An Experimental Investigation of Contact-Induced Sound Change in Shanghainese

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Outline

Reversal of merger

A complete merger cannot be reversed by linguistic means. ("Garde's Principle") [Garde 1961, Labov 1994]

Apparent exceptions when a former contrast is:

- reconstructible from distinctive phonological roles of the merged segments [Michelena 1957]
- reconstructible from orthography [Kochetov 2006]
- taken in from a different-prestige variety of the language maintaining the contrast [Weinreich et al. 1968, Ihalainen 1994]
- never fully merged [Labov 1975, Labov et al. 1991, Labov 1994]; cf. [Baranowski 2007]

What about cases of language contact?

Can language contact reverse a merger?

Cross-language influence in bilinguals

"The locus of language contact is the bilingual speaker." [Sankoff 2002]

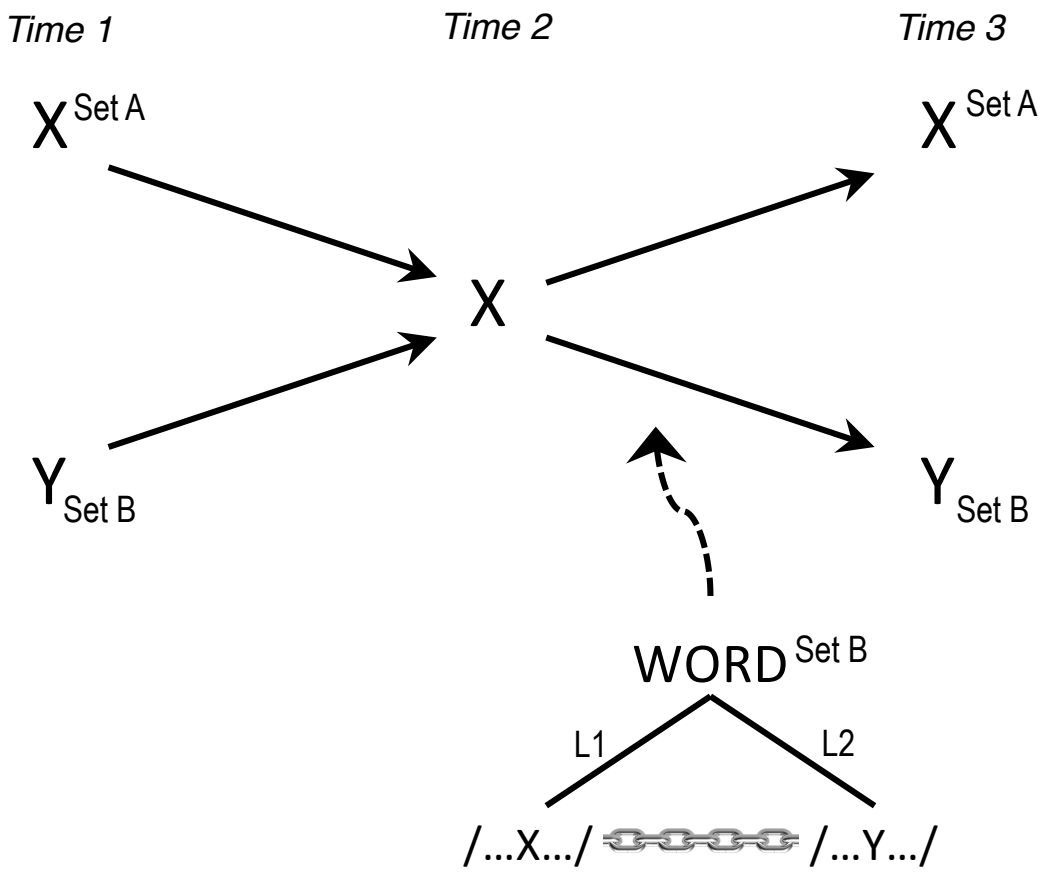
Parallel L1 and L2 representations are often **linked** at one or more levels, allowing for mutual influence in speech production.

[Flege 1995, Laeufer 1996, Chang 2010]

- French-English bilinguals produce French /u/ as relatively front (converging toward English /u/). [Flege 1987]
- Italian-English bilinguals produce English /eɪ/ as more diphthongized than English monolinguals (diverging from Italian /e/). [Flege et al. 2003]

Language contact as a source of merger reversal?

L1:



Conditions:

- L2-to-L1 influence after merger
- L2 with a cognate set of lexical items
- L2 cognate set containing a sound similar to the sound in the L1 set

The Shanghainese language and its speakers

Shanghainese (SH): member of the Wu dialect family, local dialect of the municipal area of Shanghai (most populous city in China).

- 1850s–1960s: vast wave of immigration into Shanghai from neighboring regions, which brought in influence from other Wu dialects, esp. Suzhou dialect and Ningbo dialect.
- 1980s onward: increasingly strong influence from the standard language, Mandarin (MN).

Status of /e/ and /ɛ/ in Shanghainese

Stage I (1850–1920s) and Stage II (1920s–1960s)

- separate phonemes

Stage III (1980s–2000s)

- allegedly merged into /ɛ/ [Chen 1995, Tang 1995, Xu and Tang 1988]
- influence from other Wu dialects, especially Suzhou dialect [Chen 1995]

Stage IV (2000s–present)

- separate again [Gu 2007]
- ostensible influence from Mandarin [Gu 2007]

Words participating in the sound change

Three word groups

- MN-[ai], MN-[an], MN-[ei]

MN rhyme	Example	Stage I	Stage II	Stage III	Stage IV
ai	'to come' (MN: lai˥)	e	ɛ	ɛ	ɛ
an	'orchid' (MN: lan˥)	ɛ	ɛ	ɛ	ɛ
ei	'thunder' (MN: lei˥)	e	e	ɛ	e

Status of merger in Stage III

Mixed findings

- Xu & Tang (1988): only /ɛ/ listed in the vowel inventory of middle-aged speakers [Tang 1995, Chen 1995]
- Shen (1981): free variation
- Shi & Jiang (1983): variation among 500 male speakers (middle-aged in the early 1980s)
  - merged to /ɛ/: 59.0%
  - free variation: 6.6%
  - non-merger: 34.4%
- Svantesson (1989): consistent distinction of /ɛ/ and /e/ among 3 male speakers

Merger was mainstream, but not complete.

Status of merger in Stage IV

Gu (2007) noted that /ɛ/ has been **re-split** into /ɛ/ and /e/ (or even /ei/), presumably due to Mandarin influence.

Gu's report lacks detailed acoustic and statistical analyses.

Contact as a source of merger reversal in Shanghainese

HYPOTHESIS 1: A reversal of the /ɛ/-/e/ merger is ongoing in Shanghainese.

- Prediction: **less merging** among younger speakers.

HYPOTHESIS 2: Contact with Mandarin is the major source of this merger reversal.

- Prediction: **diphthongization** in MN-[ei] words.
- Prediction: **less merging** in bilingual mode. [Grosjean 2001]

Participants

TALKERS: 9 parent-child pairs = 18 native Shanghainese speakers (born and resident in Shanghai for most of their life)

- 9 parents: 3 m., 6 f.; age 55–65 yr
- 9 children: 3 m., 6 f.; age 24–36 yr

RATERS: separate group of 23 native Shanghainese speakers

Stimuli

Total of 62 items:

- 3 rhyme groups (MN-[ei], MN-[ai], MN-[an])
  x 2 frequency levels (high, low)
  x 3 different onset consonant types = 18 critical items
- 12 items testing a different hypothesis, 32 filler items

Critical items were controlled for phonetic makeup.

- all bisyllabic, with one quadrisyllabic item
- critical /ɛ/ always word-final
- consonant preceding /ɛ/ one of /p, t, $\mathrm{p^h}$, $\mathrm{t^h}$, l, n/

Item frequency was controlled on the basis of frequency scores gathered in a online auditory rating task.

Study design

Experiment 1: Reading

- self-paced reading of a SH sentence presented on screen
- critical items always clause-final (i.e., in pre-pausal position)
- 3 presentations of each of 62 items

Experiment 2: Translation

- self-paced audio-to-speech translation of a MN stimulus
  - presented auditorily and visually on screen
  - participants instructed not to look at the screen unless they needed clarification of the intended word
- responses in the frame /gɣʌ̀ {ʐ̩ʌ̀/tɕiɔ˥}.../ 'This is (called)...'
- 3 presentations of each of 62 items

Order: Experiment 1 > questionnaire (15–20 min) > Experiment 2

Acoustic analysis

Audio was recorded with a head-mounted mic at 44.1 kHz/16 bps.

Recordings were analyzed in Praat. [Boersma and Weenink 2011]

- onset and offset of critical vowels marked by hand in a wide-band spectrogram
- F_1, F_2 measured at 20% (start) & 80% (end) points of each vowel using LPC analysis
- formant tracking errors corrected individually by hand

Total of 4 formant measures: F1Start, F2Start, F1End, F2End.

Diphthongization measure (categorical): 1 for movement in the direction of /i/, 0 otherwise.

Statistical analysis

Data from Experiment 1 (reading) and Experiment 2 (translation) modeled separately $>$ 10 mixed-effects regression models in total.

Fixed effects

MN Rhyme x Generation

Sex
Consonant Type
MN Rhyme x Frequency
MN Rhyme x Token

Random effects

Test Item
Family

Outcome variables

F1Start (linear)
F2Start (linear)
F1End (linear)
F2End (linear)
Diphthongization (logistic)

Summary of critical effects on formant measures

Experiment 1: Reading

	F1Start	F2Start	F1End	F2End
MN Rhyme	–	–	**	***
MN Rhyme x Generation	–	–	–	***

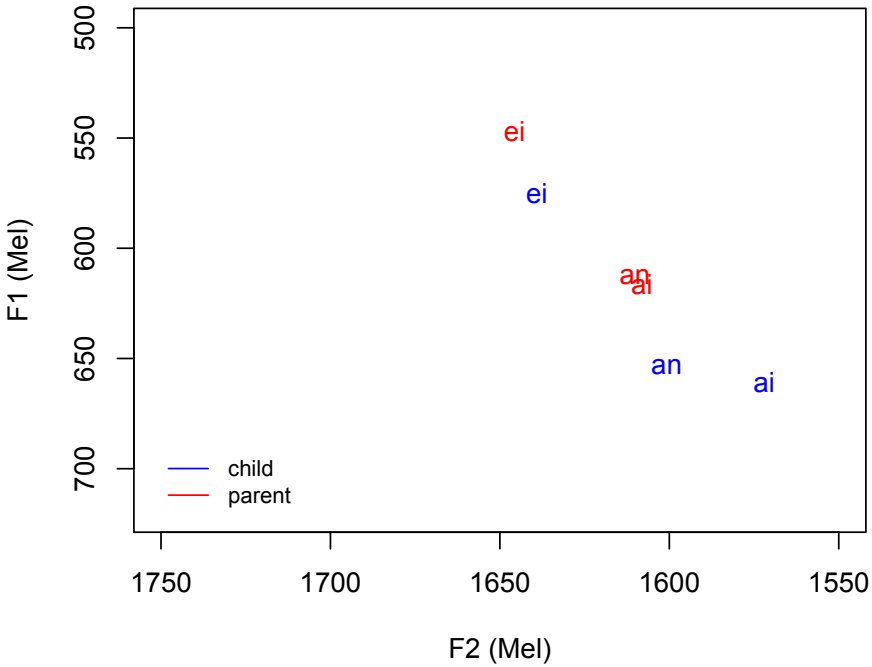
Experiment 2: Translation

	F1Start	F2Start	F1End	F2End
MN Rhyme	–	–	***	***
MN Rhyme x Generation	–	–	***	***

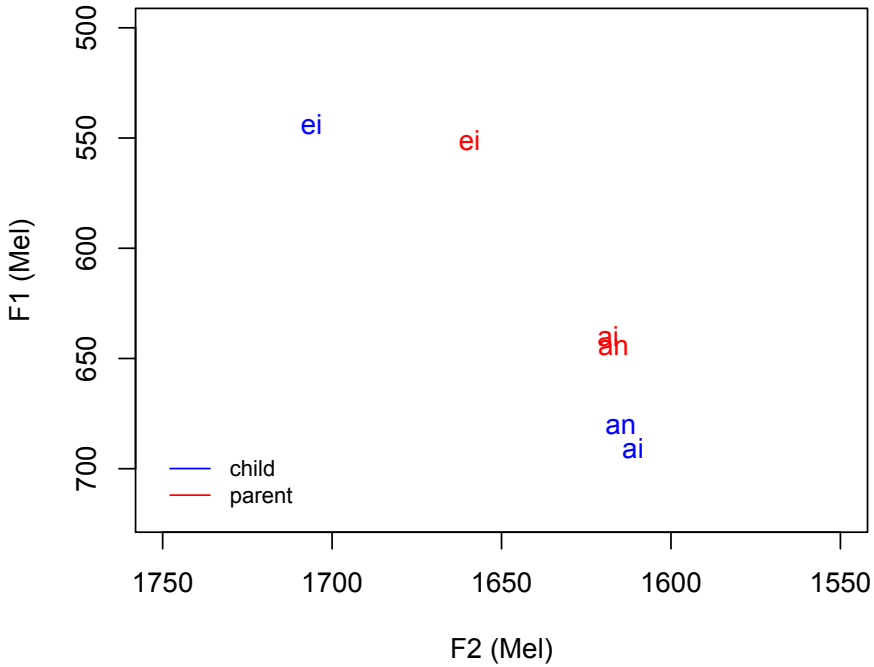
** $0.001 < p < 0.005$
*** $p < 0.001$

Mean F1End and F2End by MN Rhyme and Generation

Experiment 1: Reading

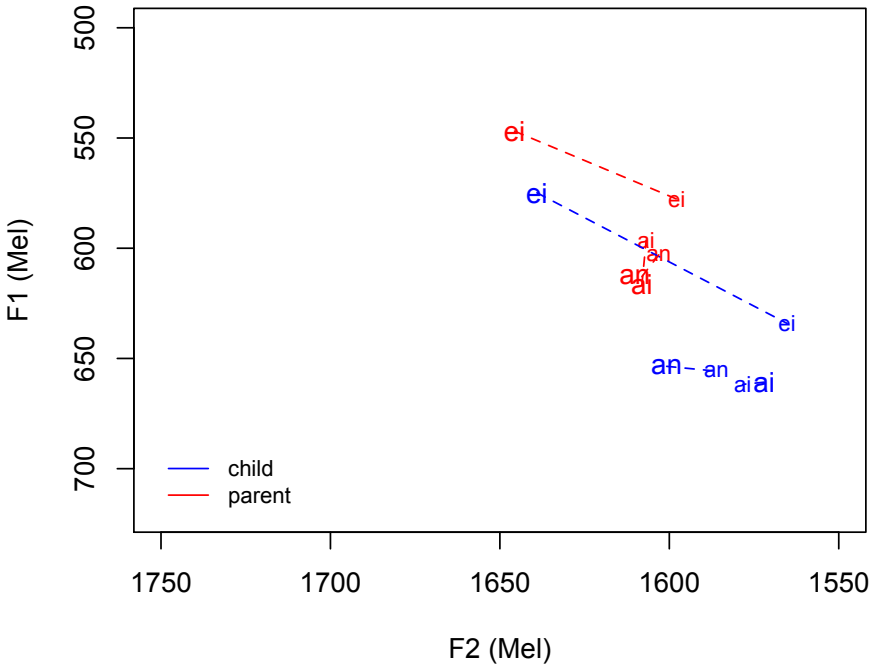


Experiment 2: Translation



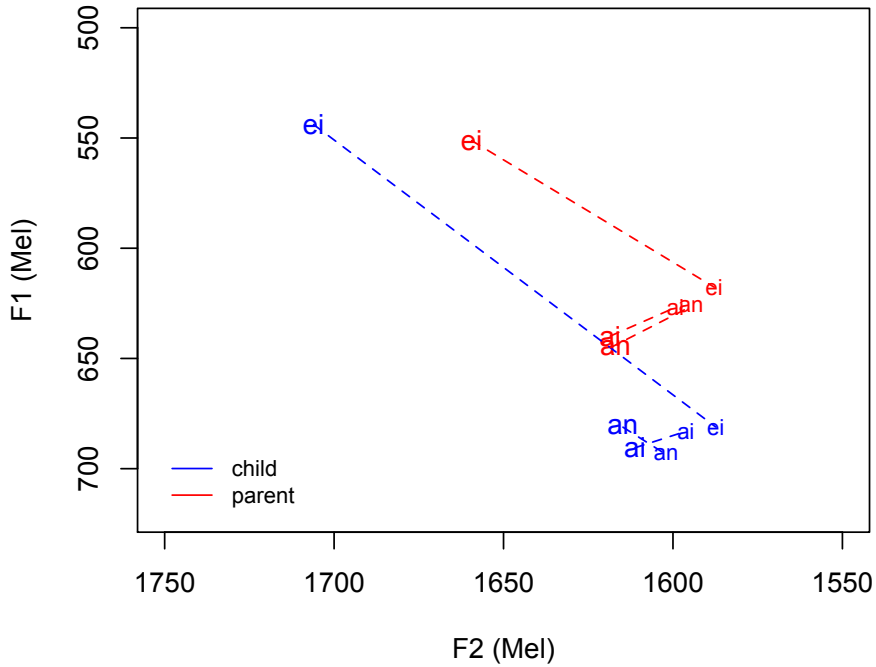
Mean formant trajectories by MN Rhyme and Generation

Experiment 1: Reading



[tə$^{\text{ʔ}\neg}$ p$^{\text{h}}$e$^{\neg}$] ‘to match’ C11F P11F

Experiment 2: Translation



[tə$^{\text{ʔ}\neg}$ p$^{\text{h}}$e$^{\neg}$] ‘to match’ C11F P11F

Summary of critical effects on diphthongization

Experiment 1: Reading

	Diphthongization
MN Rhyme	**
MN Rhyme x Generation	–

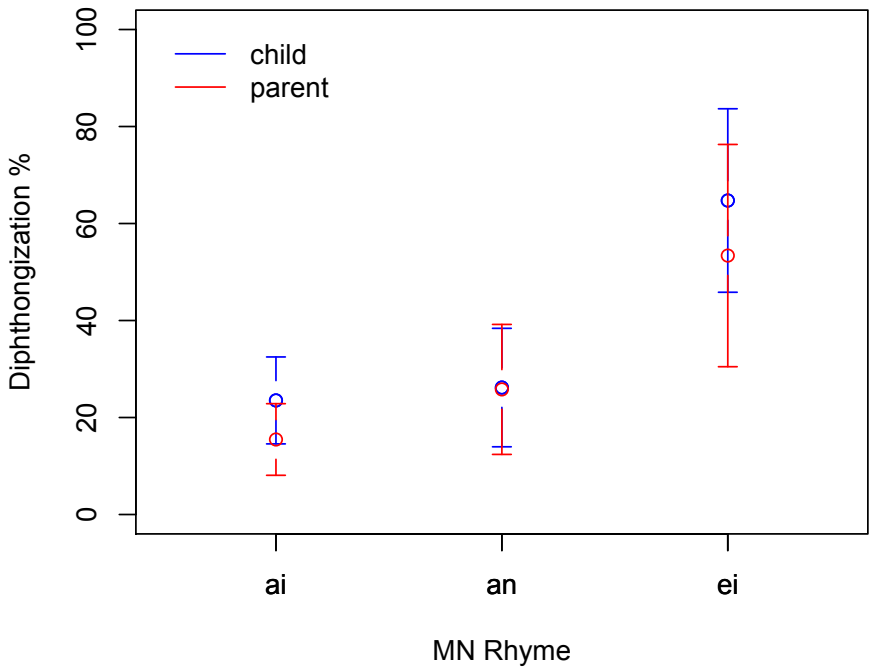
Experiment 2: Translation

	Diphthongization
MN Rhyme	***
MN Rhyme x Generation	***

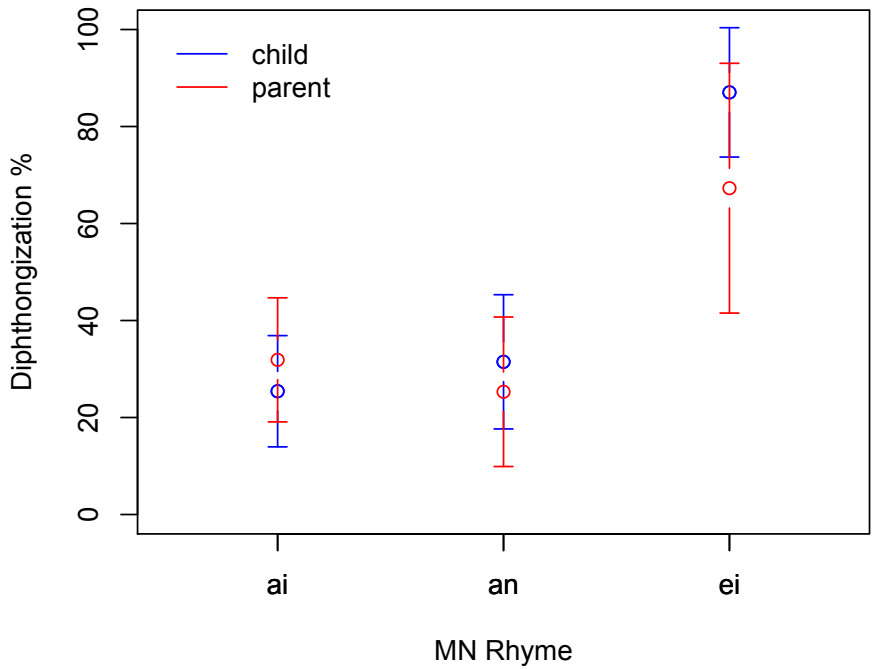
** $0.001 < p < 0.005$
*** $p < 0.001$

Frequency of diphthongization by MN Rhyme and Generation

Experiment 1: Reading

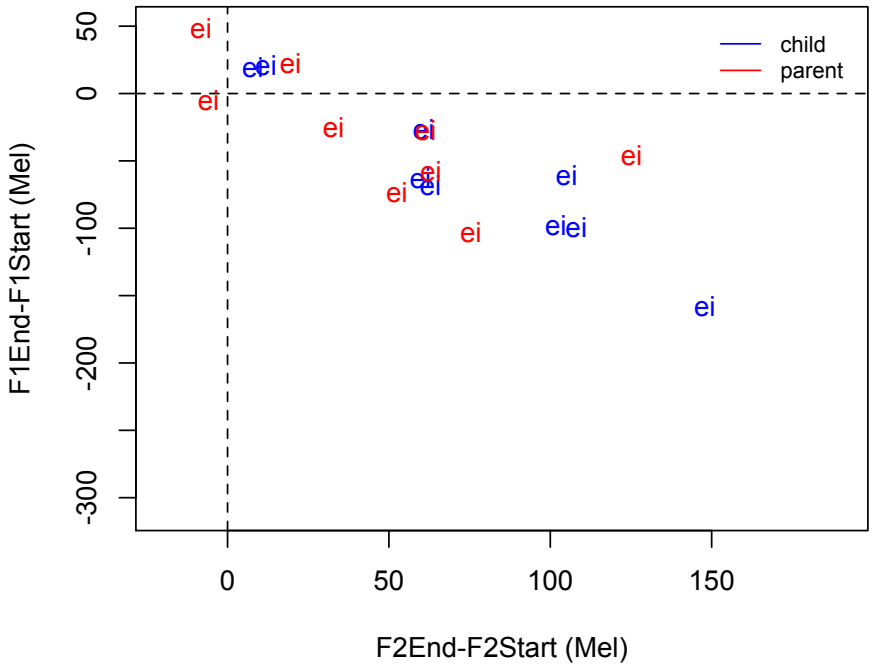


Experiment 2: Translation

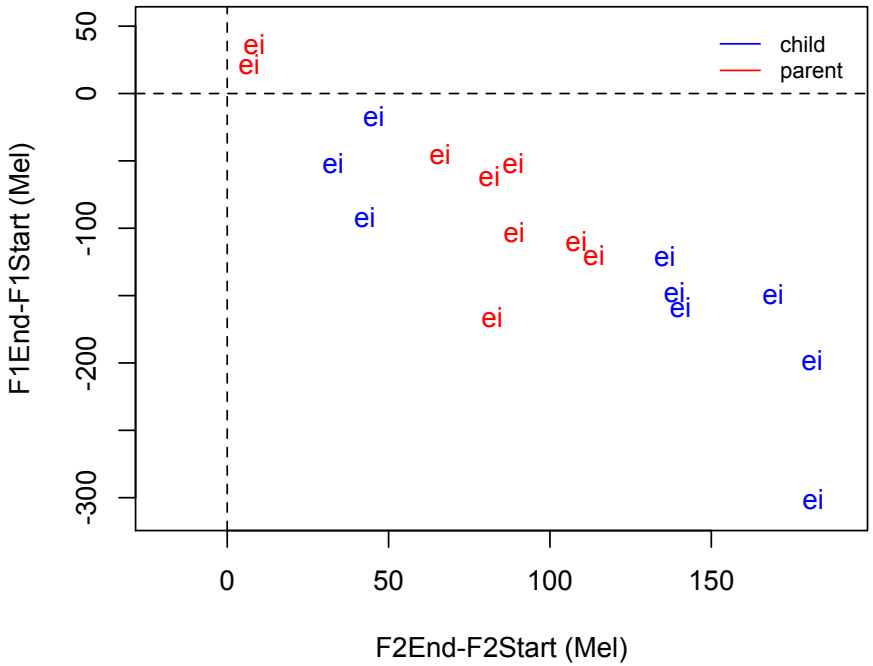


Degree of diphthongization by MN Rhyme and Speaker

Experiment 1: Reading



Experiment 2: Translation



Strong evidence of diphthongization

MN-[ei] words are **more likely** to be diphthongized and are diphthongized to a **greater degree** than MN-[ai]/MN-[an] words.

The trend is more evident in:

- younger speakers (compared to older speakers)
- audio-to-speech translation (compared to sentence reading)

Revisiting the hypotheses

HYPOTHESIS 1: A reversal of the /ɛ/-/e/ merger is ongoing in Shanghainese.

- Prediction: **less merging** among younger speakers.

HYPOTHESIS 2: Contact with Mandarin is the major source of this merger reversal.

- Prediction: **diphthongization** in MN-[ei] words.
- Prediction: **less merging** in bilingual mode.

Revisiting the hypotheses

HYPOTHESIS 1: A reversal of the /ɛ/-/e/ merger is ongoing in Shanghainese.

- Prediction: **less merging** among younger speakers. YES

HYPOTHESIS 2: Contact with Mandarin is the major source of this merger reversal.

- Prediction: **diphthongization** in MN-[ei] words. YES
- Prediction: **less merging** in bilingual mode. YES

Confounded by orthography?

- SH and MN share orthography, and some Chinese characters contain a phonetic radical that encode rhyme information (e.g., 贝 'treasure' and 狈 'type of animal').
- 13 out of 18 test items had phonetic radicals.
- However, the same diphthongization patterns were observed in items with no phonetic radicals.

Orthography alone cannot explain the findings.

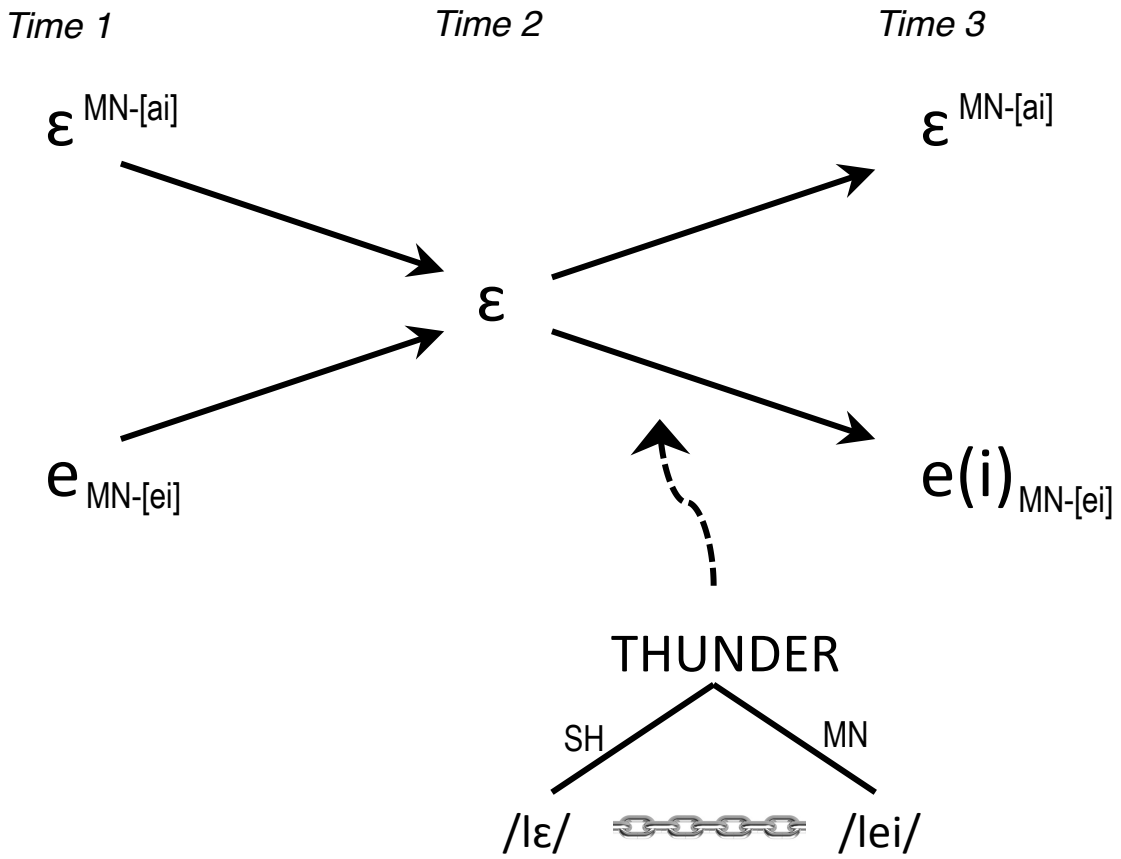
Confounded by vowel duration?

- Lengthening leads to diphthongization?
- Diphthongized and non-diphthongized vowel tokens do not differ in length.
- Parents produced longer vowels than children in both experiments, but showed less diphthongization.

Vowel duration is not a confounding factor.

Conclusion

Shanghainese:



- A previous (near) merger has been canceled via language contact.
- Speech production by bilinguals is complicated by L1-L2 linkages.
- Do bilingual phenomena count as *linguistic* means of change?

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