

GUSSING RONDONLY: HOW CANADIANS ARE ADVANCING, SPREADING, AND PERCEIVING AN ACTIVE VOWEL SHIFT

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Aims of current study

1. Account for age- and gender-based variation in the pronunciation of non-high short vowels (æ , ɛ , ʌ , ɒ) in (Jewish) Montreal English
2. Investigate the relationship between ongoing change in vowel production with inter-gender and inter-generational perceptual variation
3. Situate apparent-time evidence within models of the Canadian Shift

Notation used in this presentation

/ɛ/ = /e/ = BET

/ɪ/ = /i/ = BIT

/æ/ = /ae/ = BAT

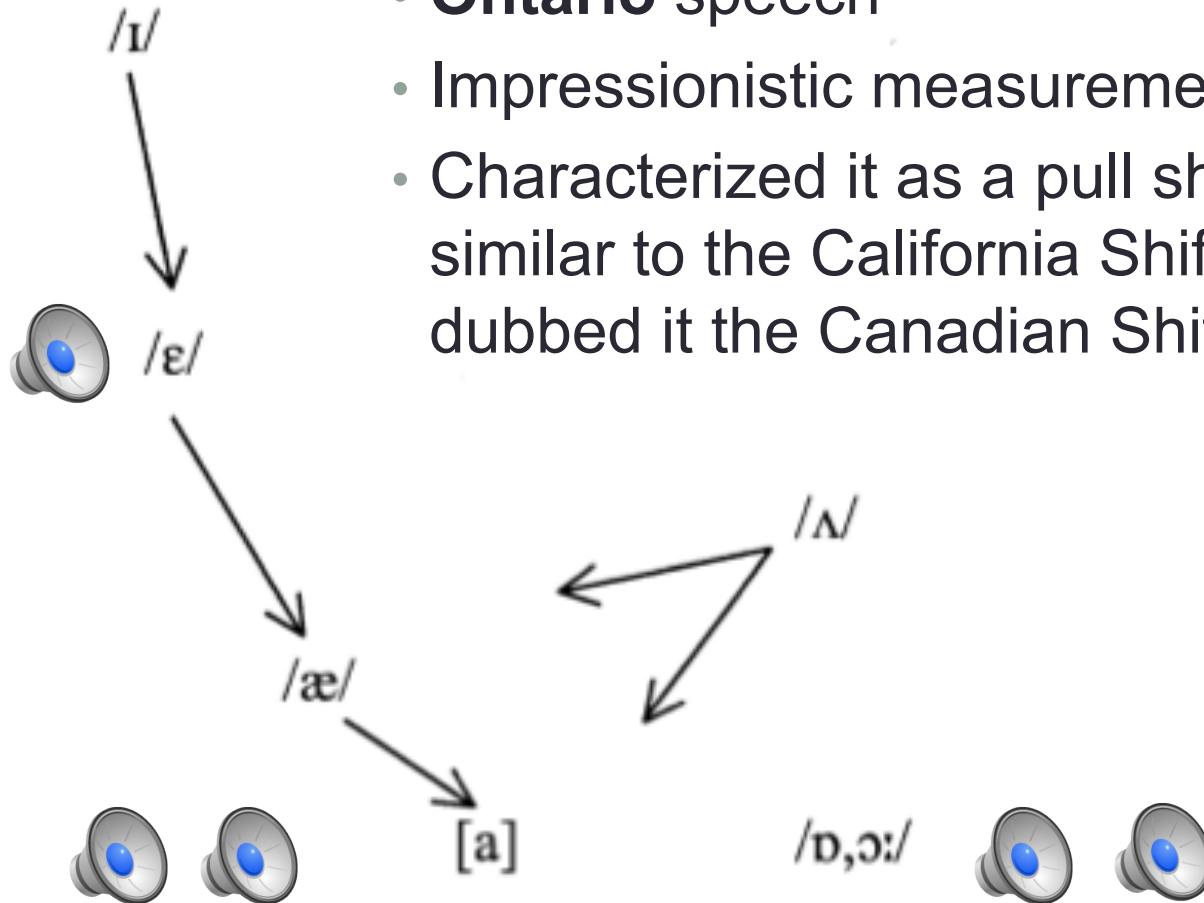
/ɔ/ = /o/ = BOT=BOUGHT (merged low back vowel)

/ʌ/ = /u/ = BUT

What is the Canadian Shift?

Clarke, Elms and Youssef (1995)

- **Ontario** speech
- Impressionistic measurement
- Characterized it as a pull shift similar to the California Shift, dubbed it the Canadian Shift



They used a novel approach to measure the shift, and they found that the shift was not as large as the California Shift.

Boberg (2005)

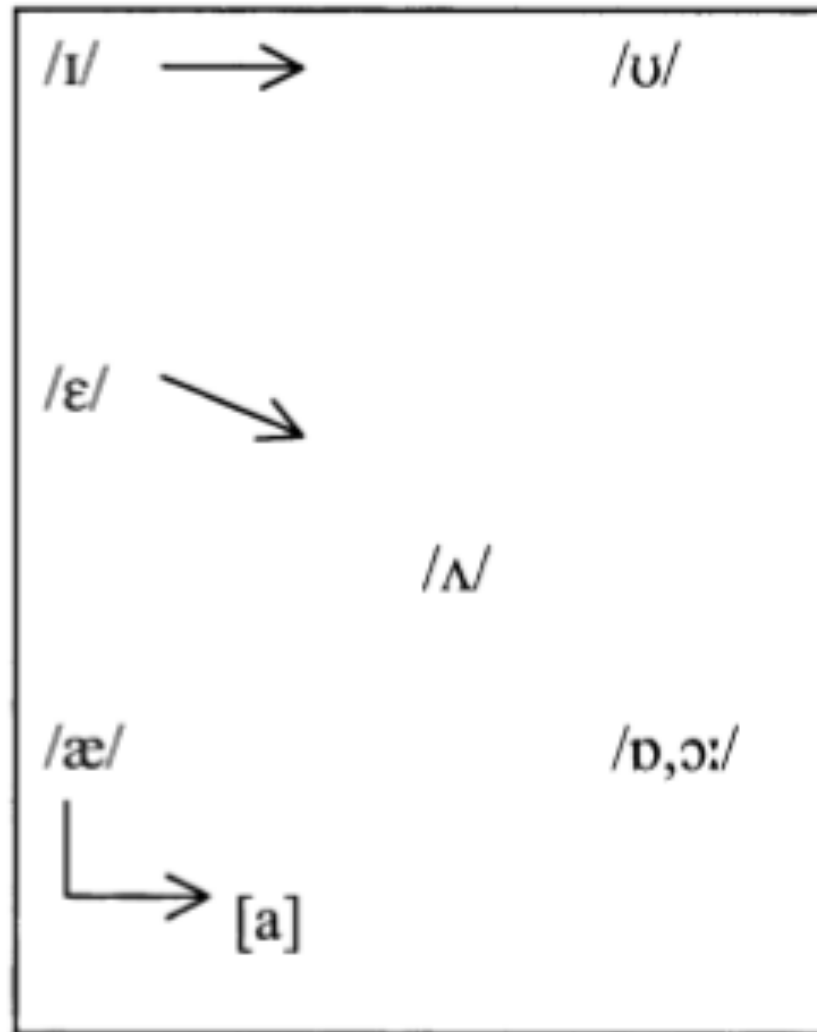


FIGURE 4. The Canadian Shift in Montreal.

Current study

Research subjects

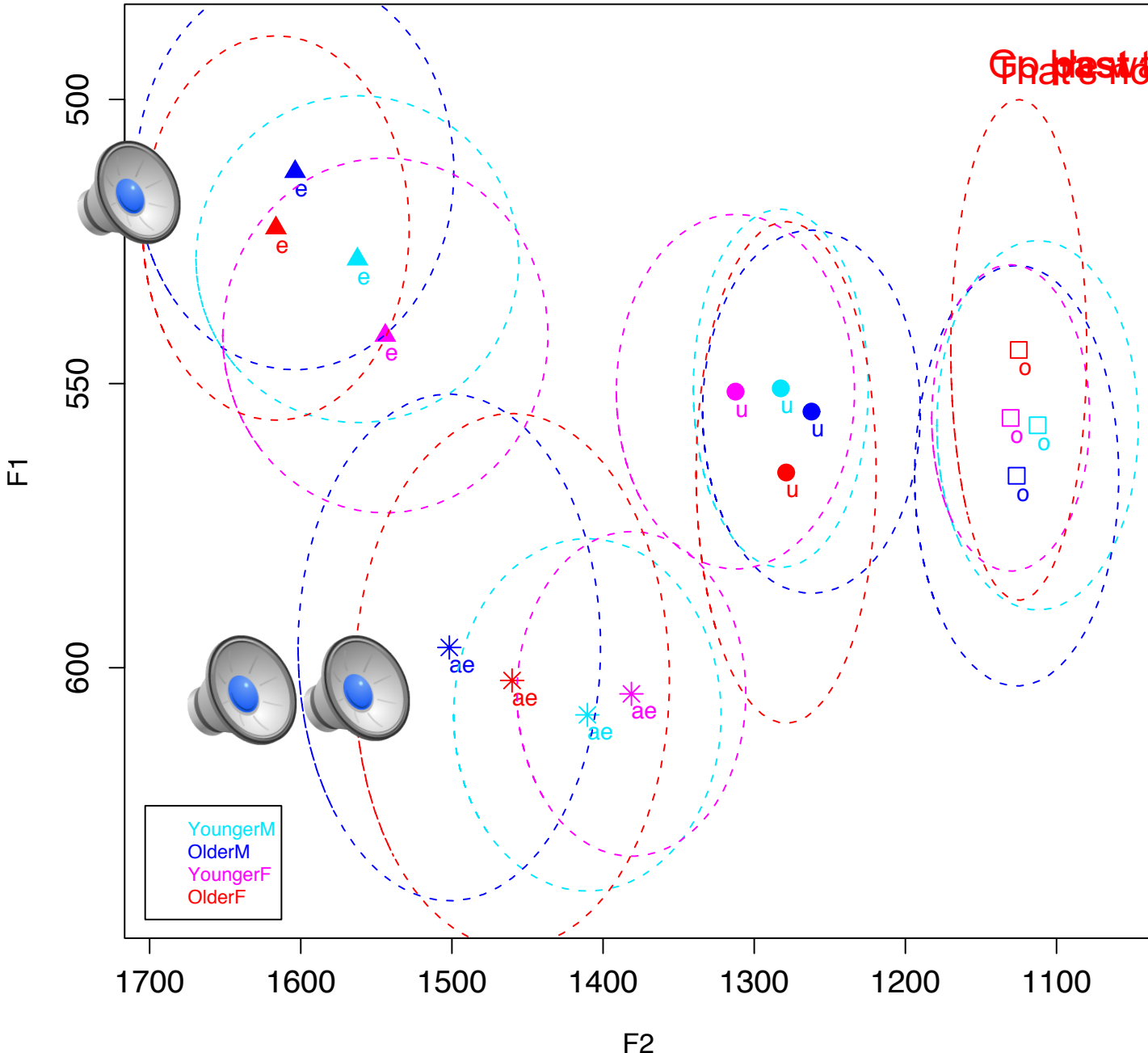
- Have at least one Jewish parent
- Grew up speaking English as a first or home language
- Grew up in Montreal

	Female	Male
Younger	1991	1995
	1989	1992
	1988	1992
	1988	1991
	1984	1989
		1988
	1987	
Older	1961	1961
	1957	1960
	1952	1957
	1950	1953
	1937	1949
		1949
		1949
		1949
		1949
		1943
	1940	

Two parts:

- Data all taken within one interview
- Production experiment
 - Classic sociophonetic experiment
 - Participants read 44 sentences at their own pace
 - Vowel formant information extracted from key words in sentences
- Perception experiment
 - Participants listen to synthetic vowel sounds through headphones
 - Classify as BET, BAT, BUT, or BOUGHT by clicking on screen
 - Program reports their answer and their response time

Group means, normalized (Lobanov method)



That's not a rat, it's a mouse
left

Vowel	Age	Gender
F1 Λ	0.0592	0.1516
F2 Λ	0.0252	0.0469
F1 ϵ	0.0076	0.0633
F2 ϵ	0.0075	0.9337
F1 ae	0.1680	0.8160
F2 ae	0.0000	0.0211
F1 υ	0.8400	0.0594
F2 υ	0.5930	0.5860

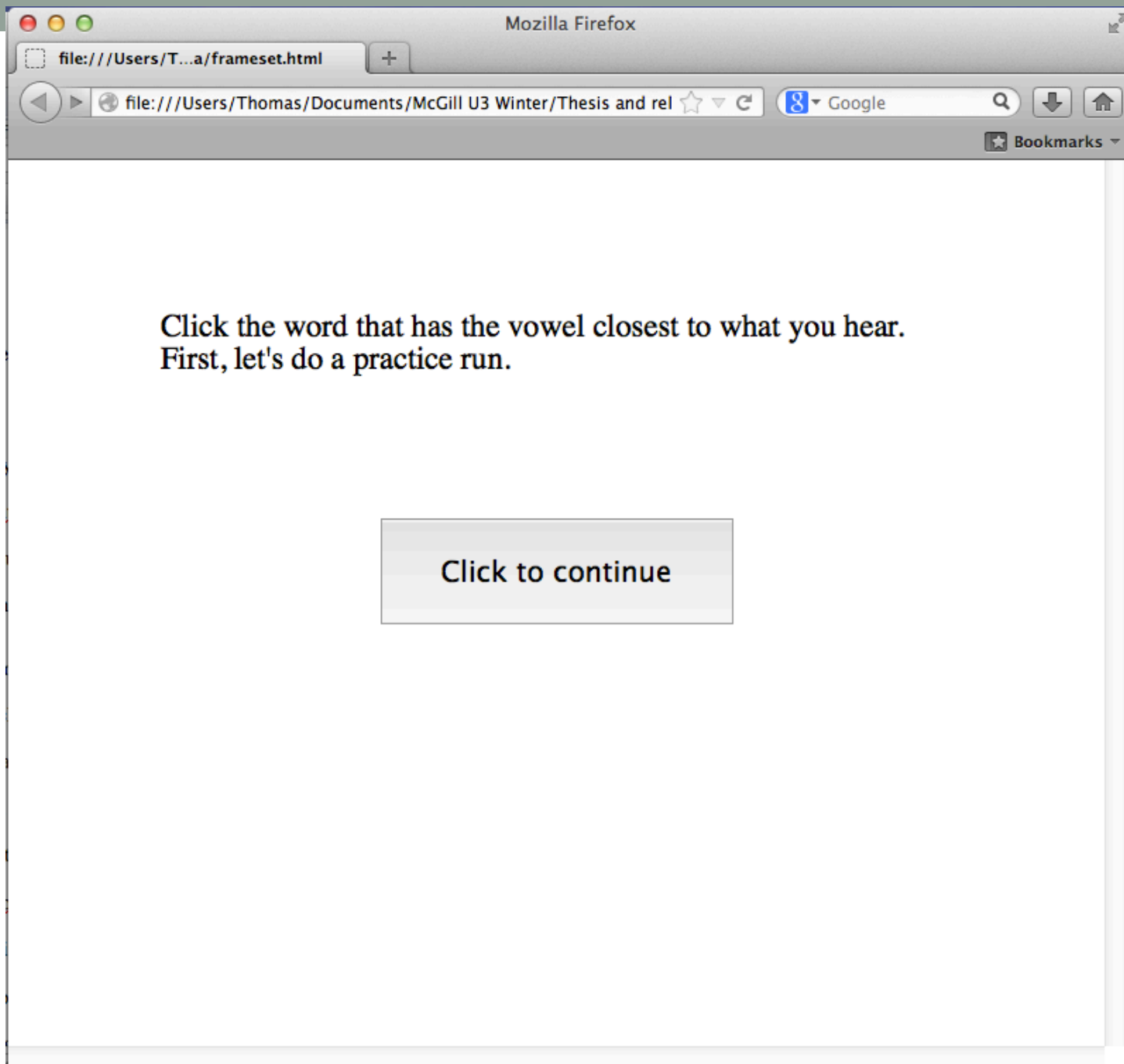
ANOVAs with age and gender as between-subject factors (p-values)

Two parts:

- Data all taken within one interview
- Production experiment
 - Classic sociophonetic experiment
 - Participants read 44 sentences at their own pace
 - Vowel formant information extracted from key words in sentences
- Perception experiment
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 - Classify as BET, BAT, BUT, or BOUGHT by clicking on screen
 - Program reports their answer and their response time

“The goals of sociophonetics include accounting for how socially-structured variation in the sound system is learned, stored cognitively, subjectively evaluated, and processed in speaking *and listening*” (704, emphasis added)

-Foulkes, Scobbie and Watt (2010)



Click the word that has the vowel closest to what you hear.
First, let's do a practice run.

Click to continue

Mozilla Firefox

file:///Users/T...a/frameset.html

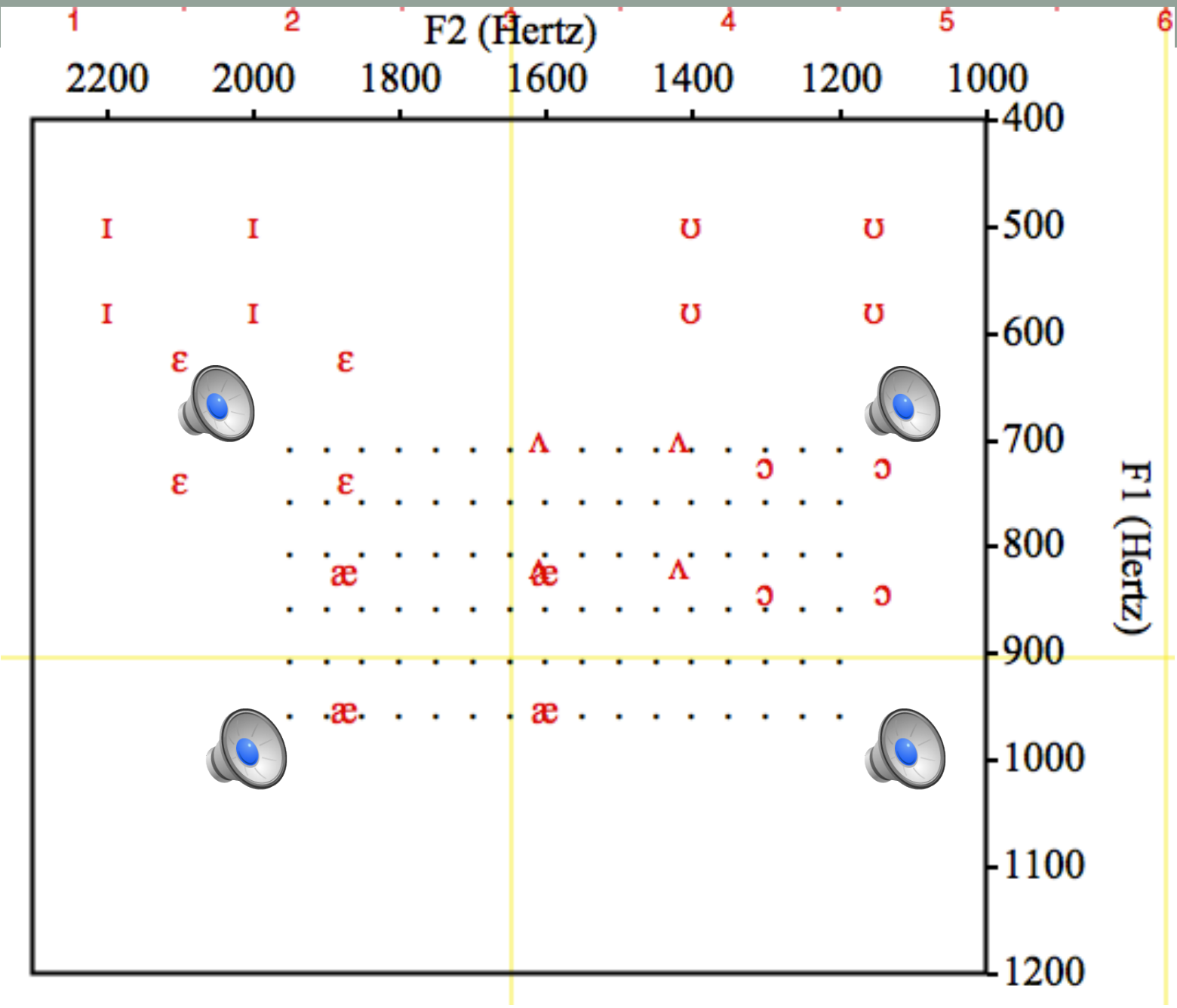
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Bookmarks



BET	BAT
BUT	BOUGHT

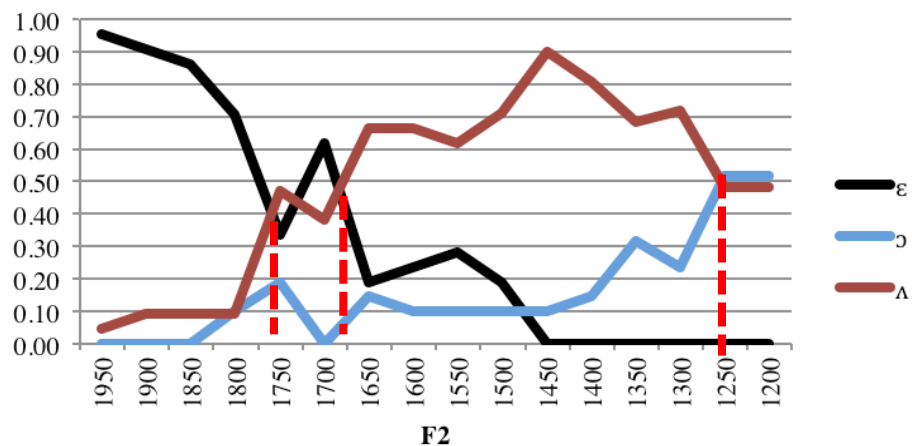


Red letters show approximate distribution of Montreal short vowels based on Boberg (2005)

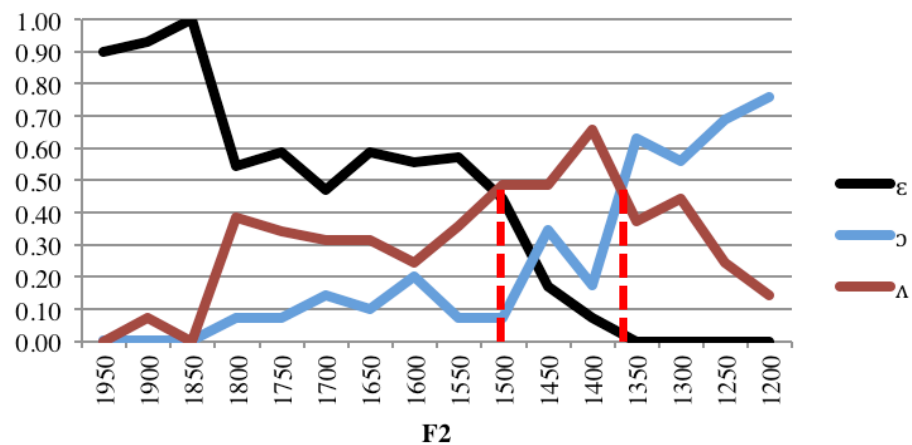
Older Listeners		F2															
		1950	1800			1700	1600			1500	1400		1300	1200			
F1	700	ɛ	ɛ	ɛ	ɛ		ɛ	ʌ	ʌ	ʌ	ʌ	ʌ	ʌ	ʌ	ʌ	ɔ	ɔ
	750	ɛ	ɛ	ɛ	ɛ	ɛ	ɛ		ʌ	ʌ	ʌ	ʌ	ʌ	ʌ		ɔ	ɔ
	800	ɛ	ɛ	ɛ		ɛ	æ	ʌ	ʌ	ʌ	ʌ	ʌ	ʌ	ʌ	ɔ	ɔ	ɔ
	850	ɛ	æ	æ	æ	æ		æ	æ	æ	æ				ɔ	ɔ	ɔ
	900	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ		ɔ	ɔ
	950	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	ɔ		ɔ

Younger Listeners		F2																
		1950	1800			1700	1600			1500	1400		1300	1200				
F1	700	ɛ	ɛ	ɛ		ɛ	ɛ						ʌ	ɔ	ɔ	ɔ	ɔ	
	750	ɛ	ɛ	ɛ	ɛ	ɛ	ɛ	ɛ		ʌ			ʌ		ɔ	ɔ	ɔ	
	800	ɛ	ɛ	ɛ	ɛ	ɛ	æ	ɛ	ʌ	ʌ					ɔ	æ	ɔ	
	850		æ	æ		æ		æ	æ	æ	æ				ɔ	ɔ	ɔ	
	900	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	ɔ	ɔ	ɔ	ɔ
	950	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ			ɔ		ɔ

Percent /ε/, /ɔ/, and /ʌ/ categorization,
F1 = 700: Older Listeners



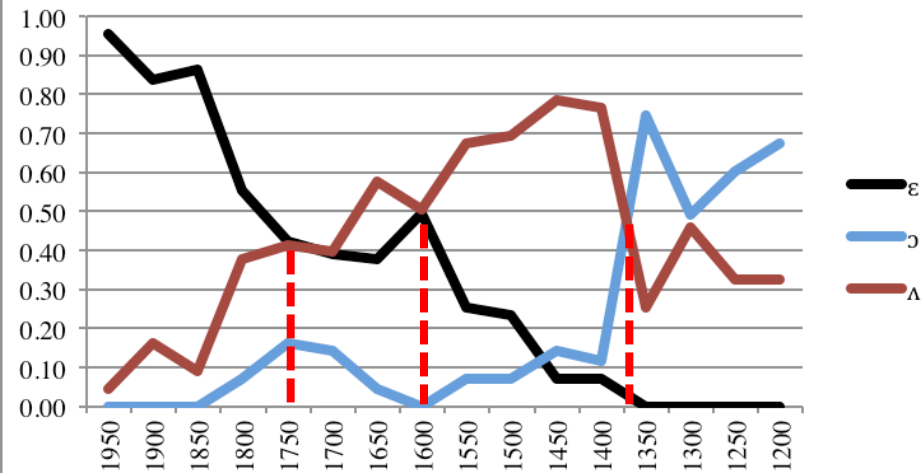
Percent /ε/, /ɔ/, and /ʌ/ categorization,
F1 = 700: Younger Listeners



Vowel	Gender	Age	Gender/Age
F2 ʌ	0.0206	0.0814	0.2989
F2 ε	0.1980	0.1530	0.3770
F2 ɔ	0.0097	0.0398	0.0328

Binomial logistic regression for responses along the F1=700Hz axis (p-values)

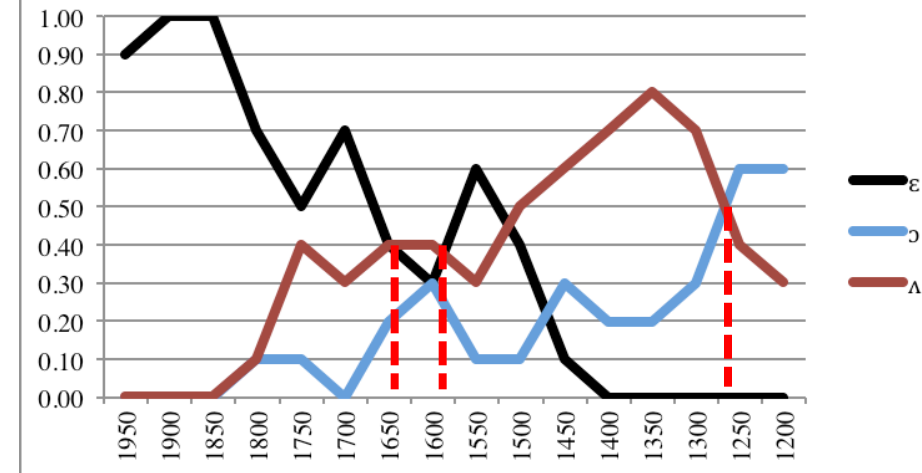
Percent /ε/, /ɔ/, and /ʌ/ categorization,
F1 = 700: Male Listeners



Vowel	Gender	Age	Gender/Age
F2 ʌ	0.0206	0.0814	0.2989
F2 ε	0.1980	0.1530	0.3770
F2 ɔ	0.0097	0.0398	0.0328

Binomial logistic regression for responses along the F1=700Hz axis (p-values)

Percent /ε/, /ɔ/, and /ʌ/ categorization,
F1 = 700: Female Listeners



Older Listeners		F2															
		1950	1800	1700	1600	1500	1400	1300	1200								
F1	700	ɛ	ɛ	ɛ	ɛ	ɛ	ʌ	ʌ	ʌ	ʌ	ʌ	ʌ	ʌ	ʌ	ɔ	ɔ	
	750	ɛ	ɛ	ɛ	ɛ	ɛ	ɛ	ʌ	ʌ	ʌ	ʌ	ʌ	ʌ	ʌ	ɔ	ɔ	
	800	ɛ	ɛ	ɛ	ɛ	æ	ʌ	ʌ	ʌ	ʌ	ʌ	ʌ	ʌ	ɔ	ɔ	ɔ	
	850	ɛ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	ɔ	ɔ	ɔ
	900	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	ɔ	ɔ	ɔ
	950	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	ɔ	ɔ	ɔ

Younger Listeners		F2															
		1950	1800	1700	1600	1500	1400	1300	1200								
F1	700	ɛ	ɛ	ɛ	ɛ	ɛ	ɛ	ɛ	ɛ	ɛ	ʌ	ɔ	ɔ	ɔ	ɔ	ɔ	
	750	ɛ	ɛ	ɛ	ɛ	ɛ	ɛ	ɛ	ʌ	ʌ	ʌ	ʌ	ʌ	ʌ	ɔ	ɔ	ɔ
	800	ɛ	ɛ	ɛ	ɛ	ɛ	æ	ɛ	ʌ	ʌ	ʌ	ʌ	ʌ	ʌ	ɔ	æ	ɔ
	850	ɛ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	ɔ	ɔ	ɔ
	900	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	ɔ	ɔ	ɔ
	950	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	ɔ	ɔ	ɔ

Few significant perceptual differences in /æ/-/ɛ/ categorization in front of vowel space

Mixed-effects logistic regressions for responses in the F2 = 1850, 1900, and 1950Hz axes: predictor of **gender** and **age** on F1, all possible by-subject random effects (intercept and slopes) included:

/æ/	z-value	p-value
Gender	0.854	0.393
Age	-1.506	0.132

/ɛ/	z-value	p-value
Gender	-2.024	0.043
Age	0.916	0.359

Geographic diffusion

- “...an account of the diffusion of changes through space is fundamental to an understanding of the mechanism of change.” – Bailey et al. (1993)
- “...innovation can be seen spreading from a centre to surrounding areas, and then jumping to other members of the central place hierarchy at a greater distance.” – Trudgill (1974)

Population	Toronto (Metro)	Montreal (Metro)	Vancouver (Metro)
1941	900,000	1,192,235	393,898
1951	1,262,000	1,539,308	562,462
1961	1,919,000	2,110,679	790,741
1971	2,628,045	2,743,208	1,028,334
1981	2,998,947	2,862,286	1,196,831
1991	3,893,933	3,127,242	1,602,590
2001	4,682,897	3,426,350	1,986,965
2011	5,583,064	3,824,221	2,313,328

BUT in 1951, only 558,256 had English as “mother tongue” *in all of Quebec*

In 2011 only 599,225 “native” speakers *in all of Quebec*; 861,770 use English as a “home language”

Roeder & Jarmasz (2009)

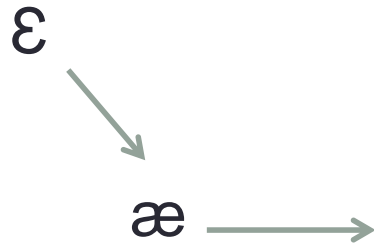
- **Toronto**
- Older group: 1920-1935
- Middle group: 1951-1965
- Younger group: 1966-1985
- Middle and Younger groups pattern together: “Canadian Shift has not been active in Toronto since the WWII era”

ɛ →

æ →

Hoffman (2010)

- **Toronto**
- Older group: 1930-1958
- Younger group: 1983-1995

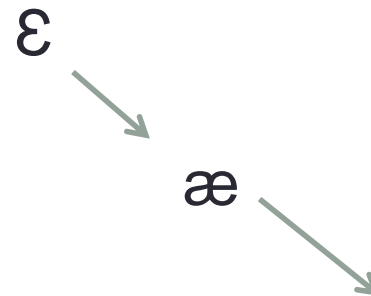


Sadler-Brown & Tamminga (2010)

- Older group: 1922-1972
- Younger group: 1981-1986
- **Vancouver**



- **Halifax**



Boberg (2005)

- Studied Anglo Montrealers (Irish, Italian, and Jewish)
- Divided them into three generations by birth year:
 - 1919-1946 (group 1)
 - 1946-1965 (group 2)
 - 1965-1981 (group 3)

ɛ

æ



Difference between
groups 1 and 2

ɛ →

æ →

Difference between
groups 1 and 3

ɛ →

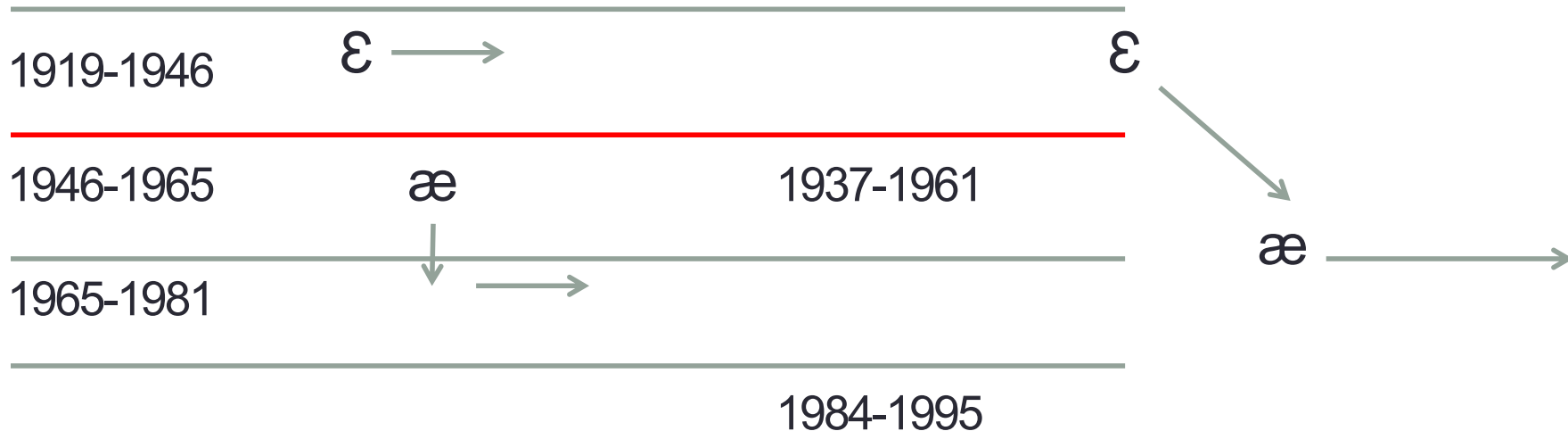
æ →

Difference between
groups 2 and 3

Real-time change – Montreal

Boberg (2005):

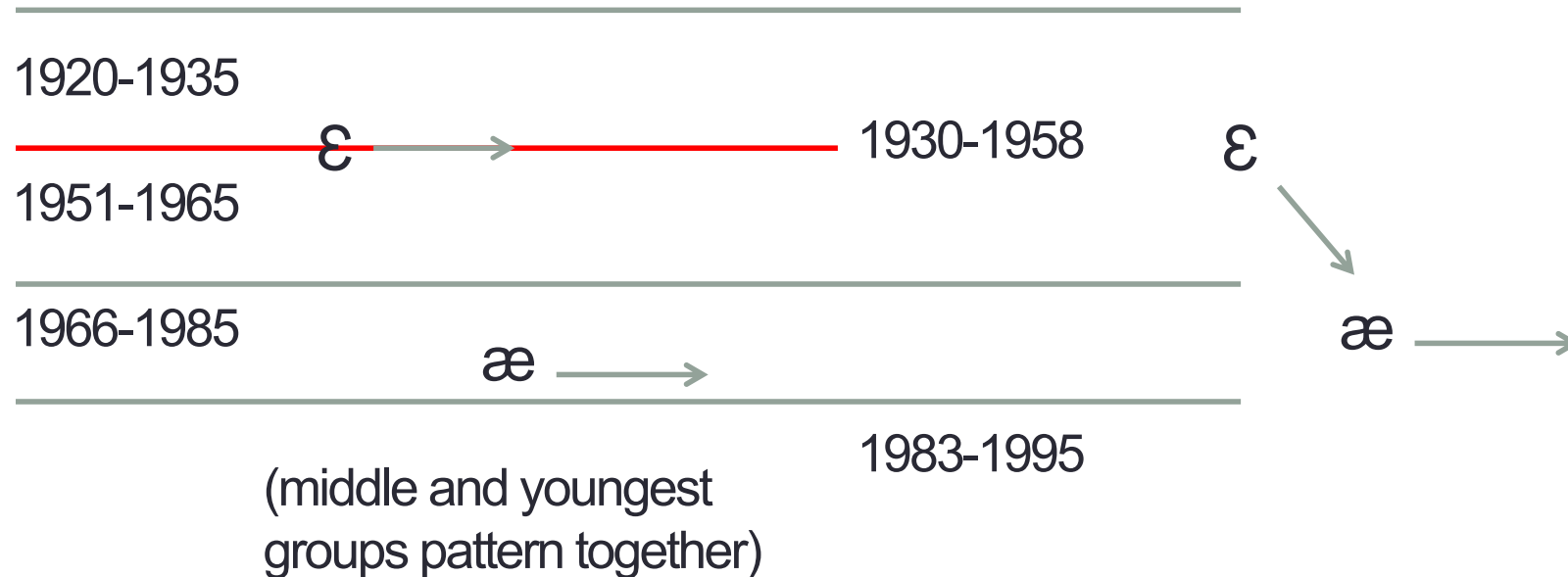
Current study:



Real-time change – Toronto

Roeder & Jarmasz (2009):

Hoffman (2010):



Real-time change – Vancouver

Esling & Warkentyne (1993):

Sadlier-Brown & Tamminga (2010)

pre-1920

1920-1955

1956-1964

1922-1972

1981-1986

ɛ

ɛ

æ

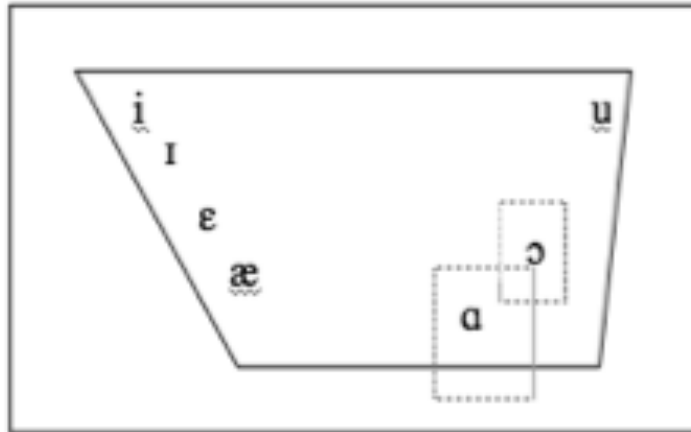
æ



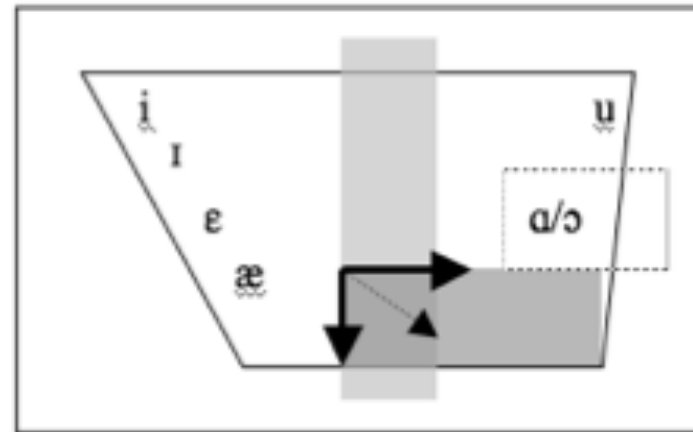
(oldest and middle groups
pattern together)

Roeder and Jarmasz's (2010) proposal

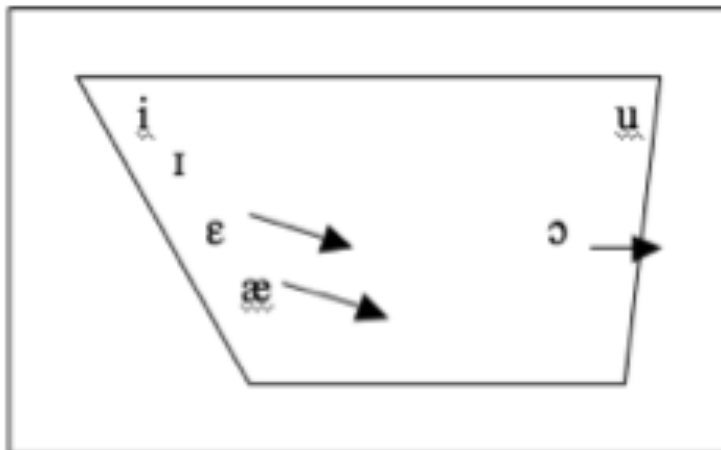
a.



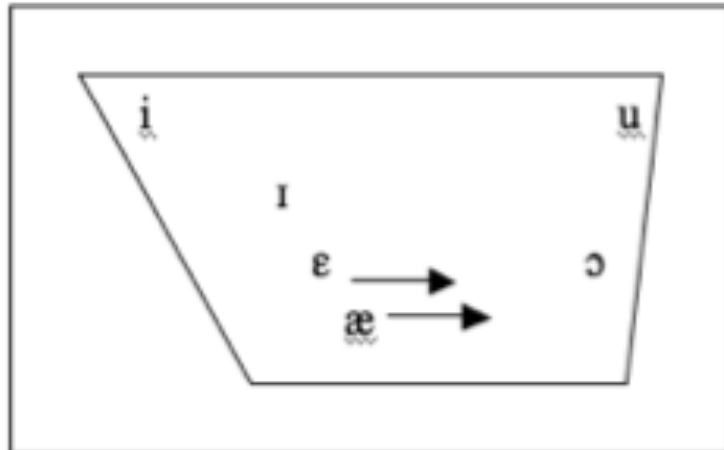
b.



c.



d.



My own proposal

Low-back merger:

Pre-WWII

/æ/ lowering: Sadlier-Brown & Tamminga (2010) (Halifax); Boberg (2005); Clarke, Elms & Youssef (1995)

/æ/ retraction: Esling & Warkentyne (1993); Hoffman (2010); Roeder & Jarmasz (2009); Boberg (2005); current study

/ɛ/ retraction: Hoffman (2010); Sadlier-Brown & Tamminga (2010) (both Halifax and Vancouver); Roeder & Jarmasz (2009); Boberg (2005); current study

“...front vowels are retracted in a set of parallel shifts, rather than rotating in a chain shift” (Boberg 2005)

ɛ

ɔ

ɒ

æ

ɑ

/ɛ/ lowering: Clarke, Elms & Youssef (1995); Sadlier-Brown & Tamminga (2010) (both Halifax and Vancouver); Hoffman (2010); current study

Geographic diffusion

- Roeder and Jarmasz (2009): “Can these findings be reconciled?”
 - CS is no longer active in Toronto, has not been for the past 60 years
 - In Montreal, however, Boberg’s (2005) results indicate that CS only really took off in Montreal once it was over in Toronto
 - No comparative data for Halifax, but later lowering of /æ/ indicates lagging behind metropolitan centres
 - As such, more research is needed in tertiary cities and rural areas throughout Canada to improve modeling of geographic spread



/æ/ lowering

1. Toronto, Vancouver
2. Montreal (and Halifax)

/æ/ retraction

All Cities

/ɛ/ retraction

All Cities

/ɛ/ lowering

1. Toronto & Vancouver
2. Montreal

Conclusions

- /æ/ is retracting, while /ɛ/ is lowering and retracting in apparent time in Montreal
- Among same participants who supplied data for production experiment, significant age effects were shown along the /ɛ/-/ʌ/ continuum, but not along the /ɛ/-/æ/ continuum or the /æ/-/ɔ/ continuum
- /ɛ/-/ʌ/ shift is a more recent development of the Canadian Shift than /æ/-/ɔ/ shift, but retraction of /ɛ/ towards /æ/ is most recent
- Evidence for Trudgill's (1973) gravity model of diffusion following urban hierarchy within Canada

Few significant perceptual differences in /æ/-/ɛ/ categorization in front of vowel space

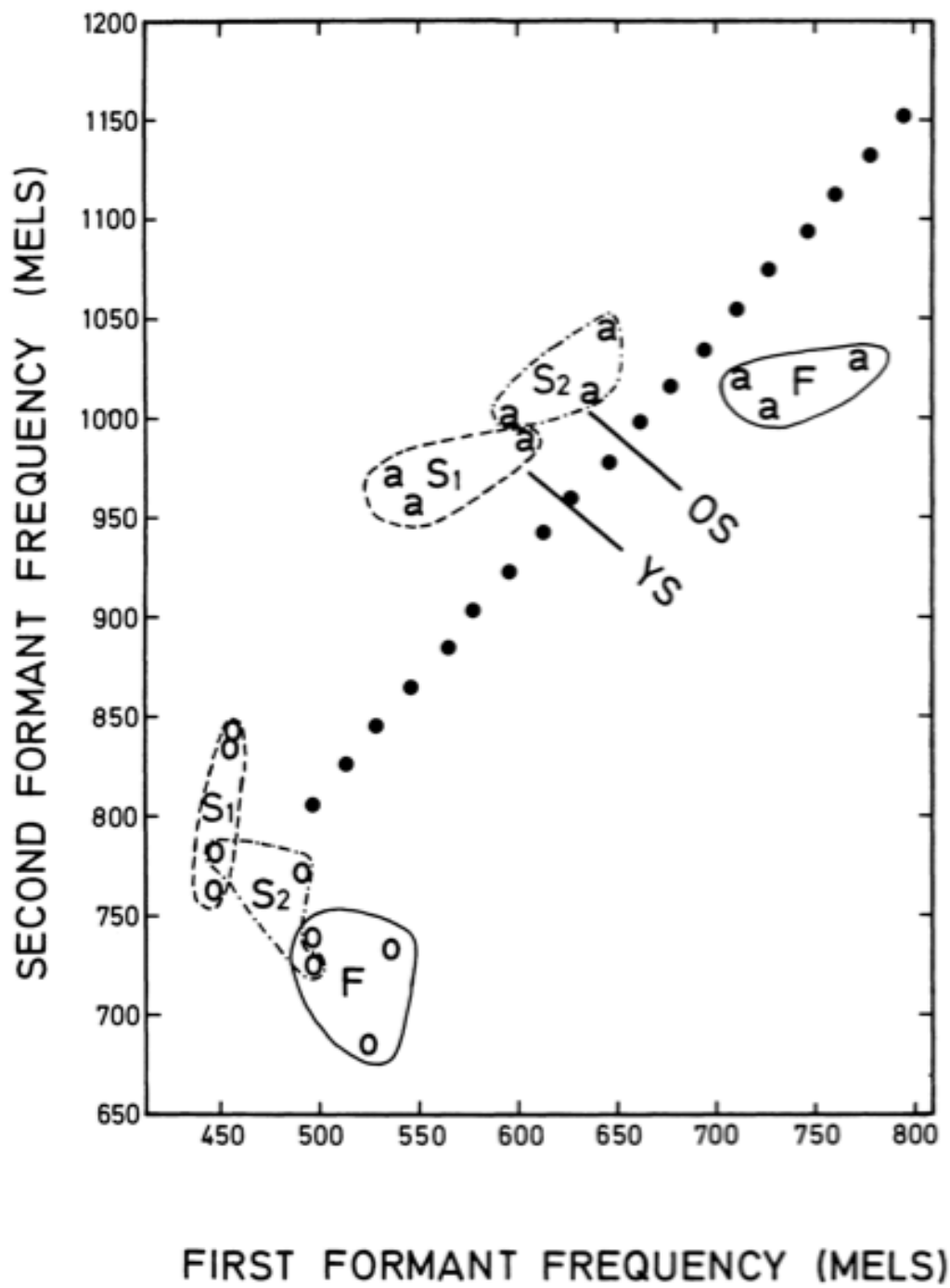
Mixed-effects logistic regressions for responses in the F1 = 850, 900, and 950Hz axes: predictor of **gender** and **age** on F2, all possible by-subject random effects (intercept and slopes) included:

/æ/	z-value	p-value
Gender	0.854	0.393
Age	-1.506	0.132

/ɔ/	z-value	p-value
Gender	-1.302	0.193
Age	-0.773	0.440

Previous studies of vowel perception in ongoing shifts

- Janson (1983, 1986)
 - Stockholm Swedish – ongoing change is shifting phonemic boundary between /a:/ and /o:/
 - Tested perceptual boundary among two age groups
 - 13-18 year olds
 - 33-70 year olds



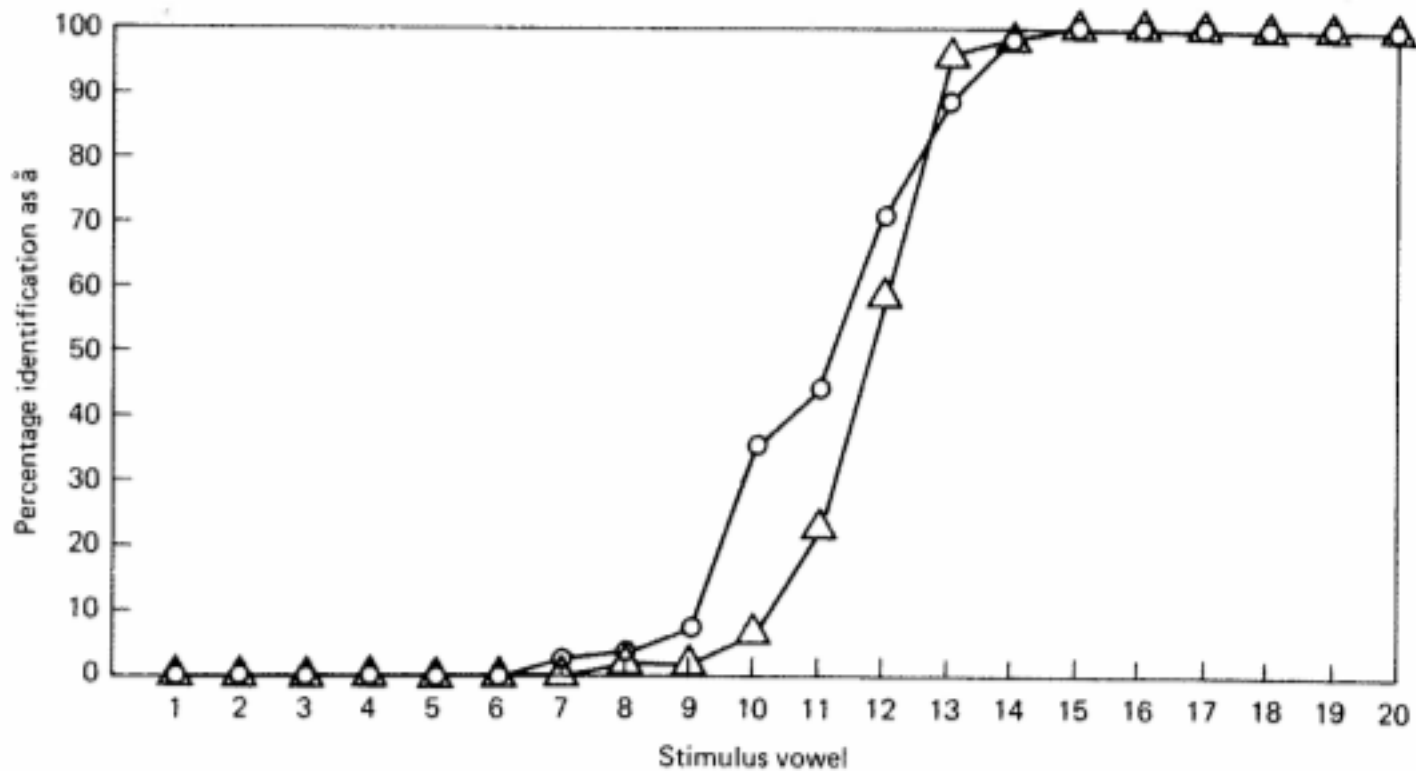
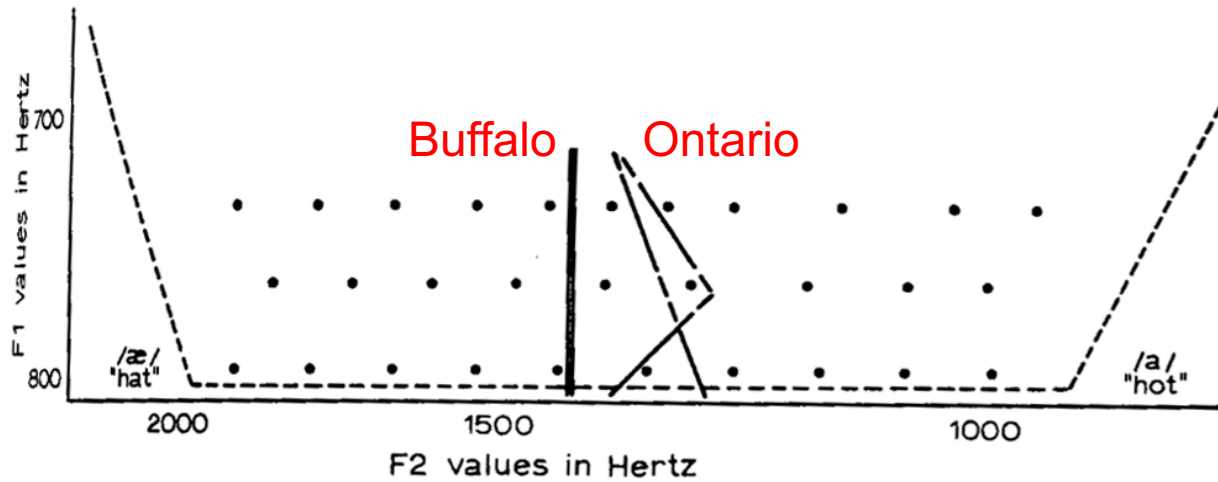
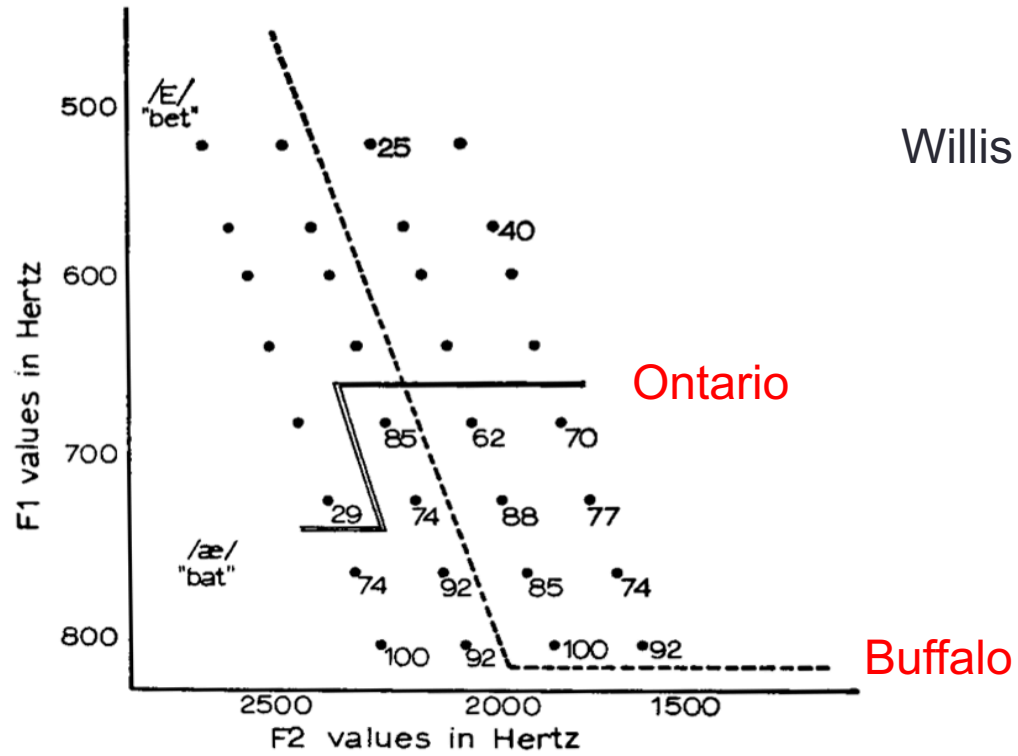


Figure 14.1 Identification of stimuli 1 through 20 as ä by young Stockholmers (Δ) and older Stockholmers (\circ).

Previous studies of vowel perception in ongoing shifts

- Willis (1972)
 - Not intergenerational, but between two regional dialects
 - High school students in Fort Erie, ON and Buffalo, NY – separated by just a river, but quite distinct vowel systems
 - Looking at two-way phoneme distinctions (*bet* vs. *bat*, *hot* vs. *hat*), but in a two-dimensional grid rather than just along one continuum

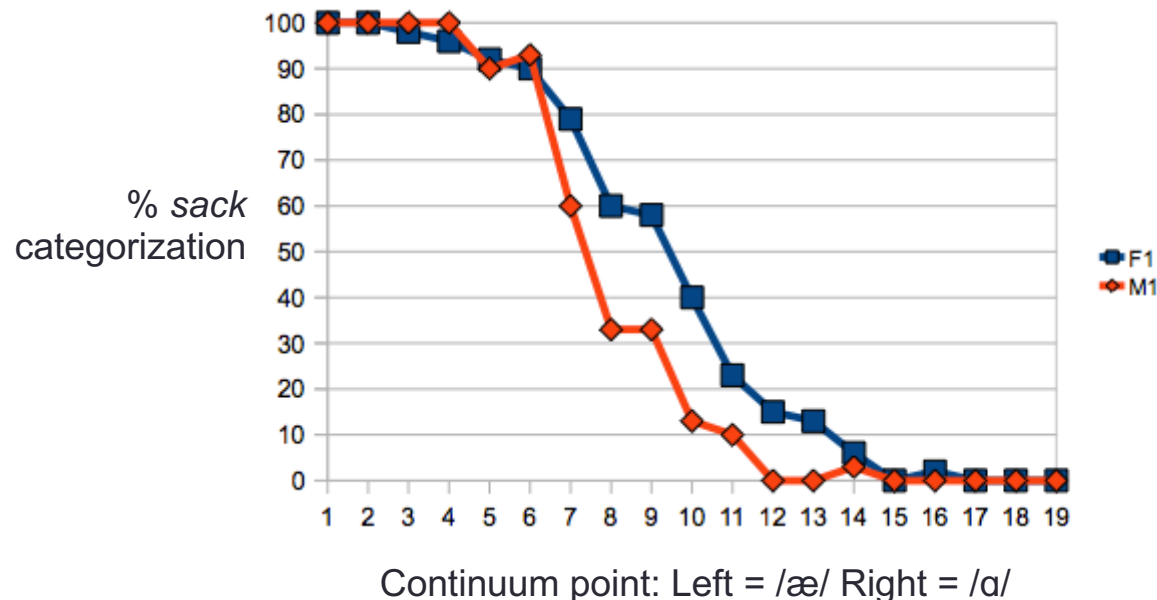
Willis (1972)



Previous studies of vowel perception in ongoing shifts

- De Decker (2010)
 - Vowel assignments of *sack* vs. *sock* in Ontarians
 - Found significant gender differences, not very much age difference

/æ/-categorization by Gender in the youngest age group.



Issues

- Methodology
 - Consonantal context around vowel tokens
 - Though Strange et al. 1976, Strange, Edman, and Jenkins 1979, Rakerd 1984, and Fox 1989 indicated that a CVC stimulus improves accuracy in vowel categorization tests, Macchi (1980) “failed to provide evidence that vowels spoken in consonantal context are better identified than naturally produced isolated vowels”
 - Diehl, McCusker, and Chapman (1980) and Strange, Jenkins, and Johnson (1983) found that error rates in phoneme mapping with isolated short vowel stimuli were relatively low
 - Presentation of perception buttons
 - Clopper, Hay, and Plichta (2011) say this opens the door to participant response bias, as subjects tend “to respond with the leftmost (or topmost) item”
 - Diehl, McCusker, and Chapman (1980) note that “anything that enhances the stability of the stimulus representation in short-term memory should also enhance identification performance”

Issues

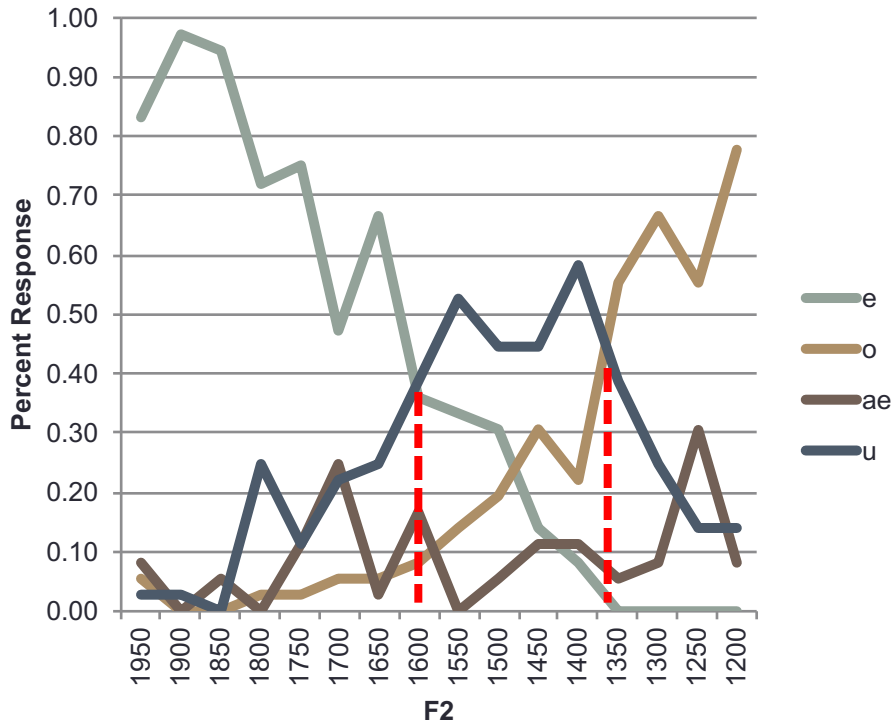
- Aimed to record “default” categorization, but is this really possible?
 - **Gender** (Johnson, Strand, and D’Imperio 1999, Strand 1999), **age** (Drager 2010), **knowledge of origin** (Niedzielski 1999), and **stuffed animal presence** (Hay and Drager 2010) can affect categorization
 - Listeners specifically denied any information on the identity of the “speaker” of the stimuli they were categorizing
 - Stimuli themselves were all produced by a single synthesizer script, controlled for any non-F1/F2 phonetic features such as the values of F0, F3, and breathiness
- **Statistics**
 - Sample size of 28
 - Uneven distribution: 5 older females, 5 younger females, 7 younger males, 11 older males

Older Listeners		F2															
		1950	1800			1700	1600			1500	1400		1300	1200			
F1	700	ɛ	ɛ	ɛ	ɛ		ɛ	ʌ	ʌ	ʌ	ʌ	ʌ	ʌ	ʌ	ʌ	ɔ	ɔ
	750	ɛ	ɛ	ɛ	ɛ	ɛ	ɛ		ʌ	ʌ	ʌ	ʌ	ʌ	ʌ		ɔ	ɔ
	800	ɛ	ɛ	ɛ		ɛ	æ	ʌ	ʌ	ʌ	ʌ	ʌ	ʌ	ʌ	ɔ	ɔ	ɔ
	850	ɛ	æ	æ	æ	æ		æ	æ	æ	æ				ɔ	ɔ	ɔ
	900	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ		ɔ	ɔ
	950	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	ɔ		ɔ

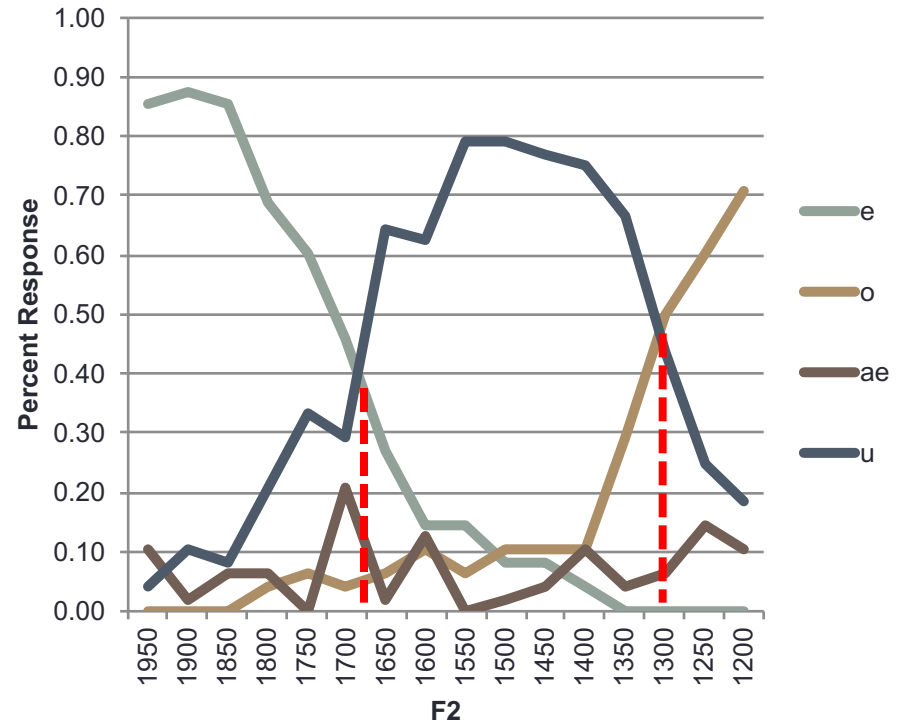
Younger Listeners		F2																
		1950	1800			1700	1600			1500	1400		1300	1200				
F1	700	ɛ	ɛ	ɛ		ɛ		ɛ	ɛ			ʌ	ɔ	ɔ	ɔ	ɔ	ɔ	
	750	ɛ	ɛ	ɛ	ɛ	ɛ	ɛ	ɛ		ʌ		ʌ		ɔ	ɔ	ɔ	ɔ	
	800	ɛ	ɛ	ɛ	ɛ	ɛ	æ	ɛ	ʌ	ʌ				ɔ	æ		ɔ	
	850		æ	æ		æ		æ	æ	æ	æ				ɔ	ɔ	ɔ	
	900	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	ɔ	ɔ	ɔ
	950	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ			ɔ		ɔ

Collapsing top three F1 rows together

Younger group, F1=700,750,800



Older group, F1=700,750,800

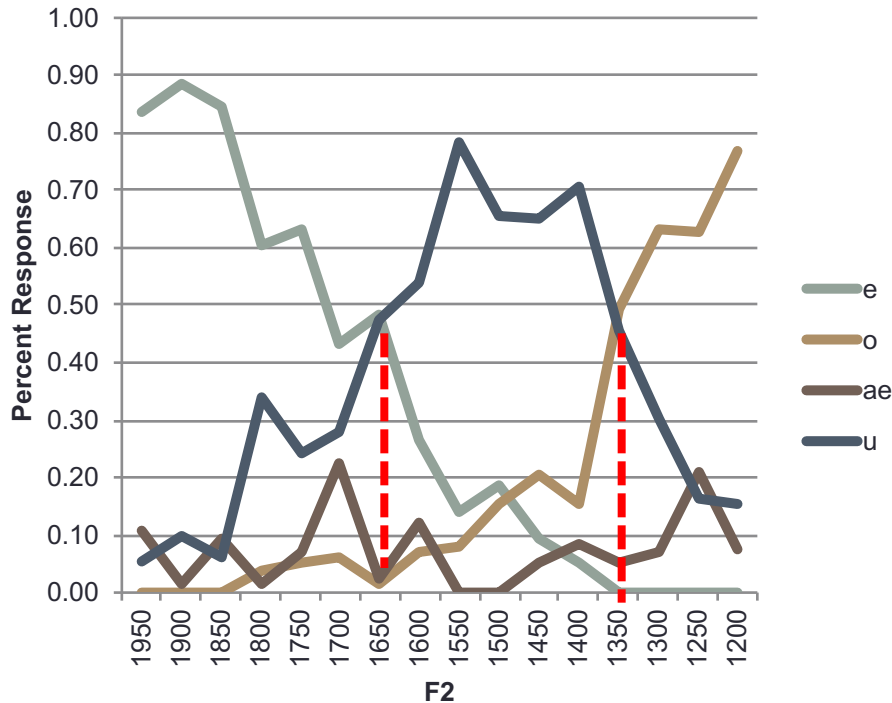


Mixed-effects logistic regression for responses in the F1 = 700, 750, and 800 Hz axes: predictor of **age** on **F2**, all possible by-subject random effects (intercept and slopes) included

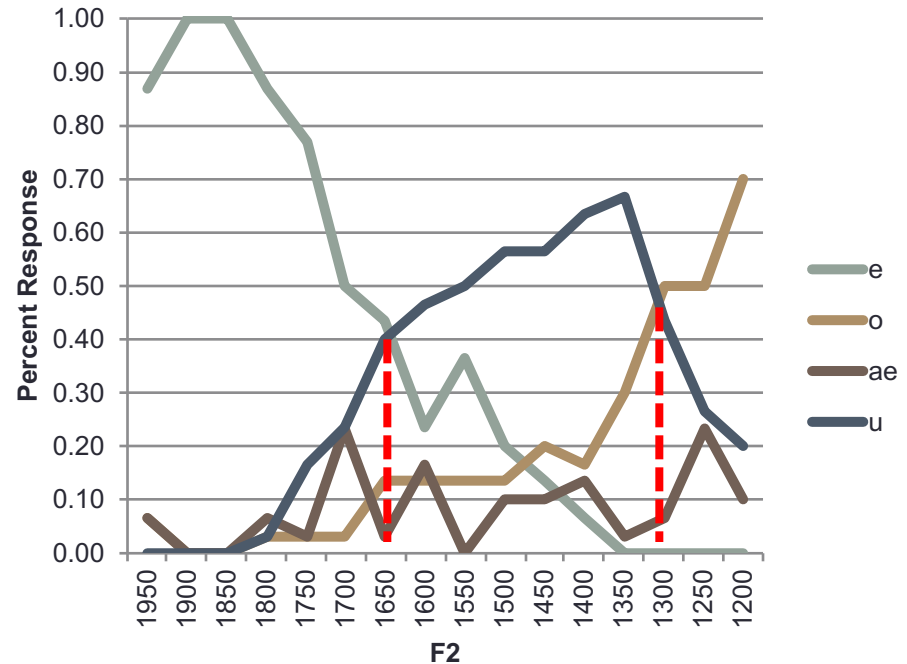
Vowel	z-value	p-value
ε	2.204	0.028
Λ	-3.013	0.003
æ	1.177	0.239
ɔ	0.931	0.352

Collapsing top three F1 rows together

Males, F1=700,750,800



Women, F1=700,750,800



Mixed-effects logistic regression for responses in the F1 = 700, 750, and 800 Hz axes: predictor of **gender** on F2, all possible by-subject random effects (intercept and slopes) included

Vowel	z-value	p-value
ε	-0.644	0.519
Λ	1.307	0.191
æ	-0.268	0.789
ɔ	0.127	0.899

		F2															
Male Listeners		1950	1800	1700	1600	1500	1400	1300	1200								
		700															
	750	ɛ	ɛ	ɛ	ɛ	ɛ	ɛ	ɛ		ʌ	ʌ	ʌ	ʌ	ʌ	ɔ	ɔ	ɔ
F1	800	ɛ	ɛ	ɛ		ɛ	æ		ʌ	ʌ	ʌ	ʌ		ʌ	ɔ	ɔ	ɔ
	850	ɛ	æ	æ	æ	æ	æ	æ	æ	æ				ɔ		ɔ	ɔ
	900	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	ɔ	ɔ	ɔ
	950	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	ɔ		ɔ	ɔ

		F2															
Female Listeners		1950	1800	1700	1600	1500	1400	1300	1200								
		700															
	750	ɛ	ɛ	ɛ	ɛ	ɛ	ɛ	ɛ		ʌ	ʌ	ʌ	ʌ	ʌ			ɔ
F1	800	ɛ	ɛ	ɛ	ɛ	ɛ	æ		ʌ			ʌ			ɔ		ɔ
	850	æ		æ	ɛ	æ	ɛ	æ	æ	æ	æ						ɔ
	900	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ		ɔ	ɔ
	950	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ		æ	ɔ	

		F2															
Male																	
F1	Listeners	1950	1800	1700	1600	1500	1400	1300	1200								
	700	ɛ	ɛ	ɛ	ɛ		ʌ	ʌ	ʌ	ʌ	ʌ	ɔ		ɔ	ɔ		
	750	ɛ	ɛ	ɛ	ɛ	ɛ	ɛ	ɛ		ʌ	ʌ	ʌ	ʌ	ʌ	ɔ	ɔ	ɔ
	800	ɛ	ɛ	ɛ		ɛ	æ		ʌ	ʌ	ʌ	ʌ		ʌ	ɔ	ɔ	ɔ
	850	ɛ	æ	æ	æ	æ	æ	æ	æ	æ	æ		ɔ		ɔ	ɔ	
	900	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	ɔ	ɔ	ɔ
	950	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	ɔ		ɔ

		F2															
Female																	
F1	Listeners	1950	1800	1700	1600	1500	1400	1300	1200								
	700	ɛ	ɛ	ɛ	ɛ		ɛ		ɛ		ʌ	ʌ	ʌ	ʌ	ɔ		ɔ
	750	ɛ	ɛ	ɛ	ɛ	ɛ	ɛ	ɛ		ʌ	ʌ	ʌ	ʌ	ʌ			ɔ
	800	ɛ	ɛ	ɛ	ɛ	ɛ	æ		ʌ			ʌ			ɔ		ɔ
	850	æ		æ	ɛ	æ	ɛ	æ	æ	æ	æ						ɔ
	900	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ		ɔ	ɔ
	950	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ	æ		æ	ɔ