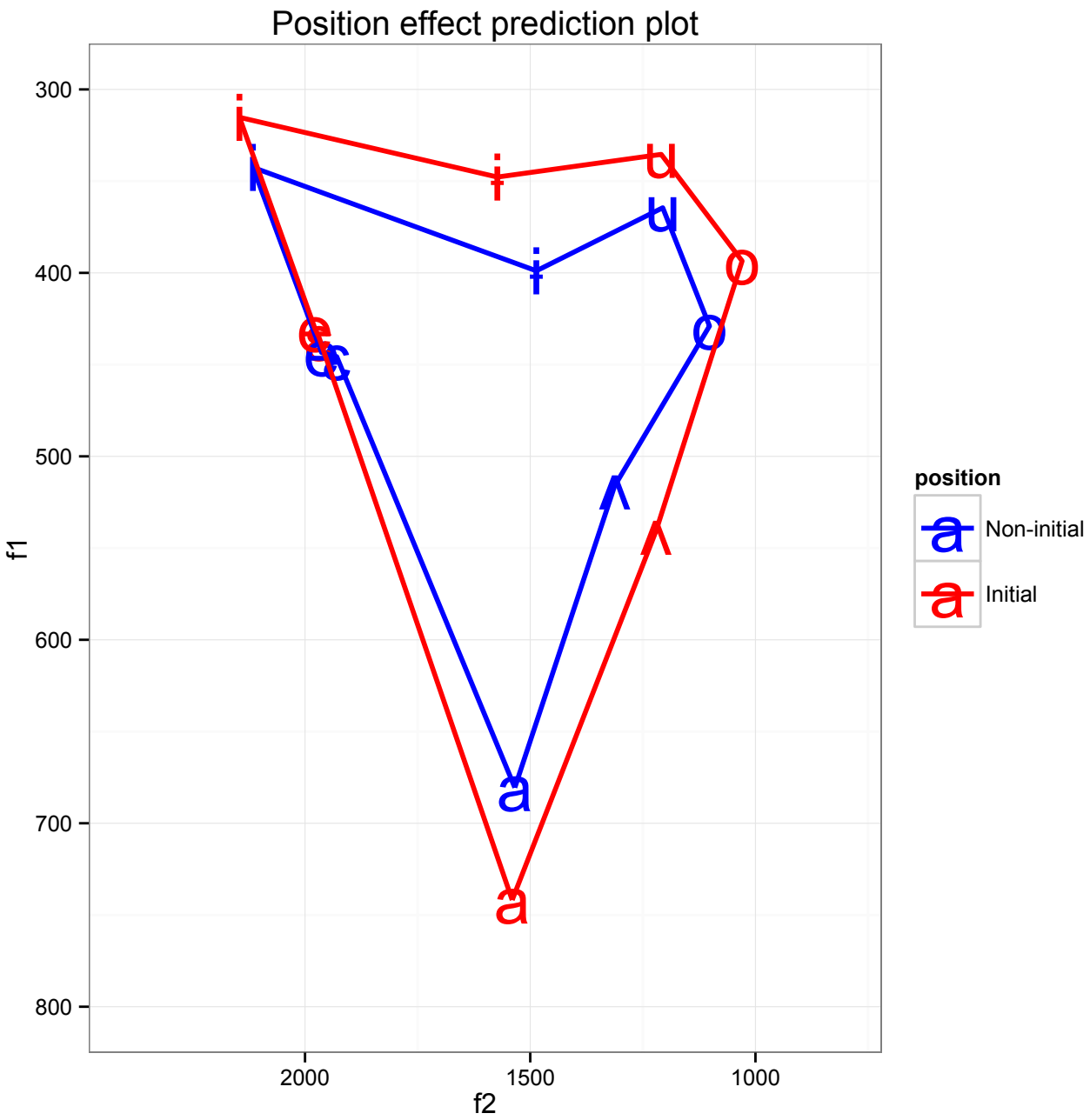
f1
2000
1500
1000
f2
position
Non-initial
Initial


Position effect prediction plot
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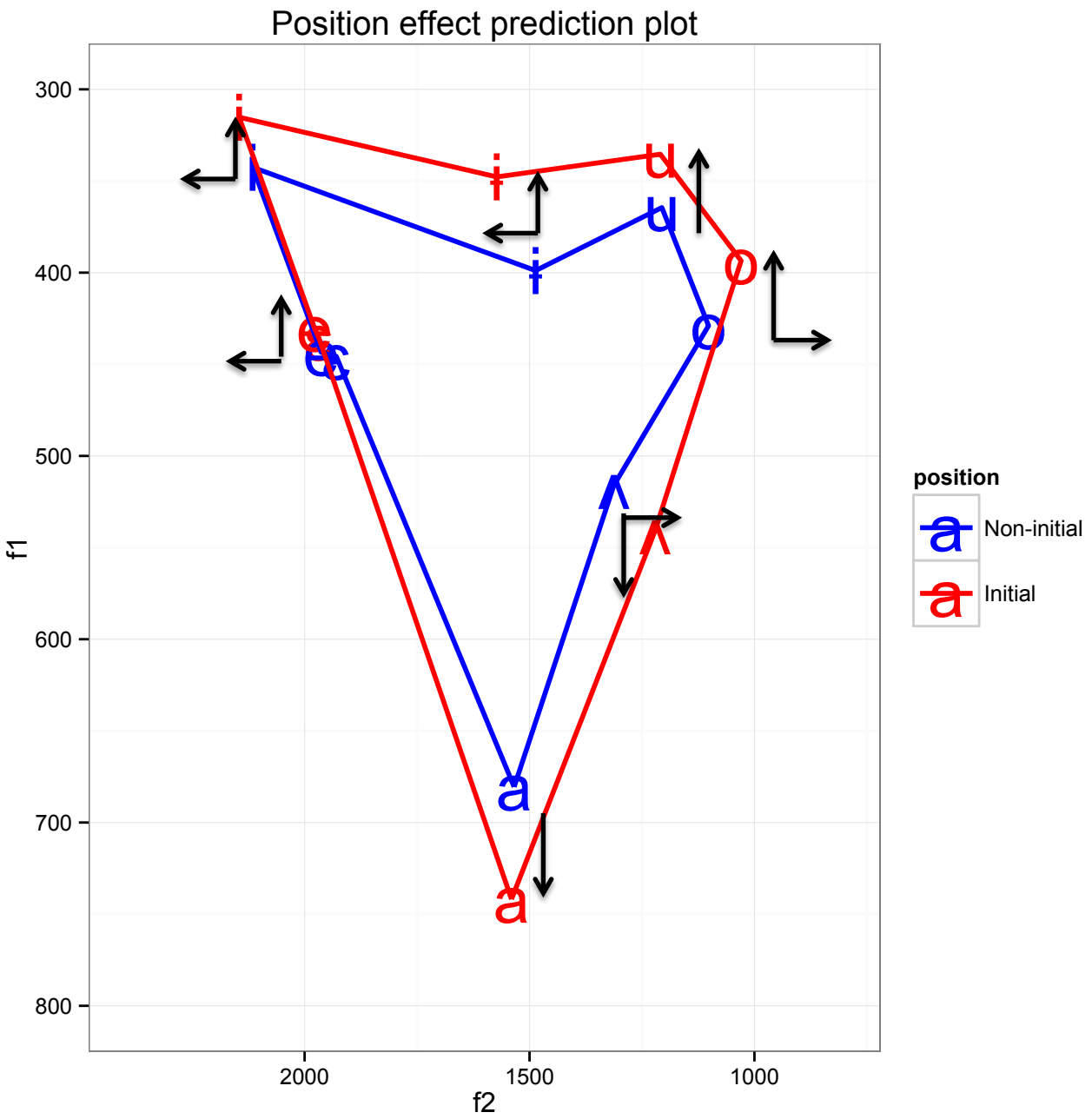
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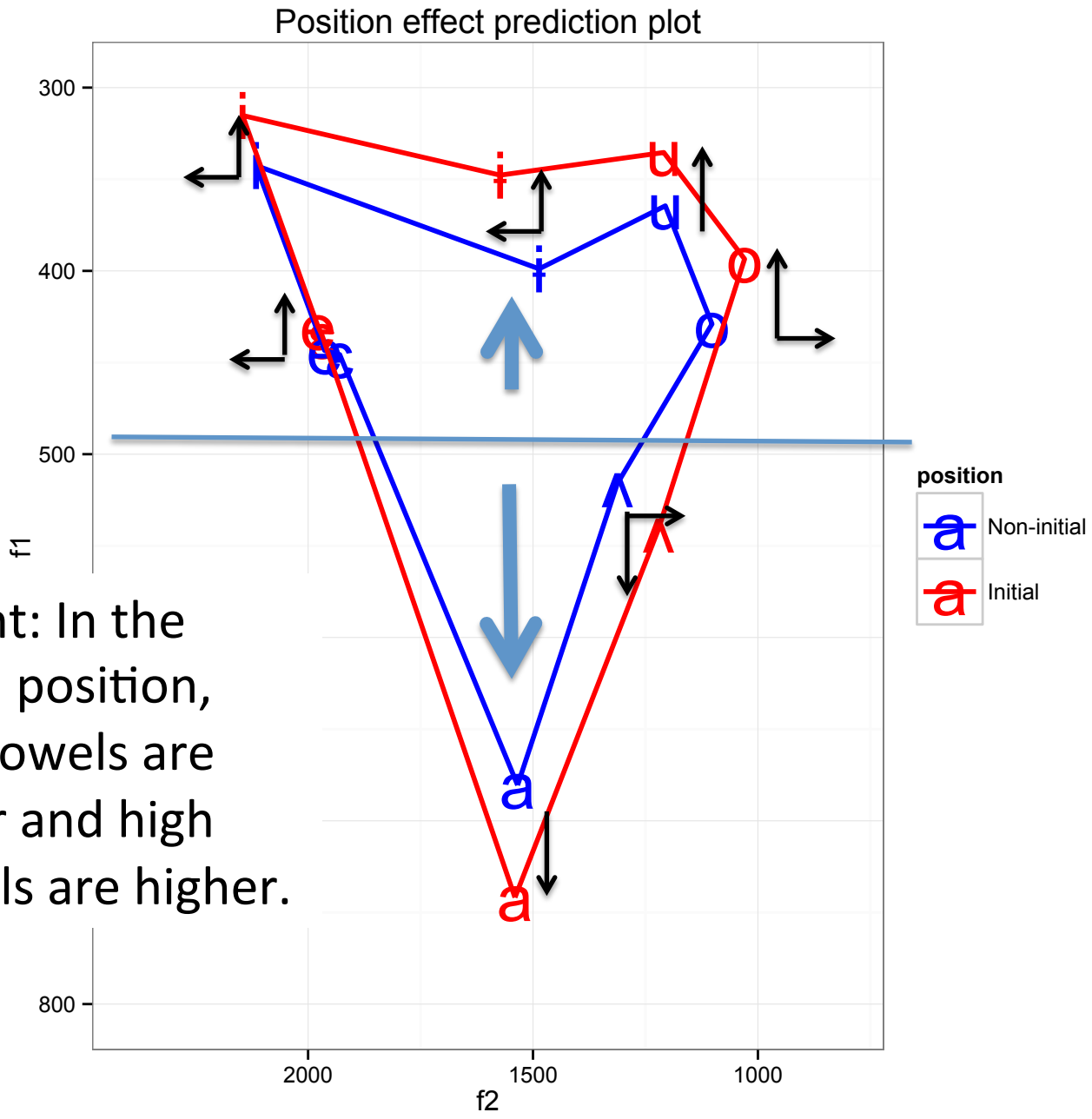
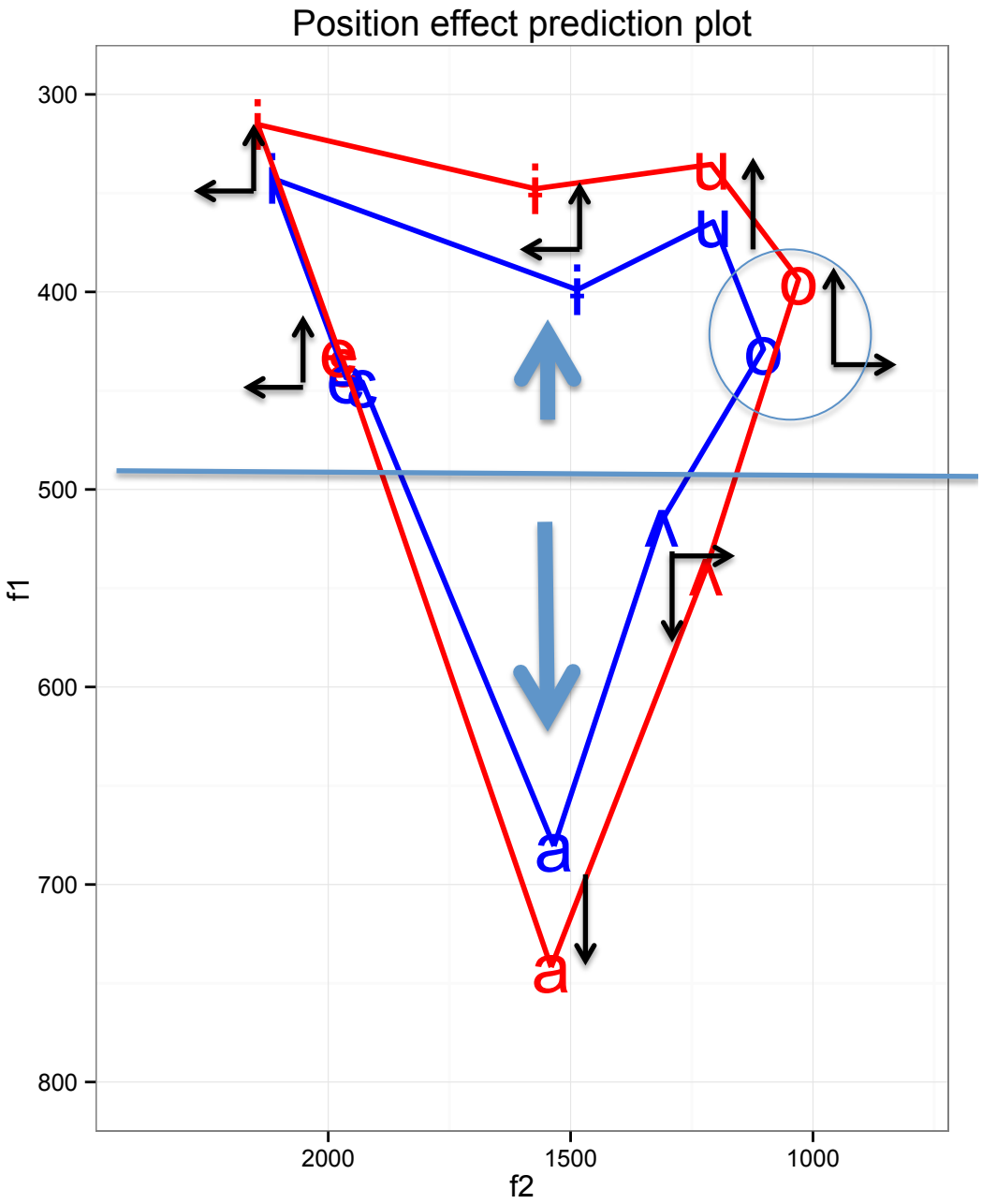
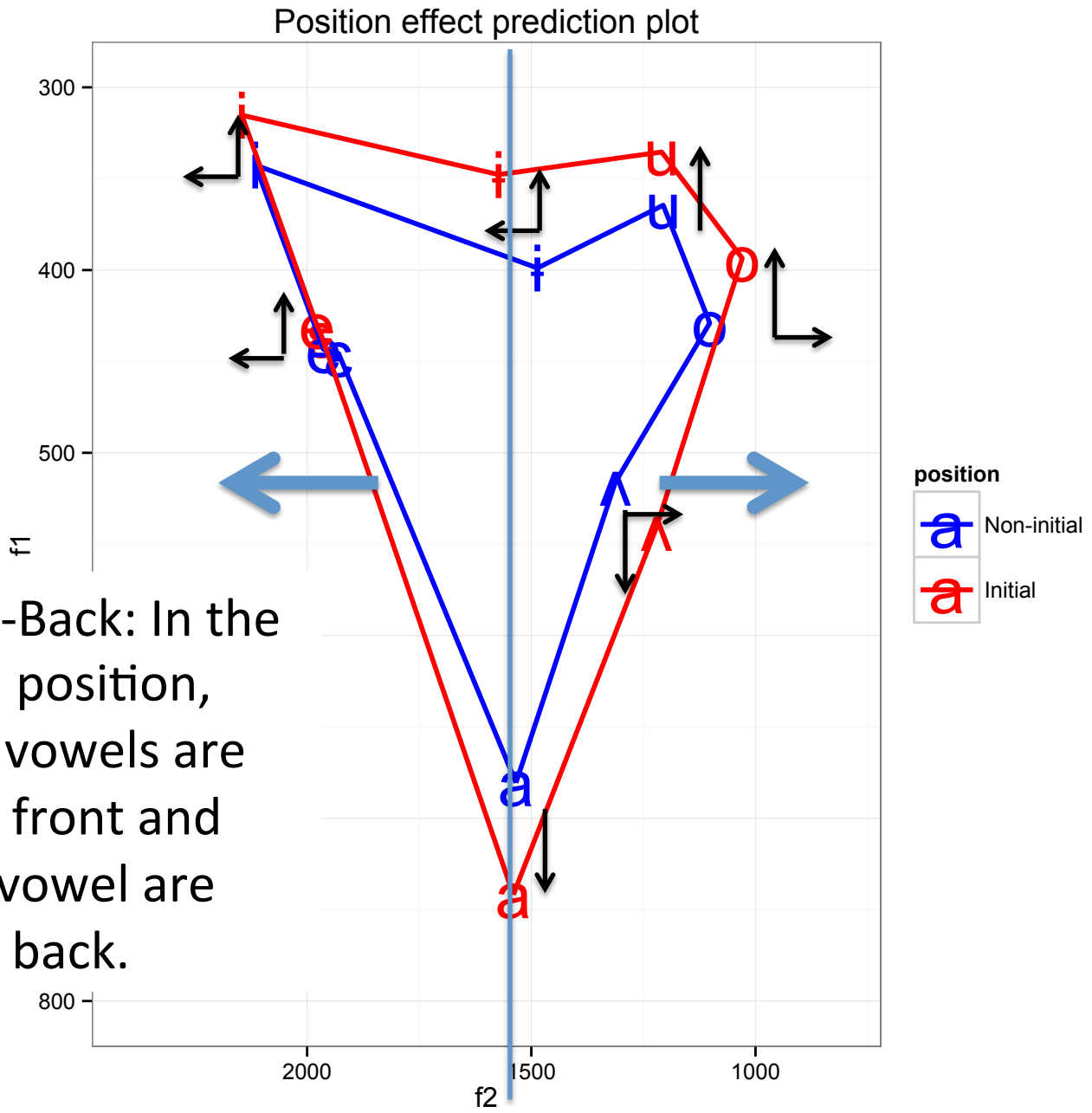


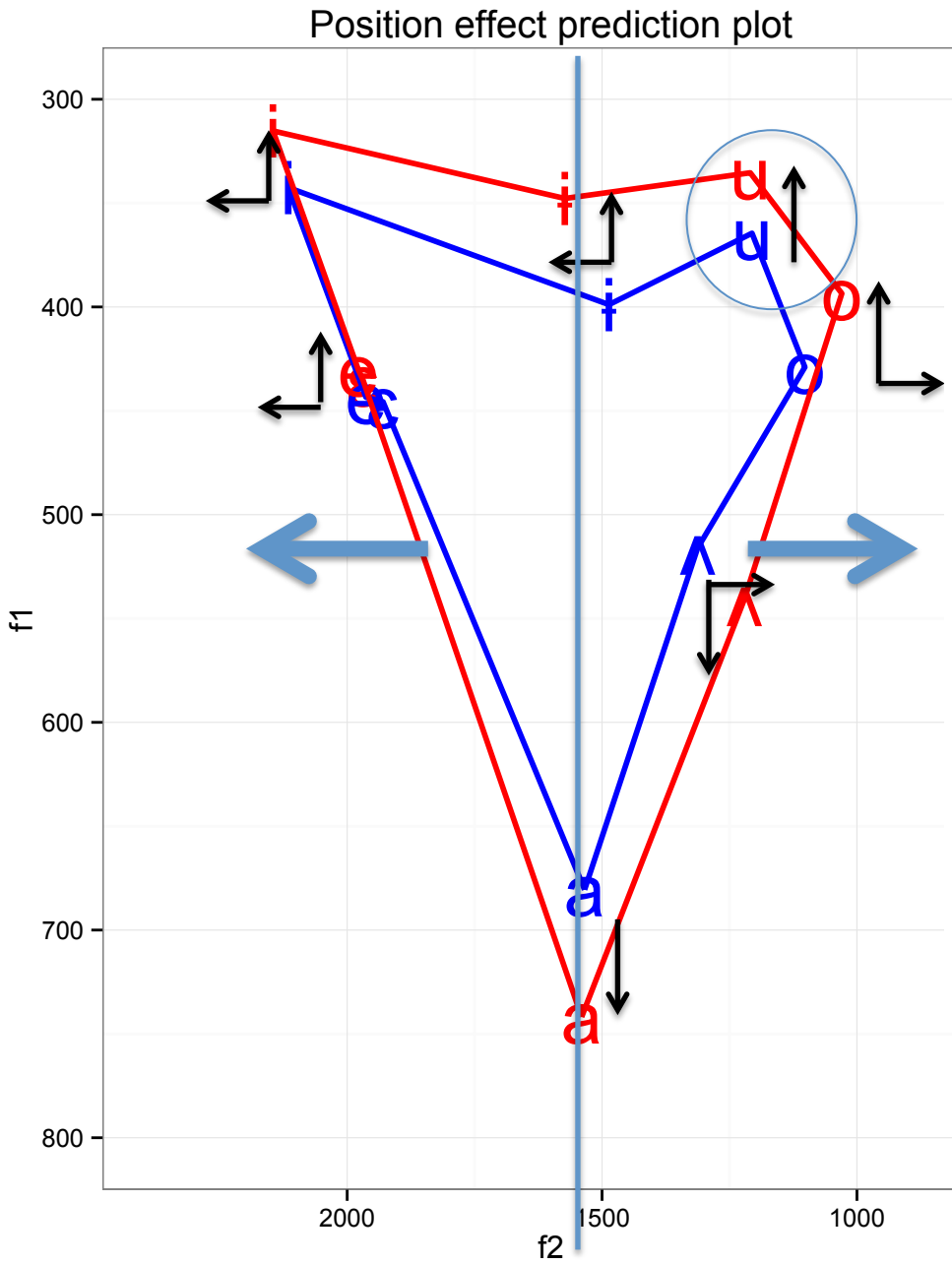
Height: In the initial position, low vowels are lower and high vowels are higher.



/o/ patterns like a high vowel: substantial raising **toward the direction of change**. (up)

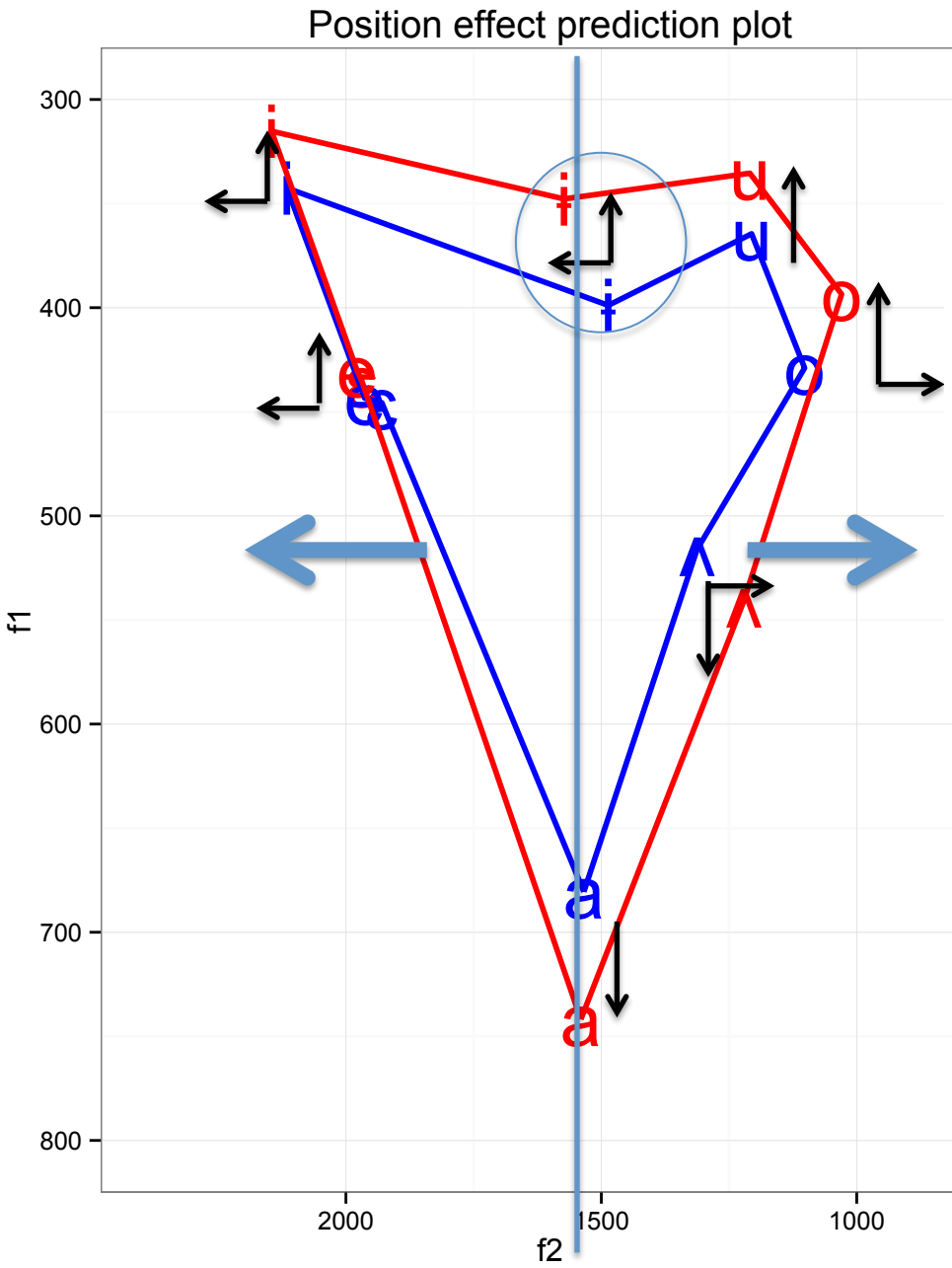


Front-Back: In the initial position, front vowels are more front and back vowel are more back.



/u/ is expected to be pulled back by this general pattern of hyperarticulation toward periphery in initial position. But, it is not...

Presumably due to pull **toward the direction of change** (front).



/ɨ/ patterns like a front vowel and is hyperarticulated toward front in initial position, **toward the direction of change** (front).

Direction of hyperarticulation in initial position

	Toward the direction of change	Toward periphery	Actual position effect
/o/	Raised	Raised	**More raised!**
/u/	Fronted	Retracted	**No effect**
/ɨ/	Fronted	Stable	**Fronted**

Direction of hyperarticulation in initial position

	Toward the direction of change		Toward periphery		Actual position effect
/o/	Raised		Raised		**More raised!**
/u/	Fronted	+	Retracted	=	**No effect**
/ɨ/	Fronted		Stable		**Fronted**

Summary

- We identified a pattern of positional effect on vowel quality, independent of duration-based variation.
  - Duration-based quality difference is due to articulatory undershoot (vowel raising and centralizing in short vowels).
  - Position-based quality difference is speaker-controlled: vowels in prominent position is hyperarticulated toward periphery + toward the direction of change.

Conclusion

- The back vowel shift in progress in Seoul Korean interacts with prosodic prominence.
  - Hyperarticulation toward the change.
  - Prominent position leads the change.
- Identifying this effect in data requires factoring out the effect of phonetic duration in the context of the vowel system in general.
- A casual form/more reduced speech style may not always be the best place to see the effect of on-going change.

Future questions

- How general is this finding?
- Is this true of all types of chain shift?
- How is this effect modulated by the dynamicity of the change?

Thanks to

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- *U of T LVC group*

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