

## Using Chinese EFL Errors to Solve Issues in Mandarin Phonological Structure

由中国学生的英语发音偏差  
探讨汉语音韵结构

李文肇

Chris Wen-chao Li

San Francisco State University

## OUTLINE

### 1. Introduction

- Perspectives on L1 transfer
- Key issues
  1. Mandarin rime structure
  2. Status of the Mandarin alveopalatals

### 2. ISSUE 1: Mandarin rime structure

- Possible rimes in Mandarin
- Proposed rime structures
- Evidence from Mandarin L1 transfer
- Parallels in neighboring languages
  1. Cantonese
  2. Vietnamese

### 3. ISSUE 2: Status of the Mandarin alveopalatals

- Problem of complementary distribution
- Proposed groupings
- View from interlanguage phonology

## Perspectives on L1 phonological transfer

### • Traditional perspective:

- How L1 /L2 phonological structure affects L2 acquisition
- Minimize **negative L1 transfer** in L2 acquisition (so as to achieve more native-like pronunciation)
  - Contrastive Analysis Hypothesis [CAH] (Lado 1957:2)
  - Markedness Differential Hypothesis [MED] (Eckman 1977: 61)
  - Speech Learning Model (Flege 1987)

### • New perspective:

- What can L1 phonological transfer tell us about the **phonological structure(s)** of L1 /L2
- (Non-pedagogical) purpose is to shed light on **language structure**

## KEY ISSUES

### 1. Mandarin syllable structure

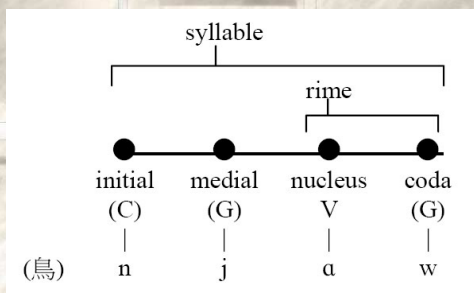
#### - rime structure

#### - Phonemic status of the Mandarin alveopalatals

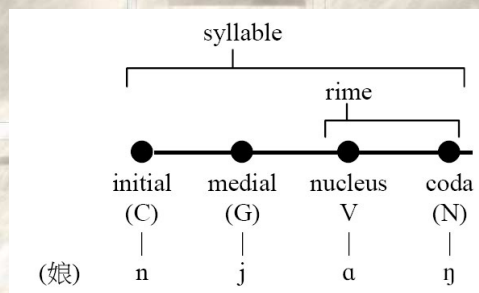
#### - alveopalatals $\text{t\check{c}}$ , $\text{t\check{c}}^h$ , $\text{c}$ in complementary distribution with

1. alveolar sibilants
2. retroflex initials
3. velar initials

## ISSUE 1: Mandarin syllable structure (basic syllable, no diminutive suffix)



## ISSUE 1: Mandarin syllable structure (basic syllable, no diminutive suffix)



### Possible Mandarin rimes

- Possible (complex) rimes in Mandarin (non-rhotic syllables only)
  - **VG**: aj, aw, əj, əw
  - **VN**: an, aŋ, ən, əŋ

### Hierarchical rime structure

- PROPOSALS
  1. **Branching nucleus**
  2. **Branching coda**
  3. **Non-branching**

### RIME STRUCTURE (1): Branching nucleus (Lin 1989)

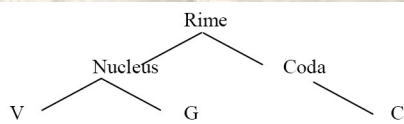


Fig. 5 Lin's model of Mandarin rime structure (1989: 27; 2007: 108)

### RIME STRUCTURE (1): Branching nucleus (Lin 1989)

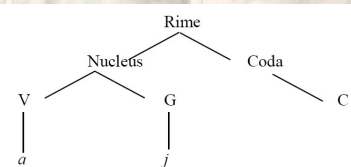


Fig. 6 VG rime (/aj/ 愛) in Lin's (1989; 2007) rime structure

### RIME STRUCTURE (1): Branching nucleus (Lin 1989)

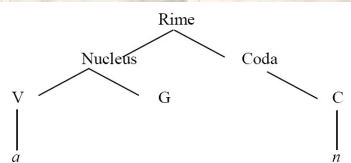


Fig. 7 VN rime (/an/ 安) in Lin's (1989; 2007) rime structure

### RIME STRUCTURE (2): Branching coda (C. Cheng 1973)

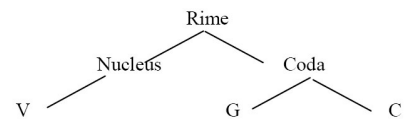


Fig. 2 C. Cheng's model of Mandarin rime structure (1973: 11)

### RIME STRUCTURE (2): Branching coda (C. Cheng 1973)

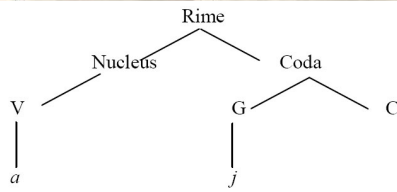


Fig. 3 VG rime (/aj/ 愛) in C. Cheng's Mandarin rime structure

### RIME STRUCTURE (2): Branching coda (C. Cheng 1973)

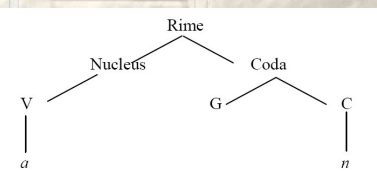


Fig. 4 VN rime (/an/ 安) in C. Cheng's (1973) Mandarin rime structure

### RIME STRUCTURE (3): Non-branching (R. Cheng 1966, Kuo 1994, Li 1999, Duanmu 2000)

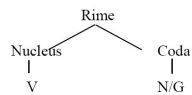


Fig. 8 Non-sub-branching rime structure (R. Cheng 1966; Yin 1989; Kuo 1994; C. Li 1999; Duanmu 1990, 2000)

### RIME STRUCTURE (3): Non-branching (R. Cheng 1966, Kuo 1994, Li 1999, Duanmu 2000)

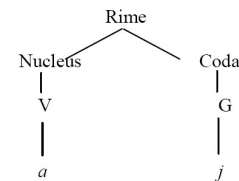


Fig. 9 VG rime (/aj/ 愛) in non-sub-branching rime structure

### RIME STRUCTURE (3): Non-branching (R. Cheng 1966, Kuo 1994, Li 1999, Duanmu 2000)

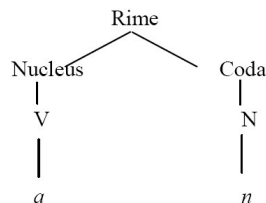


Fig. 10 VN rimes (/an/ 安) in non-sub-branching rime structure

### Which hierarchical rime structure?

- Evidence from L1 phonological transfer

### Evidence from L1 phonological transfer

- **OBSERVATION:** Chinese ESL learners difficulty producing diphthong plus consonantal coda
  - Huang and Radant (2009)
    - “Taiwanese EFL students can articulate [ej] correctly in words such as *play* and *bay*; strangely, it is quite common that they pronounce *lake* as [lɛk] or *tape* as [tʰɛp]” (2009: 152)
    - “*lame* is pronounced [lɛm]; *safe* is pronounced [sɛf]; *sale* is pronounced [sɛl]; *sane* is [sɛn]” (2009: 153)
    - “*town* is pronounced [tʰɑŋ]” (2009: 153)

### Evidence from L1 phonological transfer

- **OBSERVATION:** Chinese ESL learners difficulty producing diphthong plus consonantal coda
  - S. Chang (2008)
    - [Taiwanese EFL learners' pronunciation of English /ej/]
    - **Closed syllables** (61% accurate) inhibit accurate pronunciation of [ej] (2008: 45);
    - **Open syllables** (86% accurate) promote accurate pronunciation of [ej] (2008: 45)
    - Attributed to transfer of L1 phonotactics – Mandarin /ej/ appears only in open syllables (2008: 12–13; 61–62)

### Evidence from L1 phonological transfer

- **OBSERVATION:** Chinese ESL learners difficulty producing diphthong plus consonantal coda
  - An (2007)
    - [Taiwanese EFL learners' pronunciation of English diphthong /aw/]
    - diphthong [aw] tends to be pronounced correctly in **open syllables** (2007: 42)
    - diphthong [aw] tends to be reduced to [a] in syllables **closed** by nasals, e.g., “down” (2007: 43)
    - the phenomenon is so prevalent that not only learners, but **even language teachers** say [dan] instead of [dawn] (2007: 4)

### Evidence from L1 phonological transfer

- **INTERPRETATION:**
  - evidence for non-branching nucleus and coda

### Evidence from L1 phonological transfer

- Adaptation of ENGLISH “sane” into branching nucleus rime structure

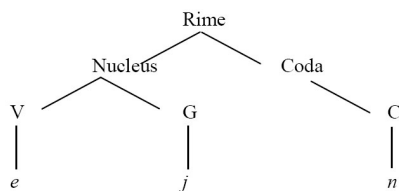


Fig. 12 Rime [ejn] positioned within Lin's (1989; 2007) model of Mandarin rime

### Evidence from L1 phonological transfer

- Adaptation of ENGLISH “sane” into branching coda rime structure

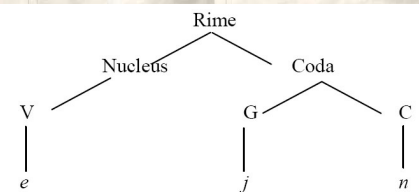


Fig. 11 Rime [ejn] positioned within C. Cheng's (1973) model of Mandarin rime

### Evidence from L1 phonological transfer

- Adaptation of ENGLISH “sane” into non-branching rime structure

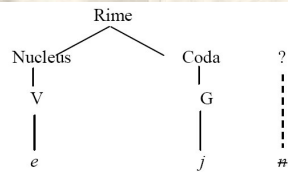


Fig. 13 Forcing rime [ejn] into a single-nucleus, single-coda rime structure via coda deletion

### Evidence from L1 phonological transfer

- Adaptation of ENGLISH “sane” into non-branching rime structure

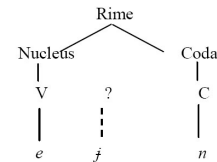


Fig. 14 Forcing rime [ejn] into a single-nucleus, single-coda rime structure via monophthongization

### Evidence from L1 phonological transfer

- Adaptation of ENGLISH “sane” into non-branching rime structure
- Conclusion:
  - branching nucleus structure (OK)
  - branching coda structure (OK)
  - non-branching structure (\*incompatible)
- Branching nucleus and branching coda structures erroneously predict that Chinese native speakers would not have trouble with rime [ejn]
- Only non-branching structure predicts that Chinese native speakers cannot produce rime [ejn]

### Evidence from L1 phonological transfer

- Adaptation of ENGLISH “town” into branching nucleus rime structure

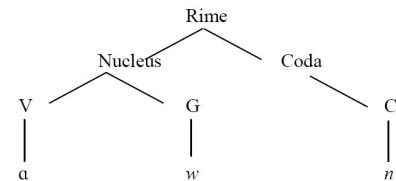


Fig. 16 Rime [awn] positioned within Lin's (1989) model of Mandarin rime

### Evidence from L1 phonological transfer

- Adaptation of ENGLISH “town” into branching coda rime structure

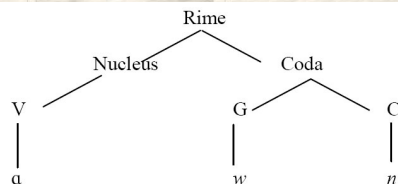


Fig. 15 Rime [awn] positioned within C. Cheng's (1973) model of Mandarin rime

### Evidence from L1 phonological transfer

- Adaptation of ENGLISH “town” into non-branching rime structure

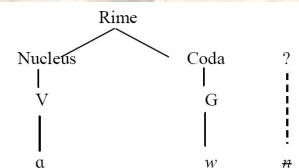


Fig. 17 Forcing rime [awn] into a single-nucleus, single-coda rime structure via coda deletion



### Evidence from L1 phonological transfer

- Adaptation of ENGLISH “town” into **non-branching** rime structure

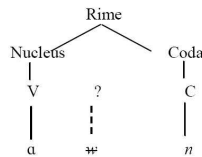


Fig. 18 Forcing rime [awn] into a single-nucleus, single-coda rime structure via monophthongization

### Evidence from L1 transfer

- Adaptation of ENGLISH “town” into **non-branching** rime structure

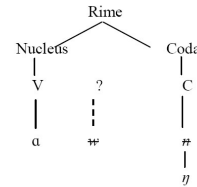


Fig. 19 Forcing rime [awn] into a single-nucleus, single-coda rime structure via monophthongization and coda tweaking

### Evidence from L1 transfer

- Adaptation of ENGLISH “town” into **non-branching** rime structure
  - Conclusion:
    - branching nucleus structure (OK)
    - branching coda structure (OK)
    - non-branching structure (\*incompatible)
  - Branching nucleus and branching coda structures erroneously predict that Chinese native speakers would not have trouble with rime [awn]
  - Only non-branching structure predicts that Chinese native speakers cannot produce rime [awn]

### Parallels in neighboring languages: CANTONESE

- Possible rimes in CANTONESE:
  - VG: vowel plus glide j or w
  - VN: vowel plus nasal m, n or ŋ
  - VC: vowel plus stop p, t or k

### Parallels in neighboring languages: CANTONESE

- OBSERVATION:** Cantonese ESL learners difficulty producing diphthong plus consonantal coda
  - L. Chang (1975: 232–233)
    - Cantonese diphthongs occur only in the final position, i.e., in open syllables. ...
    - [Cantonese speakers have problem pronouncing] English diphthongs with full glide in closed syllables.

### Parallels in neighboring languages: CANTONESE

- OBSERVATION:** Cantonese ESL learners difficulty producing diphthong plus consonantal coda (L. Chang 1975: 233)

#### ADAPTATION STRATEGY 1: Incomplete glide

Gloss (ENG)	Target language pronunciation	Interlanguage pronunciation
same	sejm	sem
home	howm	hom

### Parallels in neighboring languages: CANTONESE

- **OBSERVATION:** Cantonese ESL learners difficulty producing diphthong plus consonantal coda (L. Chang 1975: 233)

- ADAPTATION STRATEGY 2: Final consonant omission

Gloss (ENG)	Target language pronunciation	Interlanguage pronunciation
out	awt	aw
time	tajm	taj
five	fajv	faj

### Parallels in neighboring languages: VIETNAMESE

- Most diphthongs occur only in CV structures (Hansen 2001: 339)
- Single consonants always deleted after diphthongs (Benson 1988: 226–228)

### Parallels in neighboring languages: VIETNAMESE

- **OBSERVATION:** Vietnamese ESL learners difficulty producing diphthong plus consonantal coda (Benson 1988: 228)

- ADAPTATION STRATEGY 2: Final consonant omission

Gloss (ENG)	Target language pronunciation	Interlanguage pronunciation
like	lajk	laj
right	ɹajt	ɹaj
out	awt	aw
down	dawn	daw
late	lejt	lej
eight	ejt	ej

### CONCLUSION (rime structure)

- Incompatibility of diphthong+consonant with East Asian dual-slot VC rime structures, as evidenced by interlanguage adaptations
- Strategies used to reduce diphthong plus consonant structures:
  - **Mandarin:**
    - monophthongization (with phonotactic adjustment)
  - **Cantonese:**
    - monophthongization for mid vowels (lesser vowel distance);
    - consonant deletion for low vowel (greater vowel distance)
  - **Vietnamese:**
    - consonant deletion

### ISSUE 2: Phonemic status of the alveopalatals

- Complementary distribution

vowel / glide vs initial	alveopalatal	velar	retroflex	alveolar sibilant
zero	-	k, k <sup>h</sup> , x	tʂ, tʂ <sup>h</sup> , ʂ	ʈ, ʈ <sup>h</sup> , ʂ
i/ɨ	tɕ, tɕ <sup>h</sup> , ɕ	-	-	-
u/ʉ	-	k, k <sup>h</sup> , x	tʂ, tʂ <sup>h</sup> , ʂ	ʈ, ʈ <sup>h</sup> , ʂ
ɤ/ʏ	tɕ, tɕ <sup>h</sup> , ɕ	-	-	-

### ISSUE 2: Phonemic status of the alveopalatals

- The problem of complementary distribution
  - The alveopalatal initials [tɕ], [tɕ<sup>h</sup>], [ɕ] occur exclusively before the vowels [i], [y] or their corresponding medial glides, whereas there exist three other sets of Mandarin initials, namely the alveolar sibilants [ʈɕ], [ʈɕ<sup>h</sup>], [ʂ], the retroflex sibilants [tʂ], [tʂ<sup>h</sup>], [ʂ], and the velars [k], [k<sup>h</sup>], [x], which never appear before [i], [y] or their corresponding glides.
  - The complementary distribution of the **alveopalatal initials** with the **alveolar sibilants**, the **retroflex sibilants**, and the **velars** have prompted many linguists to treat the alveopalatals as allophonic variants of one of the three complementary series, most notably the alveolar sibilants or the velars

## ISSUE 2: Phonemic status of the alveopalatals

vowel/glide vs initial	alveopalatal	velar	retroflex	alveolar sibilant
<b>zero</b>	-	k, k <sup>h</sup> , x	tʂ, tʂ <sup>h</sup> , ʂ	ts, ts <sup>h</sup> , s
<b>i/j</b>	tɕ, tɕ <sup>h</sup> , ɕ	-	-	-
<b>u/w</b>	-	k, k <sup>h</sup> , x	tʂ, tʂ <sup>h</sup> , ʂ	ts, ts <sup>h</sup> , s
<b>y/q</b>	tɕ, tɕ <sup>h</sup> , ɕ	-	-	-

### PROPOSALS

1. Grouping with velars
2. Grouping with alveolar sibilants
3. Grouping with retroflex initials (no proposals to date)
4. Alveopalatals as independent series (accidental gap)

## OPTION 1: Grouping with velars

- Chao (1934) was the first to formally argue for treatment of the alveopalatals as allophones of the velar initials, citing native speaker judgement of sound similarity and alveopalatal-velar interchangeability in Mandarin language games (1934: 48).
- Additional evidence ranging from etymological origin and alliterative onomatopoeic expressions to English-Chinese transliteration conventions have been cited to support the alveopalatal-velar affiliation (Fu 1956; R. Cheng 1966; Lin 1989)

## OPTION 1: Grouping with velars

vowel/glide vs initial	velar	retroflex	alveolar sibilant
<b>zero</b>	k, k <sup>h</sup> , x	tʂ, tʂ <sup>h</sup> , ʂ	ts, ts <sup>h</sup> , s
<b>i/j</b>	tɕ, tɕ <sup>h</sup> , ɕ	-	-
<b>u/w</b>	k, k <sup>h</sup> , x	tʂ, tʂ <sup>h</sup> , ʂ	ts, ts <sup>h</sup> , s
<b>y/q</b>	tɕ, tɕ <sup>h</sup> , ɕ	-	-

## OPTION 2: Grouping with alveolar sibilants

- Duanmu (2000) uses native speaker intuition to argue for treating the alveopalatals as palatalized allophones of the alveolar sibilants, citing also greater phonetic similarity between the two series.

vowel/glide vs initial	velar	retroflex	alveolar sibilant
<b>zero</b>	k, k <sup>h</sup> , x	tʂ, tʂ <sup>h</sup> , ʂ	ts, ts <sup>h</sup> , s
<b>i/j</b>	-	-	tɕ, tɕ <sup>h</sup> , ɕ
<b>u/w</b>	k, k <sup>h</sup> , x	tʂ, tʂ <sup>h</sup> , ʂ	ts, ts <sup>h</sup> , s
<b>y/q</b>	-	-	tɕ, tɕ <sup>h</sup> , ɕ

## OPTION 3: Grouping with retroflex initials (no proposals to date)

vowel/glide vs initial	velar	retroflex	alveolar sibilant
<b>zero</b>	k, k <sup>h</sup> , x	tʂ, tʂ <sup>h</sup> , ʂ	ts, ts <sup>h</sup> , s
<b>i/j</b>	-	tɕ, tɕ <sup>h</sup> , ɕ	-
<b>u/w</b>	k, k <sup>h</sup> , x	tʂ, tʂ <sup>h</sup> , ʂ	ts, ts <sup>h</sup> , s
<b>y/q</b>	-	tɕ, tɕ <sup>h</sup> , ɕ	-

## OPTION 4: Alveopalatals as independent series

- C.C. Cheng (1973: 38) notes that much of the affiliation of the alveopalatals with the velars and alveolar sibilants is historical rather than synchronic in nature.
- Claims of native speaker judgement and evidence from alliterative onomatopoeic expressions in the literature have been shown to be conflicting (Kuo 1994; Li 1999).
- "it remains to be investigated whether the phonemes established on these criteria are in accordance with the phonemes taken to represent perceptual units of the native speaker" (R. Cheng 1966: 142).



#### OPTION 4: Alveopalatals as independent series

vowel / glide vs initial	alveopalatal	velar	retroflex	alveolar sibilant
zero	-	k, kʰ, x	tʂ, tʂʰ, ʂ	ts, tsʰ, s
i/j	tɕ, tɕʰ, ɕ	-	-	-
u/w	-	k, kʰ, x	tʂ, tʂʰ, ʂ	ts, tsʰ, s
y/ɥ	tɕ, tɕʰ, ɕ	-	-	-

#### Which option regarding the phonemic status of the Mandarin alveopalatals?

- Evidence from L1 phonological transfer

#### OPTION 1: Grouping with velars

vowel / glide vs initial	velar	retroflex	alveolar sibilant
zero	k, kʰ, x	tʂ, tʂʰ, ʂ	ts, tsʰ, s
i/j	tɕ, tɕʰ, ɕ	-	-
u/w	k, kʰ, x	tʂ, tʂʰ, ʂ	ts, tsʰ, s
y/ɥ	tɕ, tɕʰ, ɕ	-	-

- Predictions of alveopalatal–velar grouping:
  - inability to pronounce ENG velar + [i]
    - “give” → [tɕiv]
    - “keep” → [tɕʰip] (confuse with “cheap”)
    - “hip” → [ɕip] (confuse with “ship”)

#### OPTION 1: Grouping with velars

vowel / glide vs initial	velar	retroflex	alveolar sibilant
zero	k, kʰ, x	tʂ, tʂʰ, ʂ	ts, tsʰ, s
i/j	tɕ, tɕʰ, ɕ	-	-
u/w	k, kʰ, x	tʂ, tʂʰ, ʂ	ts, tsʰ, s
y/ɥ	tɕ, tɕʰ, ɕ	-	-

- Result of prediction:
  - Replacement of English velars with Mandarin alveopalatals not evidenced in literature
  - Confusion of English velars with English palato-alveolars not evidenced in literature
  - Conclusion: alveopalatals are not allophones of the velars

#### OPTION 2: Grouping with alveolar sibilants

vowel / glide vs initial	velar	retroflex	alveolar sibilant
zero	k, kʰ, x	tʂ, tʂʰ, ʂ	ts, tsʰ, s
i/j	-	-	tɕ, tɕʰ, ɕ
u/w	k, kʰ, x	tʂ, tʂʰ, ʂ	ts, tsʰ, s
y/ɥ	-	-	tɕ, tɕʰ, ɕ

- Predictions of alveopalatal–alveolar sibilant grouping:
  - Inability to pronounce ENG alveolar sibilant + [i]
    - “see” → [ɕi] (Yao 2009: 293; Tsai 2011: 31–33)
    - Mandarin only; not Cantonese

#### OPTION 2: Grouping with alveolar sibilants

vowel / glide vs initial	velar	retroflex	alveolar sibilant
zero	k, kʰ, x	tʂ, tʂʰ, ʂ	ts, tsʰ, s
i/j	-	-	tɕ, tɕʰ, ɕ
u/w	k, kʰ, x	tʂ, tʂʰ, ʂ	ts, tsʰ, s
y/ɥ	-	-	tɕ, tɕʰ, ɕ

- Result of prediction:
  - Replacement of English alveolar sibilants with Mandarin alveopalatals common
  - CONCLUSION:
    - alveopalatals may well be allophones of the alveolar sibilants

### OPTION 3: Grouping with retroflex

vowel/glide vs initial	velar	retroflex	alveolar sibilant
zero	k, kʰ, x	tʂ, tʂʰ, ʂ	ʈ, ʈʰ, ʂ
i/j	-	tʂ, tʂʰ, ʂ	-
u/w	k, kʰ, x	tʂ, tʂʰ, ʂ	ʈ, ʈʰ, ʂ
y/ɥ	-	tʂ, tʂʰ, ʂ	-

- Predictions of alveopalatal-retroflex grouping:
  - Inability to pronounce retroflex + [i]
  - No basis for comparison (no retroflex plus [i] sequences in observed L2s), but
  - Approximation with ENG palato-alveolars dʒ, tʃ, f yields L1 replacements

### OPTION 3: Grouping with retroflex

vowel/glide vs initial	velar	retroflex	alveolar sibilant
zero	k, kʰ, x	tʂ, tʂʰ, ʂ	ʈ, ʈʰ, ʂ
i/j	-	tʂ, tʂʰ, ʂ	-
u/w	k, kʰ, x	tʂ, tʂʰ, ʂ	ʈ, ʈʰ, ʂ
y/ɥ	-	tʂ, tʂʰ, ʂ	-

- Approximation with ENG palato-alveolars dʒ, tʃ, f yields L1 replacements
  - Northern (mainland) Mandarin
    - "George" as 桌紙 (retroflex replacement plus vowel change)
    - English dʒ, tʃ, f have the **same place of articulation** (palato-alveolar) as Mandarin tʂ, tʂʰ, ʂ (but different tongue configuration) (Ladefoged and Maddieson 1996: 148–154)
    - English palato-alveolars are acoustically closer (in terms of centroid frequency) to Mandarin retroflex initials than to the Mandarin alveopalatals initials (Chang et al 2011: 28–29)
    - Experiments show that native speakers of Mandarin often were not able to maintain a reliable distinction between Mandarin ʂ and English f (Chang et al 2011: 30–32)

### OPTION 3: Grouping with retroflex

vowel/glide vs initial	velar	retroflex	alveolar sibilant
zero	k, kʰ, x	tʂ, tʂʰ, ʂ	ʈ, ʈʰ, ʂ
i/j	-	tʂ, tʂʰ, ʂ	-
u/w	k, kʰ, x	tʂ, tʂʰ, ʂ	ʈ, ʈʰ, ʂ
y/ɥ	-	tʂ, tʂʰ, ʂ	-

- Approximation with ENG palato-alveolars dʒ, tʃ, f yields L1 replacements
  - Southern (Taiwan) Mandarin
    - "George" as 糾舉 (alveopalatal replacement)
    - "the English segments /dʒ, tʃ, f/ have their counterparts in Mandarin /tʂ, tʂʰ, ʂ/. Their phonological similarity induces the participants to establish correspondences between the target sound and their Mandarin counterparts" (Chen 1999: iv)
    - Heritage Taiwanese learners (American-born Taiwanese) often pronounce Mandarin tʂ, tʂʰ, ʂ as dʒ, tʃ, f (Young 2007 91: 98–106)

### OPTION 3: Grouping with retroflex

vowel/glide vs initial	velar	retroflex	alveolar sibilant
zero	k, kʰ, x	tʂ, tʂʰ, ʂ	ʈ, ʈʰ, ʂ
i/j	-	tʂ, tʂʰ, ʂ	-
u/w	k, kʰ, x	tʂ, tʂʰ, ʂ	ʈ, ʈʰ, ʂ
y/ɥ	-	tʂ, tʂʰ, ʂ	-

- Approximation with English palato-alveolars dʒ, tʃ, f yields L1 replacements
  - Conclusion: **evidence is inconclusive** as to whether alveopalatals may be allophones of retroflex initials due to lack of reliable data

### OPTION 4: Alveopalatals as independent series

vowel/glide vs initial	alveopalatal	velar	retroflex	alveolar sibilant
zero	-	k, kʰ, x	tʂ, tʂʰ, ʂ	ʈ, ʈʰ, ʂ
i/j	tɕ, tɕʰ, ɕ	-	-	-
u/w	-	k, kʰ, x	tʂ, tʂʰ, ʂ	ʈ, ʈʰ, ʂ
y/ɥ	tɕ, tɕʰ, ɕ	-	-	-

- Predictions of independent alveopalatal series:
  - Predicts no problems with alveolar sibilant plus [i] sequence, e.g., "see"
  - Conclusion: L1 transfer in Chinese ESL learners shows that the Mandarin alveopalatals tɕ, tɕʰ, ɕ are most like allophones of the alveolar sibilants ʂ, ʂʰ, ʂ

### DISCUSSION

- Types of evidence** traditionally used to determine Mandarin phonological structure
  - Language games (e.g., pig Latin – artificial convention that has to be learned)
  - Poetic devices (e.g., rhyming – artificial convention that has to be learned)
  - Slips of the tongue (inconclusive)
  - Allusion and onomatopoeic expressions (historical residue)
  - Native speaker judgement (he says, she says)
- Usefulness of **interlanguage data** (involuntary)
- Varieties of Mandarin (e.g., north vs south) – heterogeneous structures