Allophonic Emergence: three ways allophonic rules come to be

Betsy Sneller and Joel C. Wallenberg
University of Pennsylvania, Newcastle University

May 28, 2015
Formal Ways of Analyzing Variation (FWAV)
Háskóli Íslands

Introduction

In this talk, we'll argue that there are at least three ways that allophonic categories can emerge.

We provide evidence that they have all been attested in recent sound changes, and outline a research program with the goal of supporting or falsifying these hypotheses.

Introduction

Three paths to allophony
- Mechanical Means
- Spontaneous Phonologization
- Phonological Specialization

Testing for the types
- Effect of duration
- Rate of change

Conclusions

Introduction

Three paths to allophony
- Mechanical Means
- Spontaneous Phonologization
- Phonological Specialization

Testing for the types
- Effect of duration
- Rate of change

Conclusions

Mechanical Means

Traditionally assumed scenario (Ohala, 1981)

- A **mechanical**, non-grammatical effect skews the distribution of outputs perceived by the learner.

Mechanical Means

Traditionally assumed scenario (Ohala, 1981)

- A **mechanical**, non-grammatical effect skews the distribution of outputs perceived by the learner.
  - Articulatory

Mechanical Means

Traditionally assumed scenario (Ohala, 1981)

- A **mechanical**, non-grammatical effect skews the distribution of outputs perceived by the learner.
  - Articulatory
  - Perceptual

Mechanical Means

Traditionally assumed scenario (Ohala, 1981)

- A **mechanical**, non-grammatical effect skews the distribution of outputs perceived by the learner.
  - Articulatory
  - Perceptual
- **Our interpretation:** some generation reanalyzes a phonetic effect as an allophonic rule, introducing a new rule variant into the populations (of utterances within speakers, of speakers in a speech community).

Mechanical Means

- Some generation reanalyzes a phonetic effect as an allophonic rule, introducing a new rule variant into the populations (utterances, speech community).
- **Preaspiration and (some) coda-devoicing in Icelandic** (Árnason, 1980, 1986):

/hattur/ ('hat') → [hahtʏr]
/henta/ ('to suit') → [hɛn̥ta]

Mechanical Means

/hattur/ ('hat') → [hahtʏr]
/henta/ ('to suit') → [hɛn̥ta]

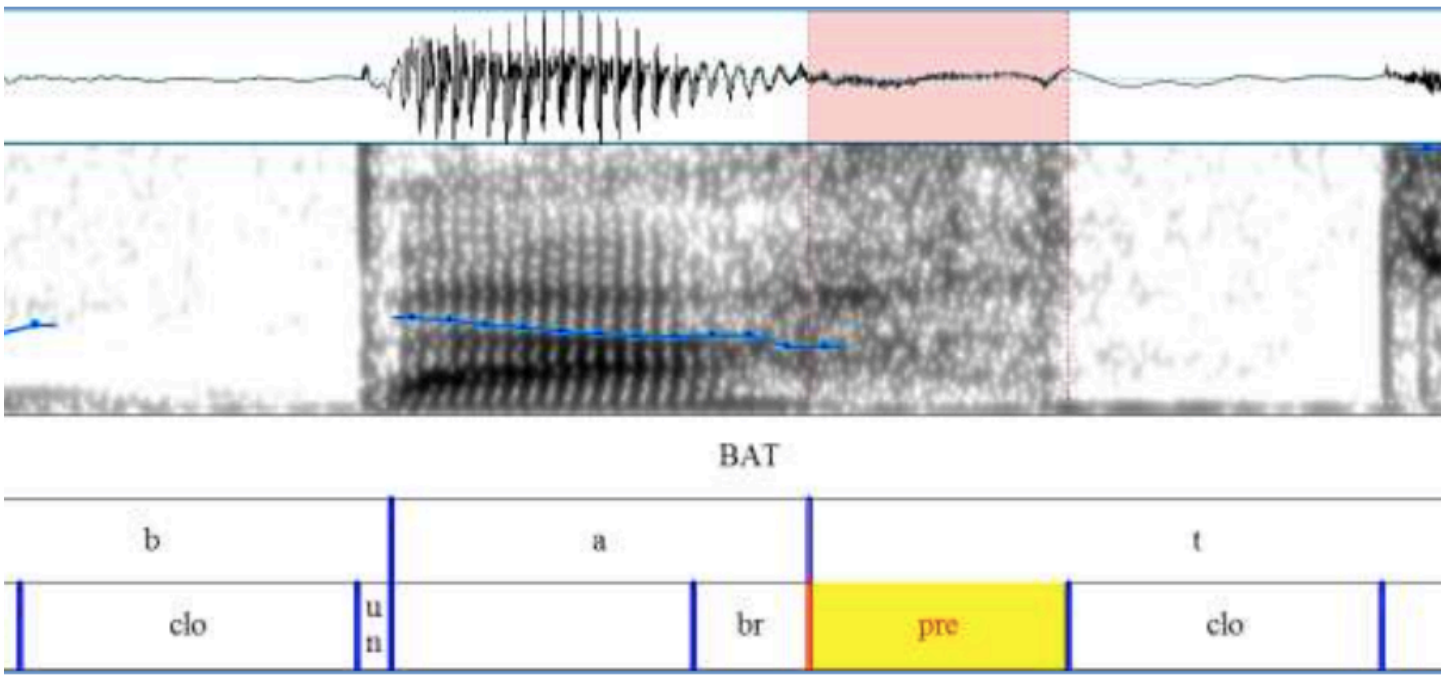
Diachrony (Árnason, 1980, 1986):

1. Icelandic loses contrastive vowel length.
2. Lengthening Rule: vowels in open syllables lengthen, closed syllables shorten (active rule)
3. In short syllables, spread glottis gesture is (mis-)timed in the segment preceding voiceless non-continuant codas.
4. Speakers reanalyze the early-timed gesture as an allophonic rule (our interpretation of Árnason 1986).

- The new rule spreads (and is possibly still spreading in Northern Iceland).

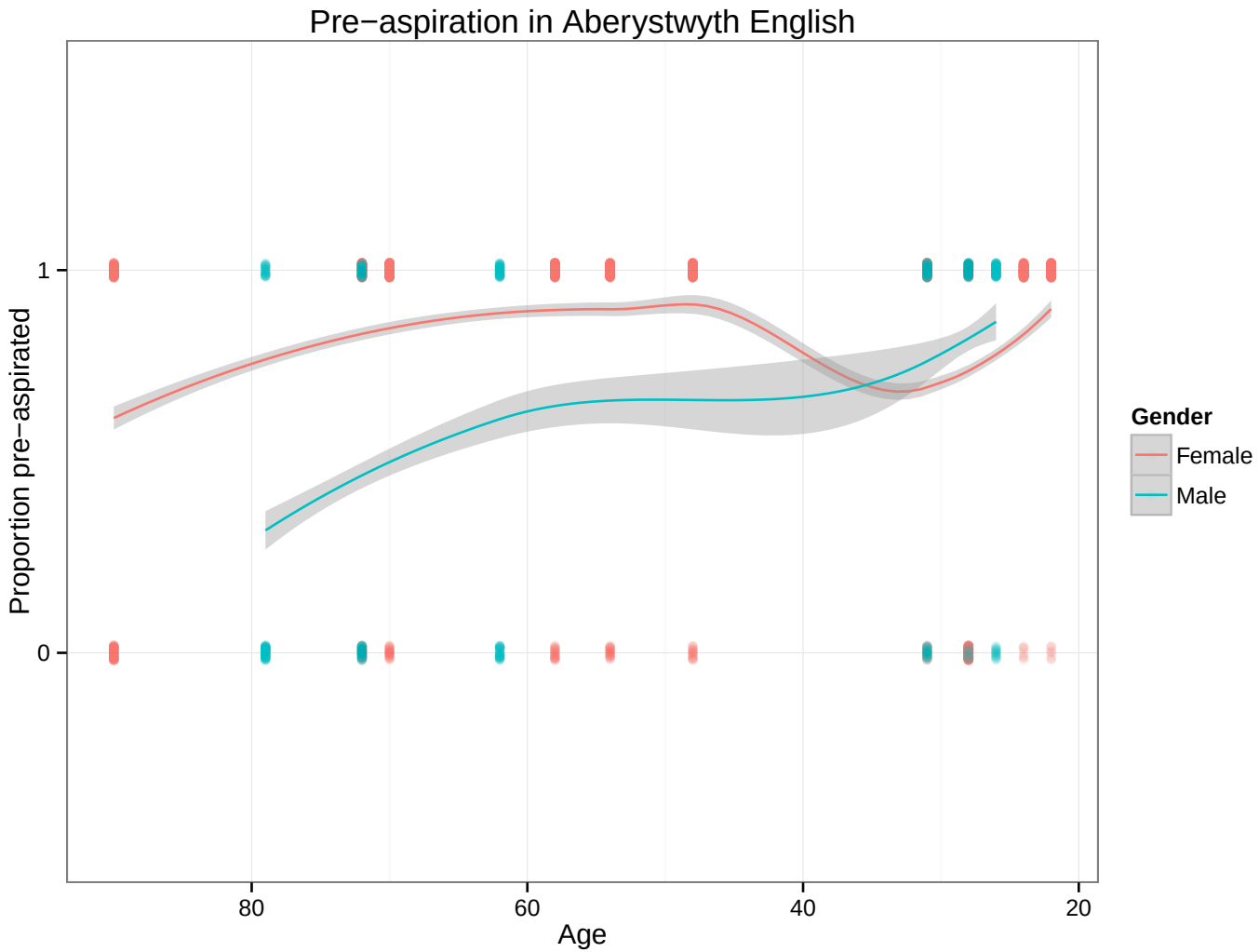
Preaspiration in Aberystwyth English (Hejná, 2014)

- The same change appears to be in progress in Aberystwyth English, Northwest British English, and possibly other British Englishes.
- As in Icelandic, it effects both vowels preceding voiceless codas and sonorants preceding a voiceless consonant in codas (Hejná, p.c.).



Preaspiration in Aberystwyth English (Hejná, 2014)

- New allophone is still spreading:



Introduction

Three paths to allophony
- Mechanical Means
- Spontaneous Phonologization
- Phonological Specialization

Testing for the types
- Effect of duration
- Rate of change

Conclusions

Spontaneous Phonologization

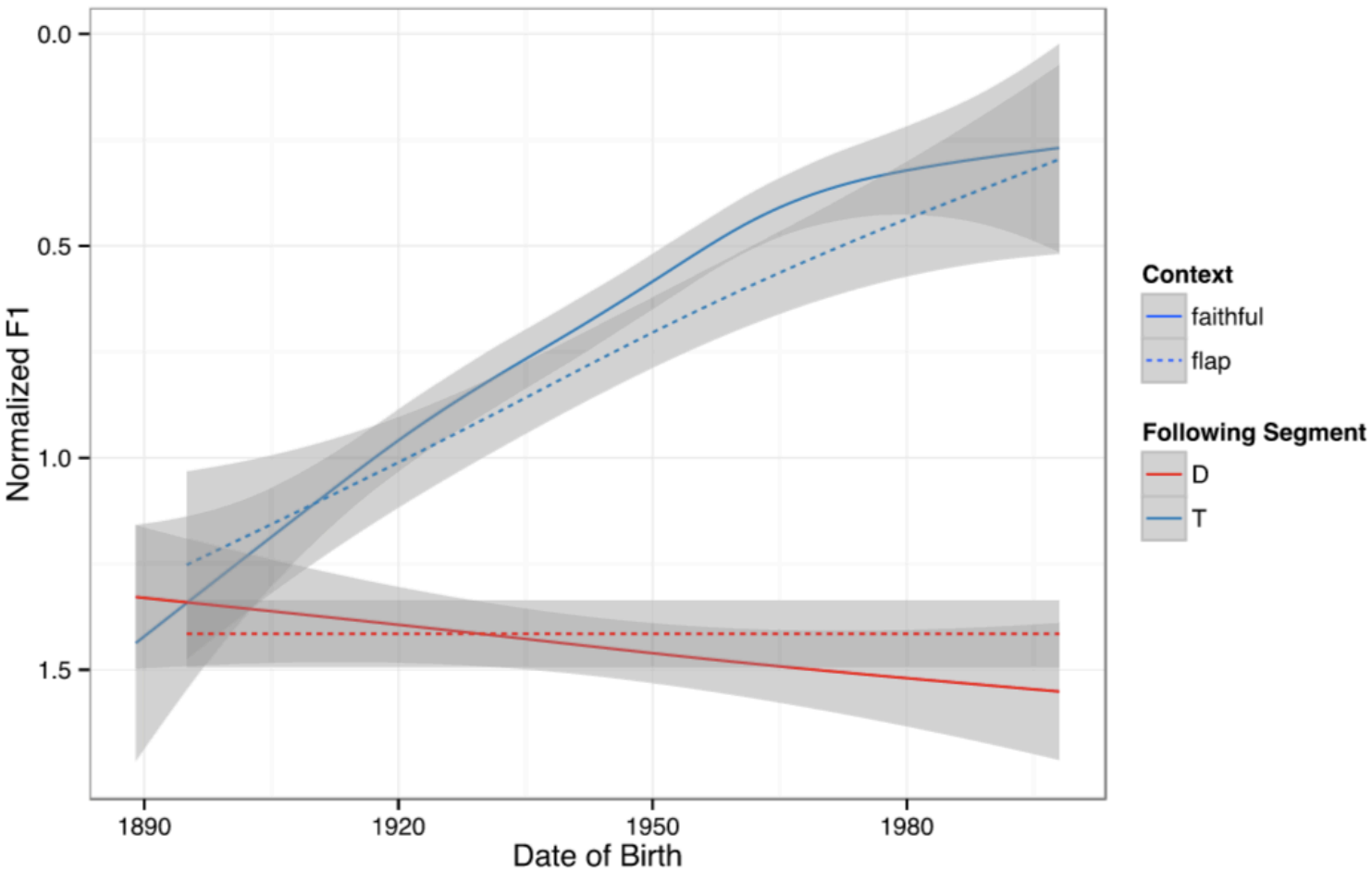
Scenario proposed by Janda and Joseph (2003); Fruehwald (2013)

- Speakers **spontaneously** create an allophone without any phonetic motivation.
  - Allophonic categories emerge in individual speakers' grammars before any phonetic motivation.

Spontaneous Phonologization:

PRICE-raising in Philadelphia English (Fruehwald 2013)

(308 speakers)



Introduction

Three paths to allophony
- Mechanical Means
- Spontaneous Phonologization
- Phonological Specialization

Testing for the types
- Effect of duration
- Rate of change

Conclusions

Phonological Specialization

Proposed by us:

Phonological Specialization

Proposed by us:

- A phonetic change begins, creating variation in phonetic space.

Phonological Specialization

Proposed by us:

- A phonetic change begins, creating variation in phonetic space.
- This variation is reanalyzed as an allophonic distinction for a generation of speakers.

Phonological Specialization

Proposed by us:

- A phonetic change begins, creating variation in phonetic space.
- This variation is reanalyzed as an allophonic distinction for a generation of speakers.
  - Different from Mechanical Means because the phonologization is **not** the result of generationally compounding perception or production errors.

Phonological Specialization

Proposed by us:

- A phonetic change begins, creating variation in phonetic space.
- This variation is reanalyzed as an allophonic distinction for a generation of speakers.
  - Different from Mechanical Means because the phonologization is **not** the result of generationally compounding perception or production errors.
  - Different from Spontaneous Phonologization because it **is** a reanalysis of existing phonetic space.

Phonological Specialization

In a categorical dimension (e.g. a consonant changes from k > t, as in Hawaiian):

- A phoneme changes from A to B, but while A and B are in variation (**doublet**), they gradually become specialized for different phonological contexts, faster than one replaces the other.
  - General case of categorical specialization, as in Kroch (1994); Fruehwald and Wallenberg (2013, In preparation), due to "Principle of Contrast".

$$/\text{k}/ \rightarrow [\text{k}] \ / \ \text{Context}_1$$
$$/\text{k}/ \rightarrow [\text{t}] \ / \ \text{Context}_2$$

Phonological Specialization

In a continuous dimension (e.g. a vowel fronts), suppose:

Phonological Specialization

In a continuous dimension (e.g. a vowel fronts), suppose:

1. A vowel change in vowel V begins, creating variation in phonetic space.

Phonological Specialization

In a continuous dimension (e.g. a vowel fronts), suppose:

1. A vowel change in vowel V begins, creating variation in phonetic space.
2. Speakers do not control the variance of their vowel production around their phonetic target for V, and assume uniform variance.

Phonological Specialization

In a continuous dimension (e.g. a vowel fronts), suppose:

1. A vowel change in vowel V begins, creating variation in phonetic space.
2. Speakers do not control the variance of their vowel production around their phonetic target for V, and assume uniform variance.
3. They hear larger than expected, asymmetrical variance around V in the last two generations of the speech community.

Phonological Specialization

In a continuous dimension (e.g. a vowel fronts), suppose:

1. A vowel change in vowel V begins, creating variation in phonetic space.
2. Speakers do not control the variance of their vowel production around their phonetic target for V, and assume uniform variance.
3. They hear larger than expected, asymmetrical variance around V in the last two generations of the speech community.
4. Speakers reanalyze half of the variance as allophone A_1 for V, and the other half of the variance as allophone A_2 for V, and assume they are supposed to occur in different phonological contexts.

Phonological Specialization

In a continuous dimension (e.g. a vowel fronts), suppose:

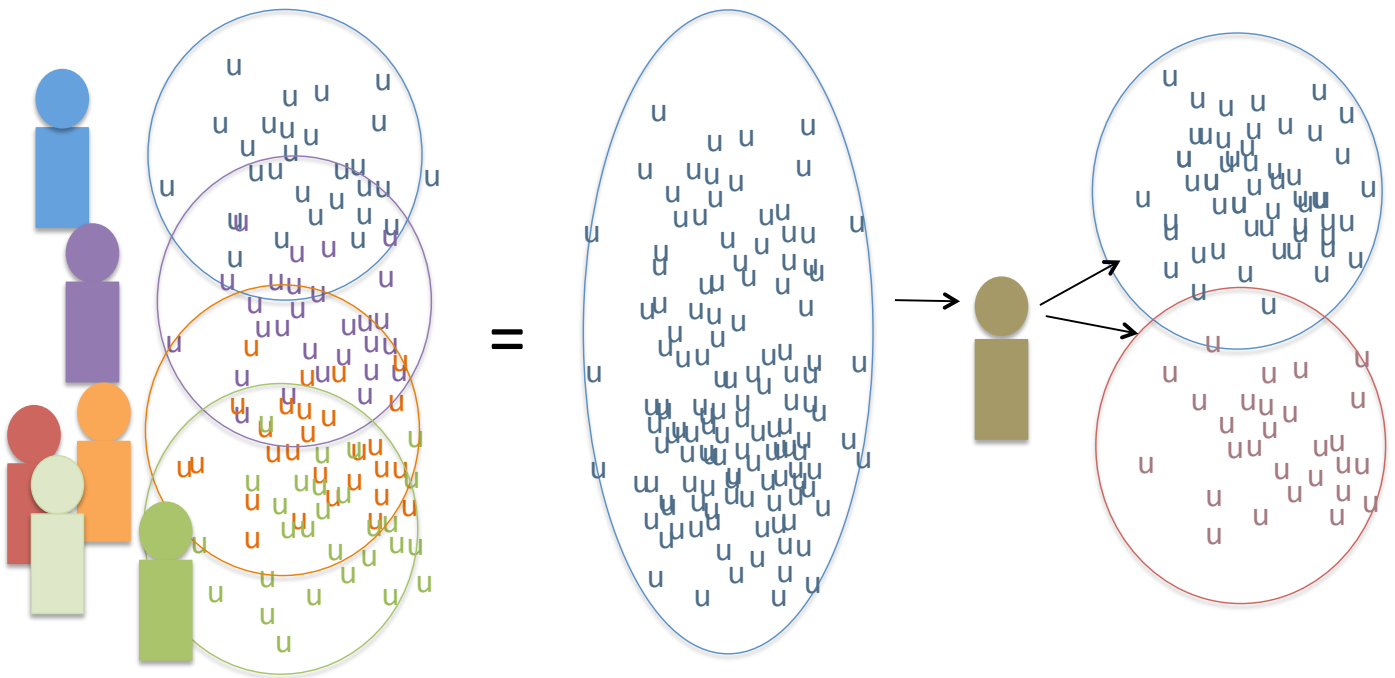
1. A vowel change in vowel V begins, creating variation in phonetic space.
2. Speakers do not control the variance of their vowel production around their phonetic target for V, and assume uniform variance.
3. They hear larger than expected, asymmetrical variance around V in the last two generations of the speech community.
4. Speakers reanalyze half of the variance as allophone A_1 for V, and the other half of the variance as allophone A_2 for V, and assume they are supposed to occur in different phonological contexts.
5. The allophonic rule spreads after the split, spreading at the expense of the old, unitary V system.

Phonological Specialization

In a continuous dimension (e.g. a vowel fronts), suppose:

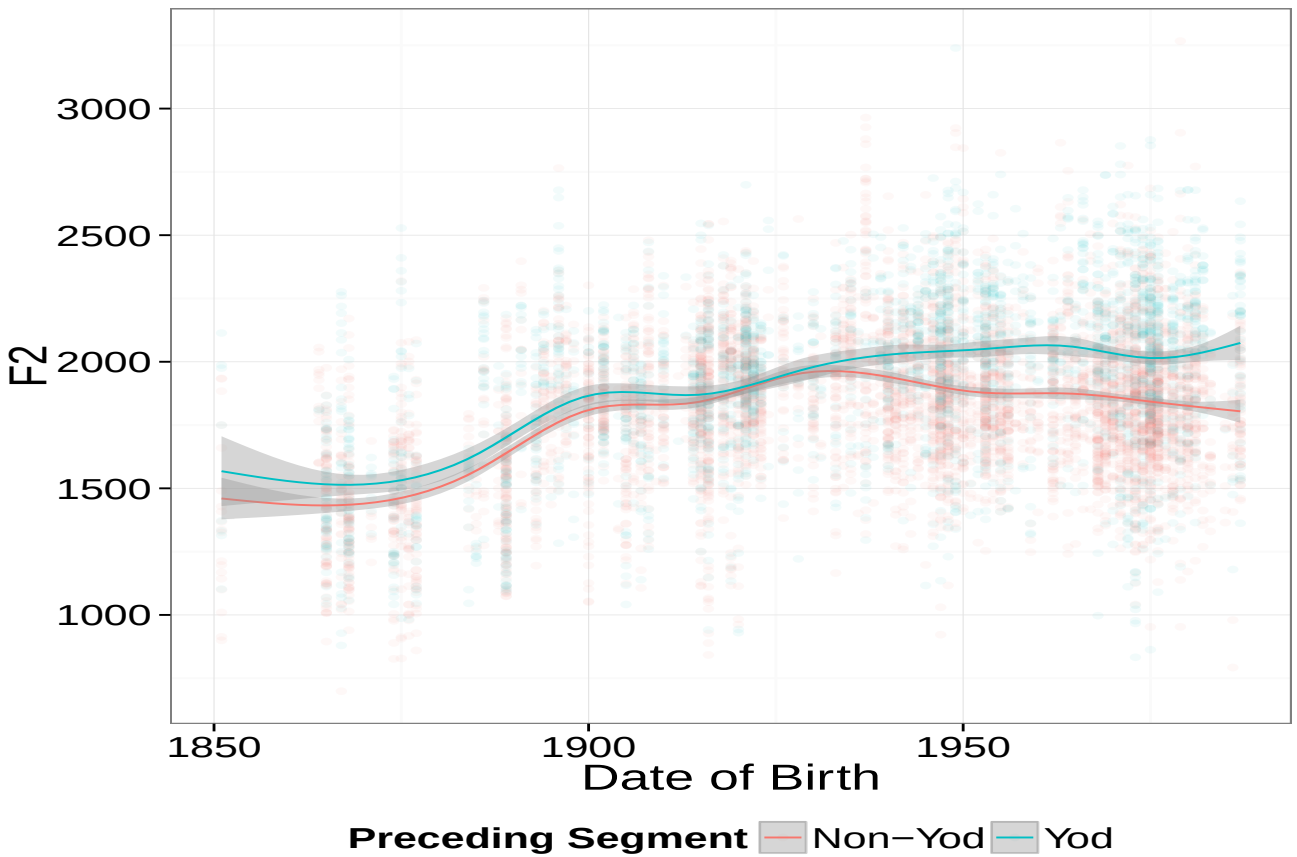
1. A vowel change in vowel V begins, creating variation in phonetic space.
2. Speakers do not control the variance of their vowel production around their phonetic target for V, and assume uniform variance.
3. They hear larger than expected, asymmetrical variance around V in the last two generations of the speech community.
4. Speakers reanalyze half of the variance as allophone A_1 for V, and the other half of the variance as allophone A_2 for V, and assume they are supposed to occur in different phonological contexts.
5. The allophonic rule spreads after the split, spreading at the expense of the old, unitary V system.

Phonological Specialization



Phonological Specialization:

GOOSE-NEW split in New Zealand English (Seyfarth and Sneller 2014)



Introduction

Three paths to allophony
- Mechanical Means
- Spontaneous Phonologization
- Phonological Specialization

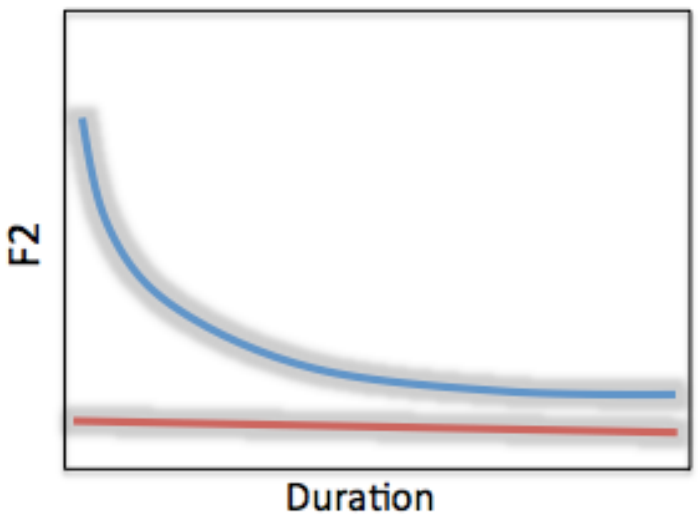
Testing for the types
- Effect of duration
- Rate of change

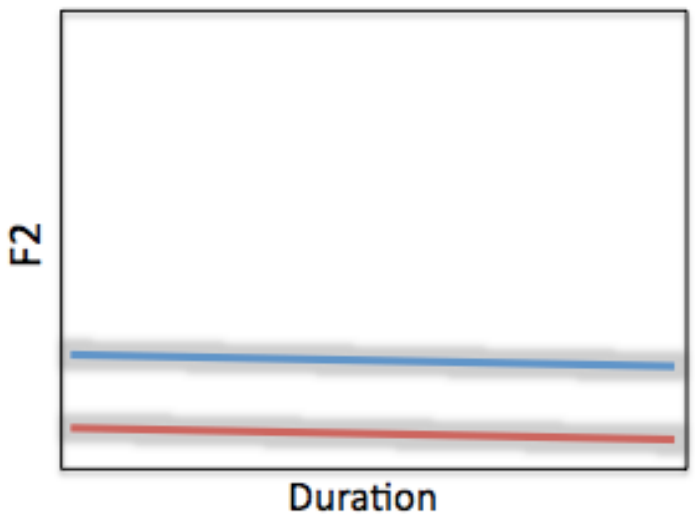
Conclusions

Does a surface distinction map to one underlying category or two?

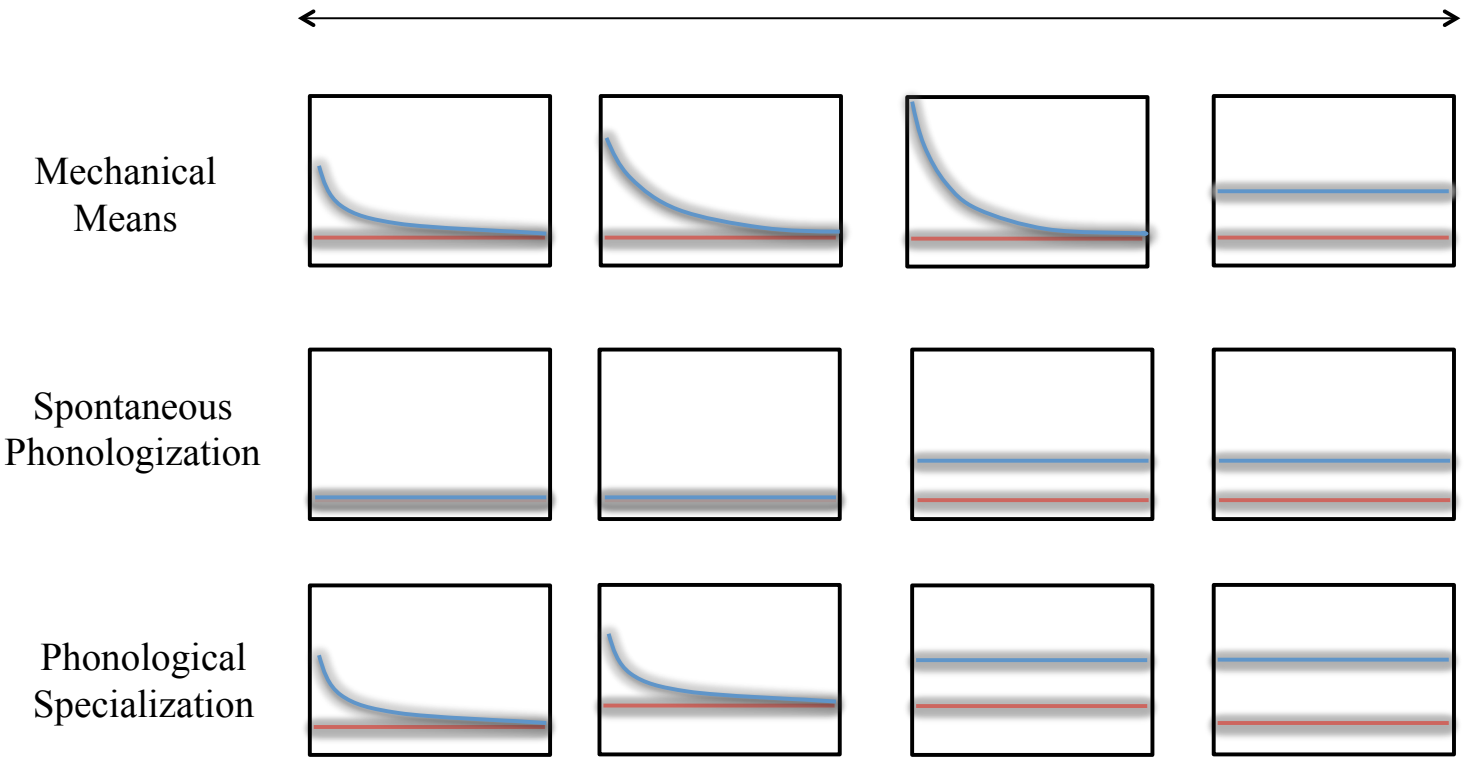
Effect of duration

- If a difference in acoustic output is caused by coarticulation, it will increase for short tokens (Strycharczuk, 2012).
- If the difference is caused by allophony, it will be present in the long tokens too.





Effect of duration: Predictions



Introduction

Three paths to allophony
- Mechanical Means
- Spontaneous Phonologization
- Phonological Specialization

Testing for the types
- Effect of duration
- Rate of change

Conclusions

Rate of change: coarticulation

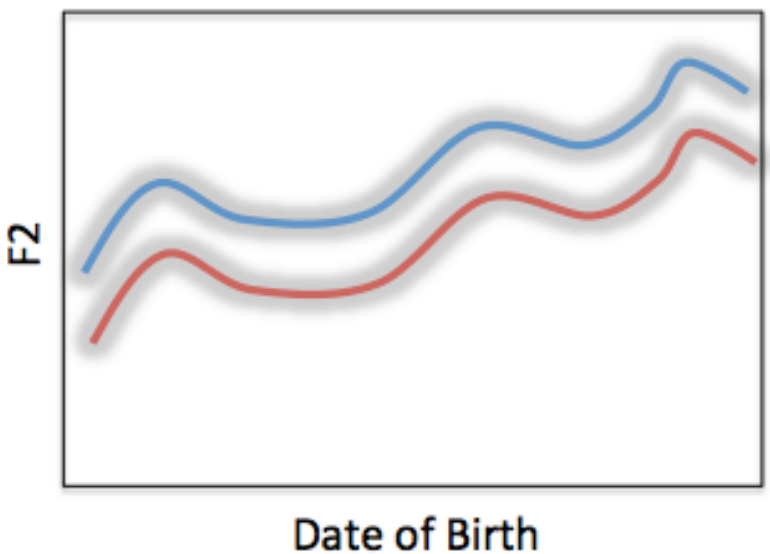
- A phonological rule operates on a single phonological category (Fruehwald, 2013).

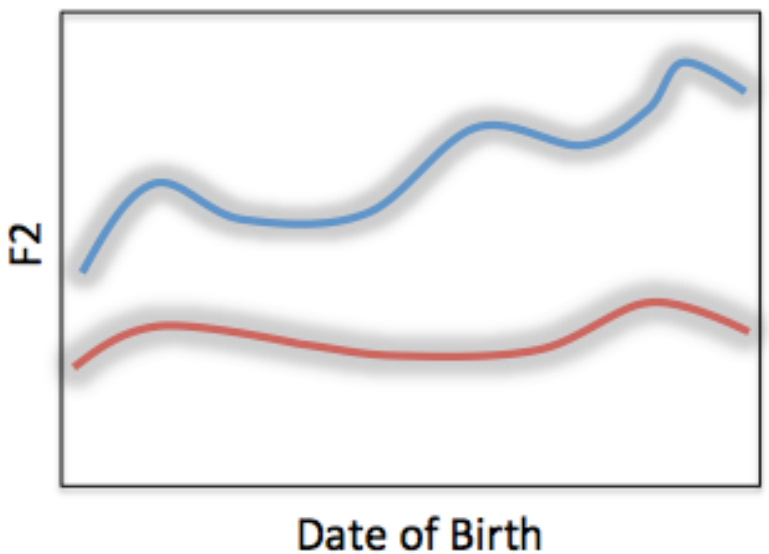
Rate of change: coarticulation

- A phonological rule operates on a single phonological category (Fruehwald, 2013).
- If two variables have different rates of change, it means there are two rules at work (Fruehwald 2013's application of the Constant Rate Effect, Kroch 1989).

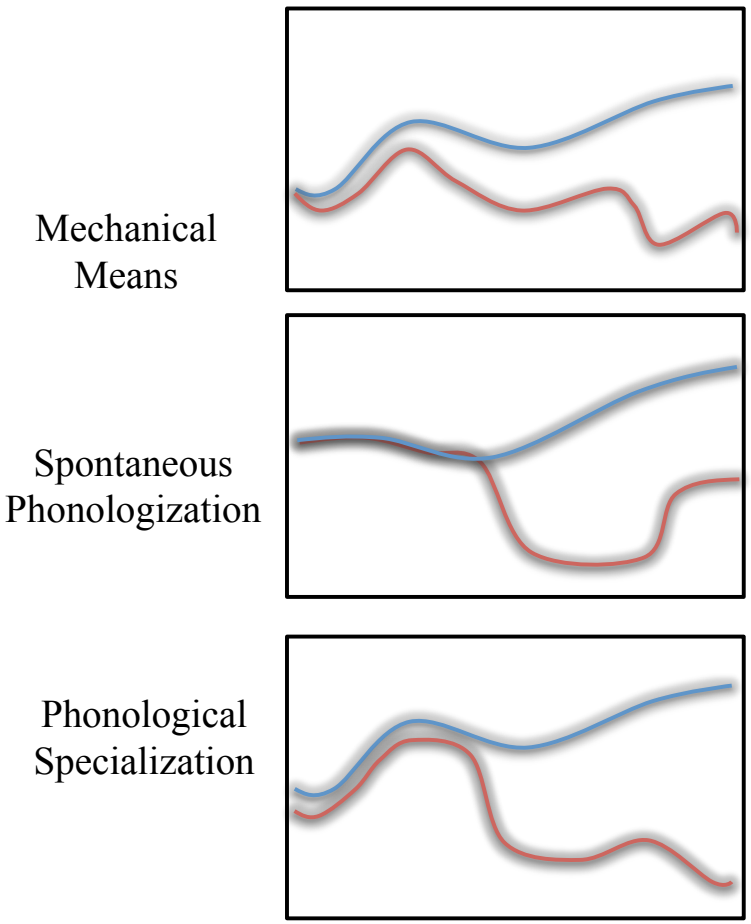
Rate of change: coarticulation

- A phonological rule operates on a single phonological category (Fruehwald, 2013).
- If two variables have different rates of change, it means there are two rules at work (Fruehwald 2013's application of the Constant Rate Effect, Kroch 1989).





Rate of change: Predictions



Conclusions: 3 types of allophonic splits

Mechanical means

- Effect of duration for the whole change until reanalysis.
- Gradual split in rate of change.

Conclusions: 3 types of allophonic splits

Mechanical means

- Effect of duration for the whole change until reanalysis.
- Gradual split in rate of change.

Spontaneous phonologization

- No effect of duration (pre-split don't have a distinction and post-split don't coarticulate).
- Immediate split in rate of change.

Conclusions: 3 types of allophonic splits

Mechanical means

- Effect of duration for the whole change until reanalysis.
- Gradual split in rate of change.

Spontaneous phonologization

- No effect of duration (pre-split don't have a distinction and post-split don't coarticulate).
- Immediate split in rate of change.

Phonological specialization

- Effect of duration until reanalysis.
- Immediate split in rate of change.

Final thoughts and questions

- To use these metrics, we need **lots** of data from lots of people.

Final thoughts and questions

- To use these metrics, we need **lots** of data from lots of people.
  - We need data on changes before they happen, or close to actuation (possible with corpora).

Final thoughts and questions

- To use these metrics, we need **lots** of data from lots of people.
  - We need data on changes before they happen, or close to actuation (possible with corpora).
- DARLA, FAVE.

Final thoughts and questions

- To use these metrics, we need **lots** of data from lots of people.
  - We need data on changes before they happen, or close to actuation (possible with corpora).
- DARLA, FAVE.
- What about suprasegmentals?
  - Duration and ROC are good metrics for vocalic and consonantal change.

Final thoughts and questions

- To use these metrics, we need **lots** of data from lots of people.
  - We need data on changes before they happen, or close to actuation (possible with corpora).
- DARLA, FAVE.
- What about suprasegmentals?
  - Duration and ROC are good metrics for vocalic and consonantal change.
  - Cho (2015) Development of pitch contrast in Korean prosody.

Final thoughts and questions

- To use these metrics, we need **lots** of data from lots of people.
  - We need data on changes before they happen, or close to actuation (possible with corpora).
- DARLA, FAVE.
- What about suprasegmentals?
  - Duration and ROC are good metrics for vocalic and consonantal change.
  - Cho (2015) Development of pitch contrast in Korean prosody.
- Questions going further: how does allophone emergence relate to phoneme emergence?
- What's the role of learned phonetic targets (pre-phonological) in allophonic split, or gradient phonological rules in Bermúdez-Otero's work?

References I

Árnason, Kristján. 1980. *Quantity in Historical Phonology: Icelandic and Related Cases*. Cambridge: Cambridge University Press.

Árnason, Kristján. 1986. The segmental and superasegmental status of preaspiration in modern icelandic. *Nordic Journal of Linguistics* 9:1–23.

Cho, Sunghye. 2015. Development of pitch contrast in korean prosody.

Fruehwald, Josef. 2013. Phonological involvement in phonetic change. Doctoral Dissertation, University of Pennsylvania.

References II

Fruehwald, Josef, and Joel C. Wallenberg. 2013. Optionality is Stable Variation is Competing Grammars. *Presented at 25th Scandinavian Conference of Linguistics, Formal Ways of Analyzing Variation (FWAV) Workshop* .

Fruehwald, Josef, and Joel C. Wallenberg. In preparation. Optionality is Stable Variation is Competing Grammars.

Hejná, Michaela. 2014. Pre-aspiration and glottalizaton in Aberystwyth English. To be submitted.

Janda, Richard D, and Brian D Joseph. 2003. Reconsidering the canons of sound-change: Towards a "big bang" theory. In *Historical Linguistics 2001. Selected Papers from the 15th International Conference on Historical Linguistics*, ed. Barry Blake and Kate Burridge, 205–219. Melbourne: John Benjamins.

References III

Kroch, Anthony S. 1989. Reflexes of grammar in patterns of language change. *Language Variation and Change* 1:199–244.

Kroch, Anthony S. 1994. Morphosyntactic variation. In *Papers from the 30th Regional Meeting of the Chicago Linguistics Society: Parasession on Variation and Linguistic Theory*, ed. K. Beals et al.

Ohala, John. 1981. The listener as a source of language change. In *Papers from the parasession on language and behavior*, ed. C S Masek, R A Hendrick, and M F Miller. Chicago Linguistics Society.

Strycharczuk, Patricia. 2012. Phonetics-phonology interactions in pre-sonorant voicing. Doctoral Dissertation, University of Manchester.

Thank you!

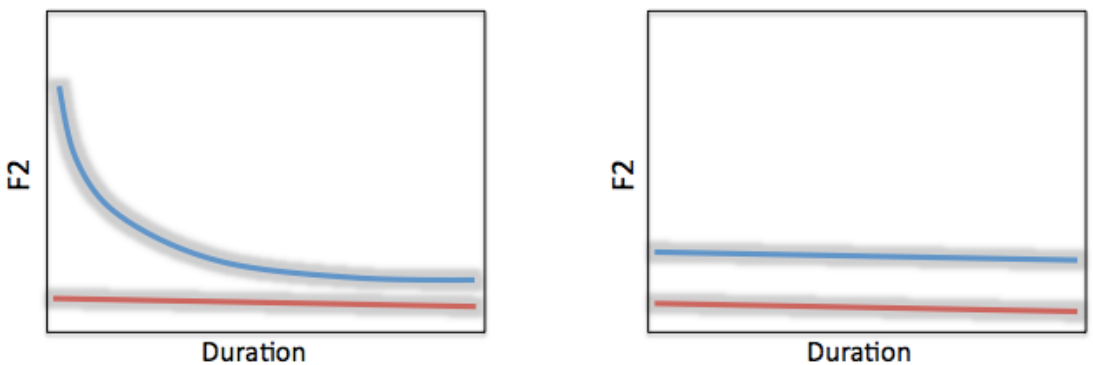
Effect of duration: Mechanical means

Mechanical means

- Because the allophonic split is the result of accruing phonetic effects, we should see an effect of duration for most speakers, until a reanalysis has been made.
- After the reanalysis, as the new allophone spreads, the earlier effect of duration should decrease over time.

Effect of duration: Mechanical means

Mechanical means



Effect of duration: Spontaneous phonologization

Spontaneous phonologization

- Because there is no phonetic effect that precedes the phonological effect, we should see no effect of duration at any time

Effect of duration: Spontaneous phonologization

Spontaneous phonologization

- Because there is no phonetic effect that precedes the phonological effect, we should see no effect of duration at any time
    1. Speakers with one category show no coarticulation (no difference to be found)

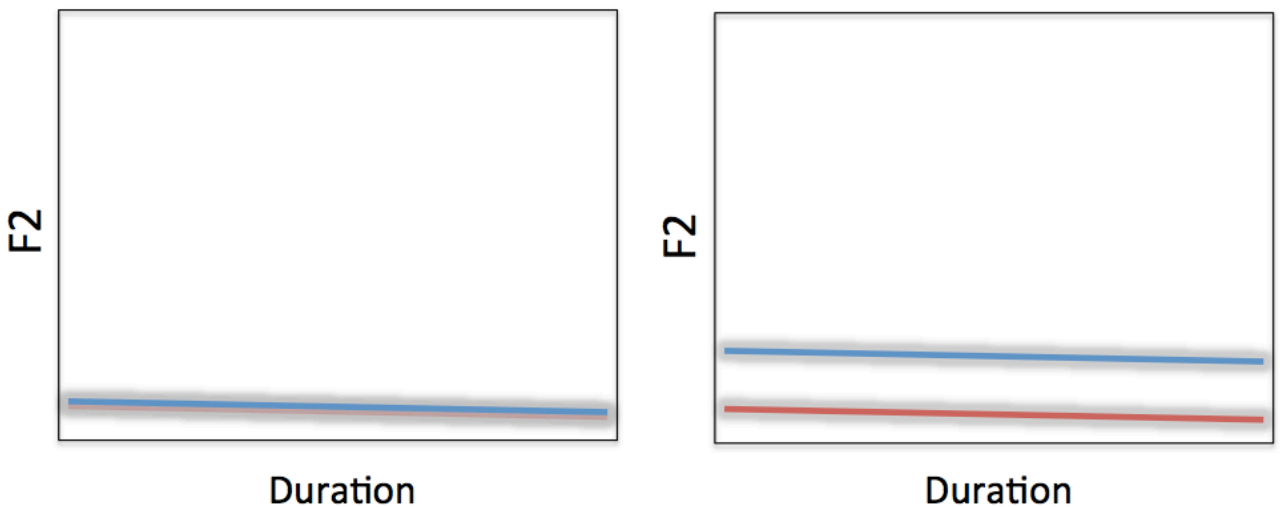
Effect of duration: Spontaneous phonologization

Spontaneous phonologization

- Because there is no phonetic effect that precedes the phonological effect, we should see no effect of duration at any time
  1. Speakers with one category show no coarticulation (no difference to be found)
  2. Speakers with two categories show two phonological categories (no effect of duration)

Effect of duration: Spontaneous phonologization

Spontaneous phonologization



Effect of duration: Phonological specialization

Phonological specialization

- Because the phonologization is the result of reanalyzed coarticulation, we should see older speakers showing an effect of duration (shorter tokens more distinct)

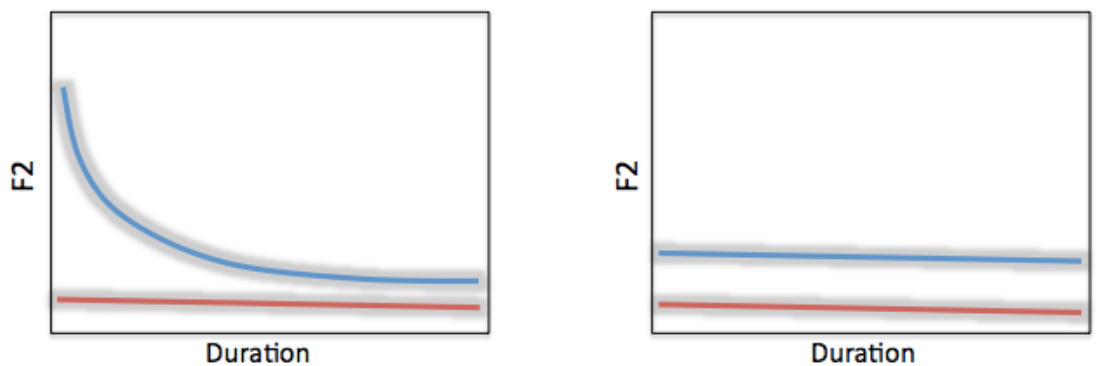
Effect of duration: Phonological specialization

Phonological specialization

- Because the phonologization is the result of reanalyzed coarticulation, we should see older speakers showing an effect of duration (shorter tokens more distinct)
- and younger speakers with two distinct categories for tokens of all duration

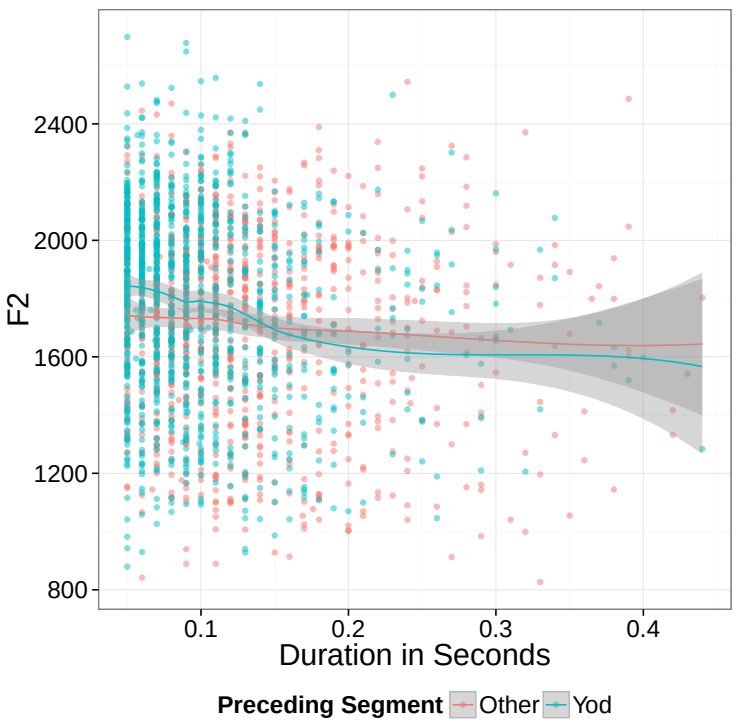
Effect of duration: Phonological specialization

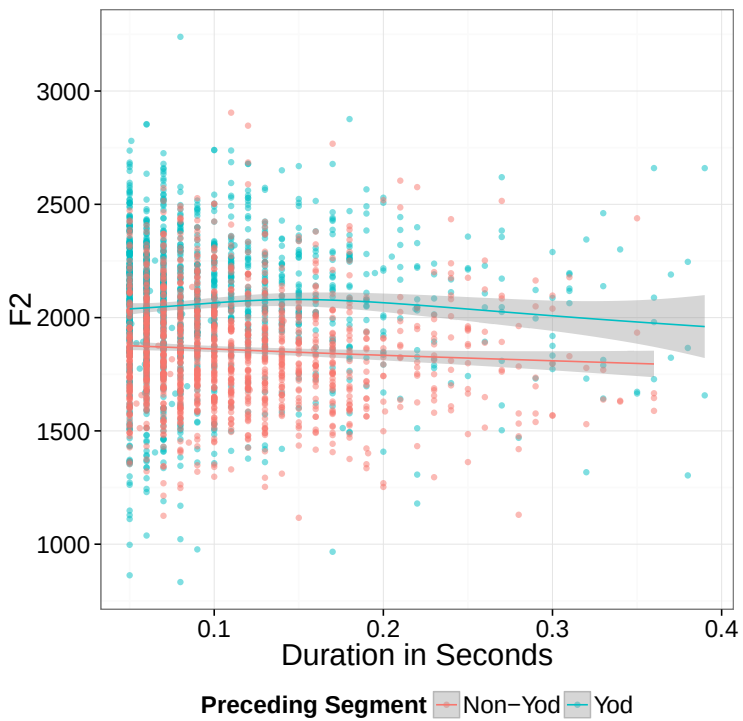
Phonological specialization



Effect of duration: Phonological specialization

Phonological specialization in New Zealand English





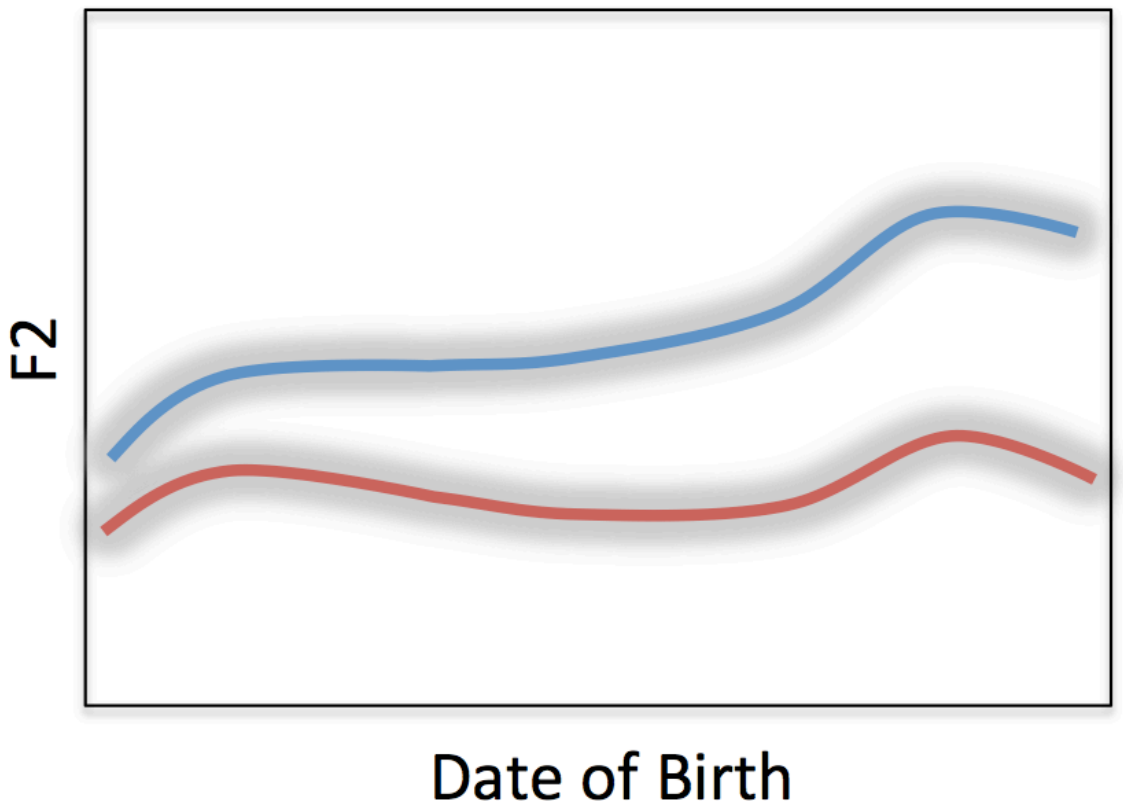
Rate of change: Mechanical means

Mechanical means

- Because the allophonic split is the result of accruing phonetic effects, we should see a gradual drift in the two variables

Rate of change: Mechanical means

Mechanical means



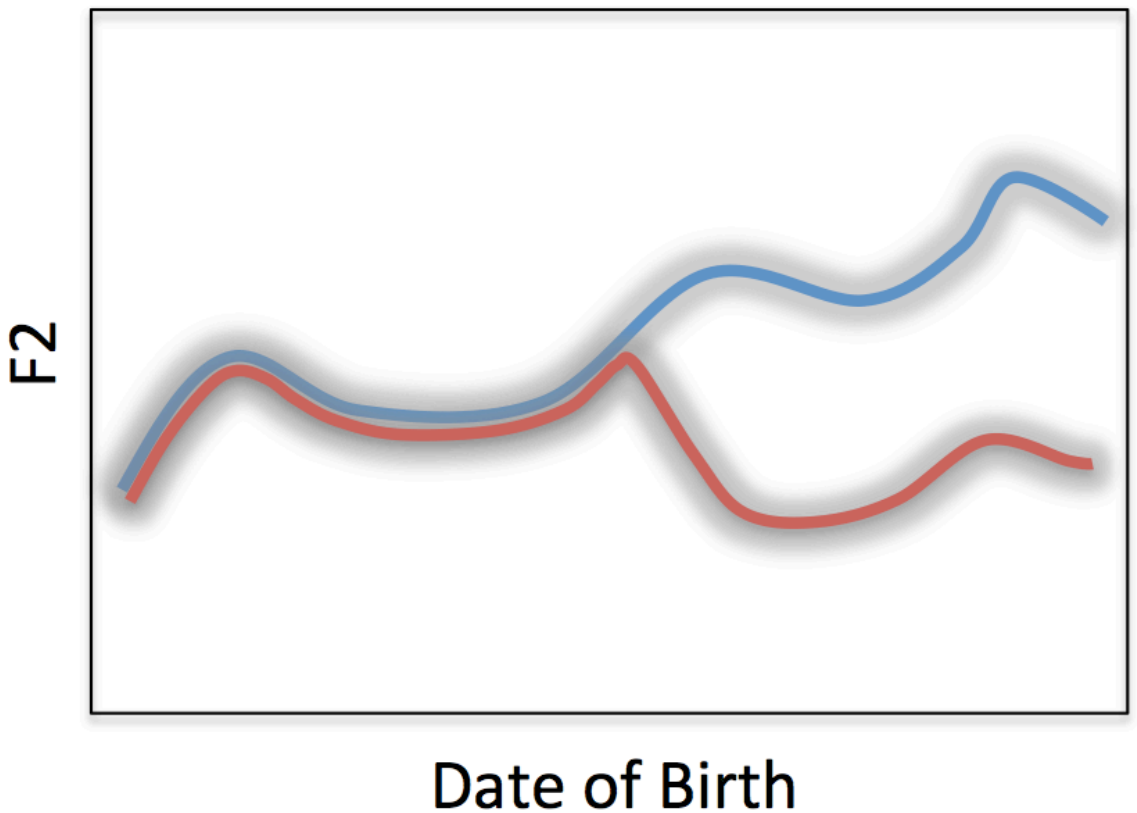
Rate of change: Spontaneous phonologization

Spontaneous phonologization

- Because the allophonic split occurs suddenly, we should see both variables in lock step until the community spontaneously creates a new category

Rate of change: Spontaneous phonologization

Spontaneous phonologization



Rate of change: Phonological specialization

Phonological specialization

- Because the allophonic split occurs suddenly, we should see both variables in lock step until the community spontaneously creates a new category

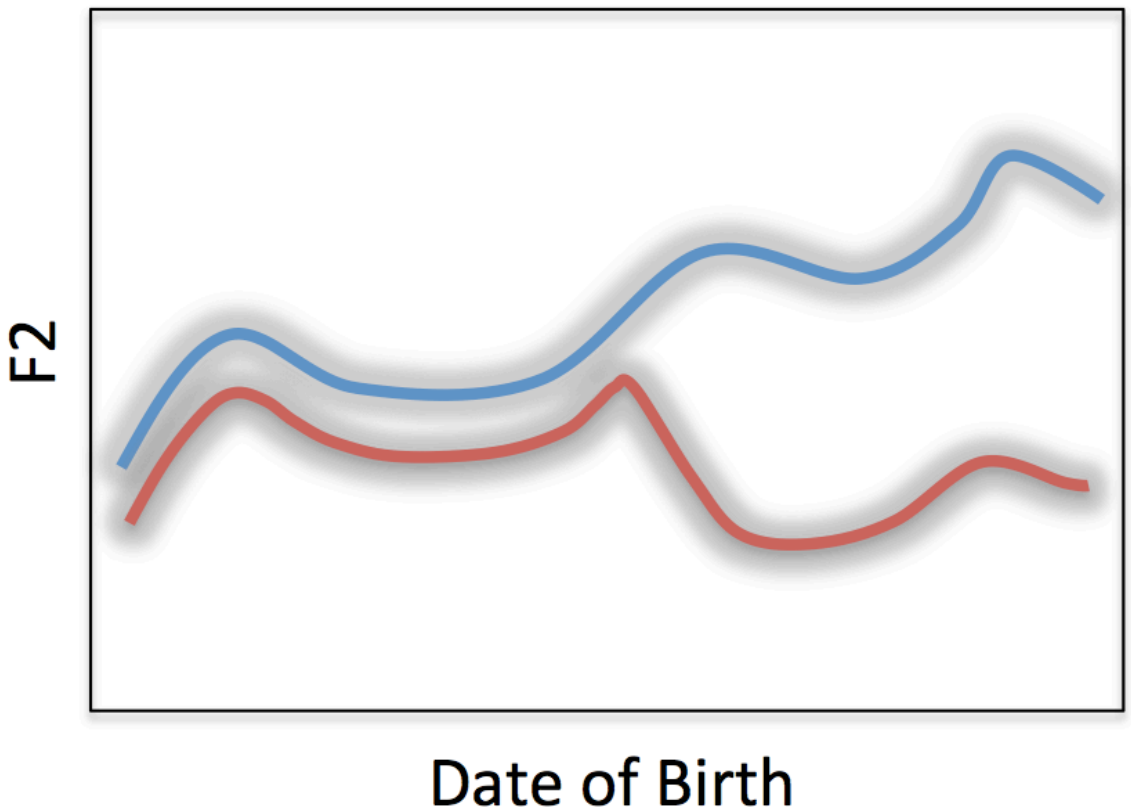
Rate of change: Phonological specialization

Phonological specialization

- Because the allophonic split occurs suddenly, we should see both variables in lock step until the community spontaneously creates a new category
- However, we may still see an effect of coarticulation for the early speakers

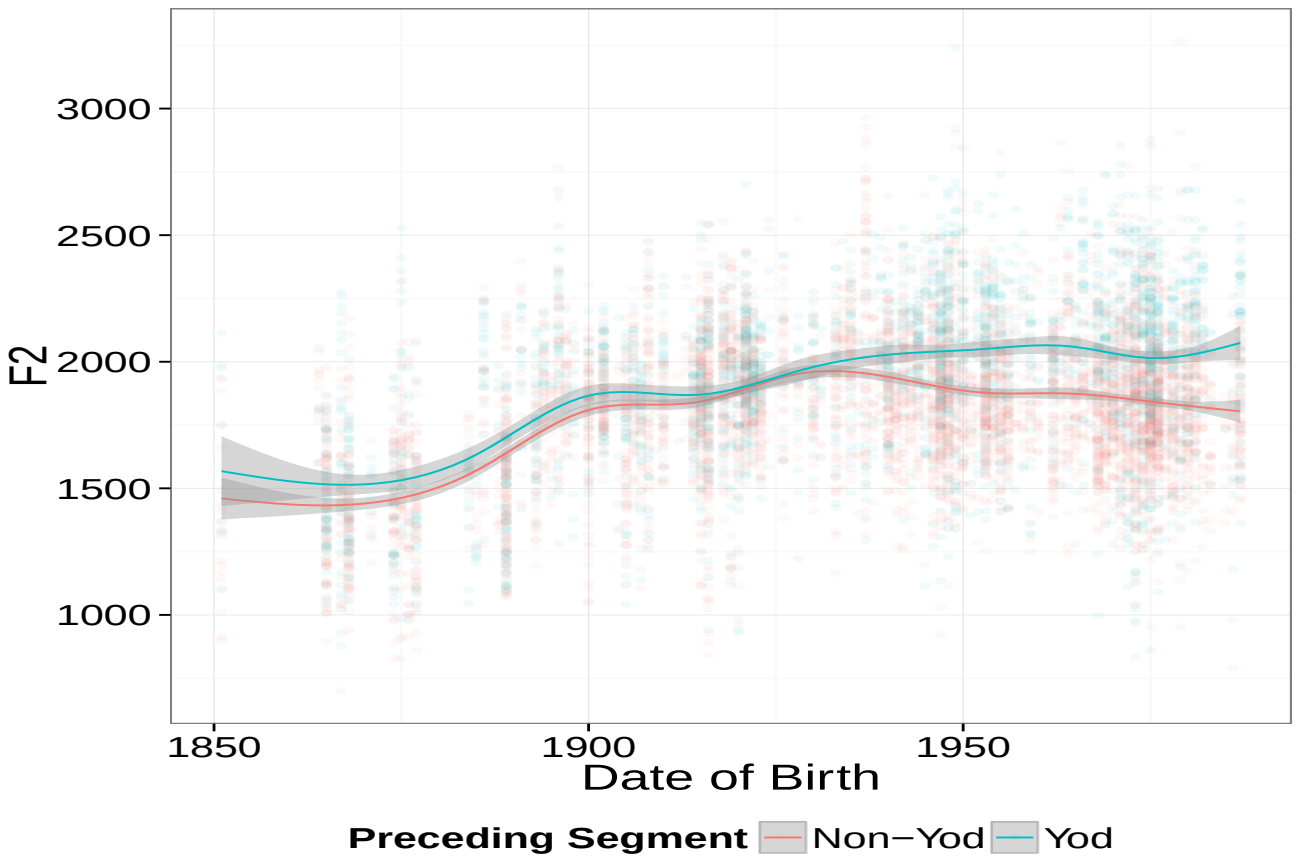
Rate of change: Phonological specialization

Phonological specialization



Rate of change: Phonological specialization

Phonological specialization in New Zealand English /u/-fronting



Rate of change: Phonological specialization

Phonological specialization in New Zealand English /u/-fronting