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Cantonese Loanwords: Conflicting Faithfulness in VC Rime Constraints*

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Abstract

This paper focuses on the ways in which English loanwords are brought into line with four phonotactic constraints that restrict the possible combinations of nuclear vowels and coda consonants in Cantonese Chinese. It is found that three of the four constraints are strictly enforced in loans. Repairs change either the vowel or the coda consonant. Parallel to Mandarin, changes in vowel height features ([high], [ATR]) as opposed to changes in vowel backness are employed. Coda consonant changes obey a dorsal > coronal > labial faithfulness hierarchy that mirrors the typology of coda mergers discovered by Chen (1973) for many Chinese dialects. While changes in both the vowel and coda consonant occur, on-line adaptations favor changing the coda and preserving the vowel and suggest that the relative phonetic salience of the nuclear vowel to the coda consonant still plays a role in these adaptations.

Key words: loanword adaptation, rime constraints, Cantonese, consonant place hierarchy

1. Introduction

Within generative grammar loanword phonology was originally treated as a corpus-external source of evidence to validate the productivity of the rules and constraints postulated on the basis

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of an analysis of a language's core native vocabulary. Sometimes loans contain sound combinations and structures that decide among alternative analyses whose resolution is otherwise indeterminable due to the lack of appropriate corpus-internal evidence (Hyman 1970). With the rise of constraint-based models of phonology such as Optimality Theory (OT) there has been renewed interest in loanword adaptation. OT is well suited to formally express the conflict that typically arises in trying to remain faithful to the loanword source while still satisfying native language (L1) segmental, phonotactic, and prosodic constraints. A topic of particular interest in this line of research is sound similarity. When a segment from the donor language is missing from the grammar of the borrowing language the closest sound is normally chosen. But what is meant by closest? Appealing to simple feature counting does not provide a general answer (Kenstowicz 2003). More subtle and richer phonetic considerations (often highly dependent on context) seem to frequently be at play. Moreover, the adaptations often pose learnability questions since the particular strategies employed may lack any direct counterparts in the L1 grammar (Broselow 2004, 2009). For example, how does the speaker decide whether to employ deletion or epenthesis to adapt a consonant cluster? How does the speaker decide whether to change the vowel or the consonant when faced with a CV or VC sequence that is not permitted in the native language? Chinese is particularly interesting in this regard. It has a CVC syllable template but with many gaps in the possible three-segment strings that can in principle fill out the template. How does the analyst (and the learner) decide whether a missing combination is an accidental gap or a systematic exclusion? Since the language typically lacks morphophonological alternations, one cannot probe the restriction with violations arising from morpheme concatenation to see if they are repaired and if so with what sound change. Loanwords thus provide one valuable source of evidence in this regard.

Cantonese has figured prominently in the theoretical research on loanword phonology. Silverman (1992) was one of the first studies to propose a specific model of how a loanword is adapted, using Cantonese as the case study. The model postulates that the input is the surface (acoustic) form of the output from the donor language (chiefly English). According to Silverman this input is parsed by matching the closest segments drawn from the L1 segment inventory. The acoustic input is also parsed by the gross syllable template CVC. This syllabically licit representation is then brought into conformity with the native language segmental phonotactics by processes of vowel insertion and feature change at a later stage of analysis. In a series of

papers discussing Cantonese loanwords from an Optimality Theoretic perspective, Moira Yip (1992, 1996, 2003, 2006) also proposes a two-stage model where the input is first parsed by a prosodic template and then phonotactic constraints are imposed. Yip (2006) examines vowel adaptation, concentrating on how English [æ] and schwa (segments which lack direct analogs in the Cantonese segmental inventory) are treated. She finds a hierarchy in the types of repair processes that impose native constraints. Deletion and epenthesis are employed to repair violations of constraints on consonant clusters and coda consonant restrictions. But licit vowel-consonant VC rime structures are obtained by preferentially adjusting the length of the vowel instead of changing its quality or the place of articulation of the coda consonant.

Our goal in this paper is to provide a more detailed analysis of the vowel adaptations in the Cantonese loans. The discussion proceeds as follows. First we introduce the vowel inventories of English and Cantonese followed by the rime tables showing the attested VC combinations in the core native vocabulary. We then review several well-known restrictions on the combinations. The next section establishes a base-line correspondence between the vowels and coda consonants of English and Cantonese that are evident in contexts where a particular VC phonotactic is not in play. We then turn to loans where an application of the baseline correspondences to the English input would create structures that violate one of the four phonotactic restrictions and show how they are modified. Like Yip, our analysis also relies on OT ranked constraints. As with Silverman (1992) and Yip (2006), our data originate primarily from Chan and Kwok (1982) and Cheung (1986) plus a few additional forms taken from other sources such as Lai (2004) as well as from personal observations of our consultant. The total corpus comprises about 350 words.

It is well known that compared to Japanese and Korean, the number of phonological loans in Chinese languages is much more restricted. This is true for Cantonese as well in spite of the fact that Cantonese and English have been in close contact for over two centuries and that Cantonese is primarily a spoken language and hence loans are normally transmitted orally rather than graphically. The database is thus quite limited, making any analysis tentative and necessarily more speculative compared to other loanword studies. Nevertheless certain generalizations do emerge.

2. Segmental Inventory and Syllable Rime Phonotactics

Cantonese is commonly regarded as having the eleven contrasting vowels of (1) on the phonetic surface.

(1)	high	i:	y:	u:
	mid close	e	ø	o
	mid open	ɛ	œ	ɔ
	low central		ɐ	
	low		a:	
	glide	j		w

Unless otherwise noted, we follow the transcription system utilized in Bauer and Benedict (1997). The mid close vowels [e] and [o] are transcribed as high [ɪ] and [ʊ] in other studies. In a spectrographic investigation of ten male speakers, Zee (2003) finds that [e], [ø], and [o] overlap with [ɛ:], [œ:], and [ɔ:], respectively, in F1-F2 space and are distinguished phonetically by their shorter duration. The same relation holds for [ɐ] vs. [a:]. We reproduce his F1 and F2 measures for corresponding front and back close and open mid vowels as well as the low vowel pair in (2a). This finding also agrees with the speech of our female consultant (shown in 2b), based on three repetitions for each vowel.¹

- (2) first and second formant averages (standard deviations) for selected short and long vowels

a	F1	F2
[e]	520 (44)	2127 (140)
[ɛ]	537 (49)	2088 (142)
[o]	518 (52)	882 (66)
[ɔ:]	544 (59)	871 (79)
[ɐ]	820 (90)	1287 (86)
[a:]	827 (97)	1229 (86)

¹ On the other hand So and Wang (n.d.) find roughly equidistant spacing in F1 among [i:, e, ɛ:] (389/42, 544/106, 738/71) and [u:, o, ɔ:] (434/36, 550/41, 733/71) for the speech of two subjects. Yip (2006) reports a similar finding.

b		
[i:]	399 (52)	2900 (96)
[e]	678 (61)	2367 (73)
[ɛ:]	691 (45)	2145 (88)
[u:]	426 (56)	792 (37)
[o]	738 (10)	1463 (25)
[ɔ:]	766 (47)	1060 (49)
[ɐ]	949 (35)	1475 (52)
[a:]	1048 (71)	1459 (97)

Cantonese has a bimoraic CVC, CV: syllable template. In syllables lacking a coda the vowel must be long (bimoraic). Codas are restricted to the three nasals [m, n, ŋ] and the corresponding stops [p, t, k], which are unreleased. In addition the language has various diphthongs. We follow the consensus in the literature and treat them as vowel-glide sequences. The vowels [e, ø, o, ɐ] are short and thus barred from an open syllable. A major analytic question is whether the contrast between [e, ø, o, ɐ] and [ɛ:, œ:, ɔ:, a:] is based on vowel quality with duration playing an enhancing role or the other way around. As Zee (2000) notes, most of the previous literature has distinguished these vowels in terms of quality even though they overlap in F1-F2 space. He points out that [e, ø, o, ɐ] are typically found in short syllables closed by a stop or nasal and that their steady-state is very brief (20-40 ms). Consequently, their “vowel quality cannot be discretely localized in any single portion of the syllable, but is distributed throughout the period during [which] the voicing is present” (p. 4). As we shall see, the loanword phonology also supports the position that vowel quality predominates over vowel length. For concreteness, we shall assume that the difference is subsumed under the feature Advanced Tongue Root with [e, ø, o, ɐ] being [+ATR] and [ɛ:, œ:, ɔ:, a:] being [-ATR].

In (3) we indicate the duration ratios of the short close mid vowels V to their long open-mid and high-vowel counterparts in checked V-stop and V-nasal rimes. The short vowels serve as the baseline. The ratios are based on the vowel duration measures reported in So and Wang (n.d.) and the graphs in Kao (1971:56). The low vowel ratios are also shown.

(3)		<u>VT</u>	<u>VN</u>	
	e/ɛ:, o/ɔ:	1.8	2.2	
	e/i:, o/u:	1.5	1.7	
	ɐ/a:	1.7	2.2	
	V/V:	1.9	1.9	(Kao 1971)

These ratios approximate the 1 to 2 proportions of short vs. long vowels found in many other languages and support the contention that duration is an important factor in the phonetic realization of the nonhigh vowels in Cantonese.

In (4) we show the average vowel duration measures cited in Bauer and Benedict (1997) based on the measurements in Kao (1971). Using the short mid close and low central vowels as a baseline, we see that the [i:, u:, ɛ:, ɔ:, a:] vowels are approximately twice as long as [e, ø, o, ɐ]. Moreover, the former are lengthened by an additional increment in bimoraic open syllables.

(4)	<u>coda types</u>	<u>average vowel duration</u>	<u>ratio</u>
	V:	308 ms.	3.0
	V:N/G	203	2.0
	V:T	169	1.9
	VN/G	100	1.0
	VT	89	1.0

We now turn to the VC rime combinations. The long and short low vowels [a:] and [ɐ] combine with all three classes of codas: glides, nasals, and stops. However, for the remaining vowels there are many gaps in the inventory of possible VC combinations. The table below is a synthesis of the rime tables from Hashimoto (1972), Kao (1971), and Bauer and Benedict (1997) for the core native vocabulary. The leftmost column indicates the nuclear vowels and the top row indicates the coda consonants. The row/column intersections show the permissible nucleus+coda rimes.

(5)	<u>j</u>	<u>y</u>	<u>w</u>	<u>m</u>	<u>n</u>	<u>ŋ</u>	<u>p</u>	<u>t</u>	<u>k</u>
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i:		i:w	i:m	i:n		i:p	i:t	
y:				y:n		y:t		
u:	u:j			u:n		u:t		
e	ej				eŋ		ek	
ø	øj			øn			øt	
o		ow			oŋ		ok	
ɛ:					ɛ:ŋ		ɛ:k	
œ:					œ:ŋ		œ:k	
ɔ:	ɔj			ɔ:n	ɔ:ŋ	ɔ:t	ɔ:k	
ɐ	ɐj	ɐw	ɐw	ɐn	ɐŋ	ɐp	ɐt	ɐk
a:	a:j	a:w	a:m	a:n	a:ŋ	a:p	a:t	a:k

There are four noteworthy restrictions on the nucleus+coda combinations. First, the round vowels do not combine with labial codas except for the homorganic [ow] and [øj] diphthongs. Second, the long and short front mid vowels [ɛ:] and [e] as well as [œ:] do not combine with labial or dental codas in the core native vocabulary.² Third, [o] does not combine with [t] and [n]. Finally, the high vowels do not combine with velar codas. The close mid vowels [e] and [o] are in complementary distribution with the high vowels and are treated as allophones of /i:/ and /u:/ by Hashimoto (1972). Kao (1971) follows Chao (1947) and phonemicizes /e/ and /o/, uniting them with the vowel nuclei appearing in the [ej] and [ow] diphthongs. In Optimality Theory (Prince and Smolensky 1993, 2004) with its assumption of Richness of the Base, phonotactic constraints are defined on the output. In this model the four VC rime restrictions can be expressed as the following constraints. We follow SPE (Chomsky and Halle 1968) in assuming that velars are [+high].

(6) Cantonese Syllable-Rime Constraints

- a. *OP: *[-cons, +labial] [+cons, +labial]
- b. *ET: *[-cons, -high, -low, -back] [+cons, +anterior]

² The short counterpart [ø] of long [œ:] arises from fronting between coronals.

c. *oT: *[-cons, -high, -low, +back, +ATR] [+cons, +anterior]

d. *IK: *[-cons, +high] [+cons, +high]

(6a) bans the combination of a labial vowel and a labial coda consonant. (6b) excludes a rime composed of a front nonhigh vowel [e, ε:, œ:, ø] with an anterior (labial, coronal) coda consonant. (6c) bars a combination of close [o] with an anterior consonant. Finally, (6d) bans a rime containing a high vowel plus a dorsal consonant.

A couple of other restrictions should be mentioned. First, in an observation attributed to Chao (1947:24), Hashimoto (1972:111) states that while a low tone in a checked syllable (Yang-Ru) combines with both long and short vowels, in the Yin-Ru (upper register) tone group the long vs. short categories align with the mid vs. high tonal contrast: long vowels co-occur with mid tone 44 while short vowels co-occur with the high tone 55³. Yip (2006) appeals to this constraint, which she dubs *V:O⁵, to explain certain unexpected vowel adaptations in the loans. Second, the vowels [y:] and [u:] are largely in complementary distribution. They superficially contrast after velars: [ky:n] ‘donate’ vs. [ku:n] ‘official’. Chao (1947) postulated deriving the latter minimal pair from an underlying /k/ vs. /kw/ contrast in the onset.

3. English-Cantonese Vowel and Coda Consonant Correspondences

Before turning to the ways in which the native language phonotactic constraints of (6) affect the adaptation of loans, we establish a base-line correspondence for the vowels and coda consonants. Our English transcriptions are based on the Received Pronunciation (RP) represented in such handbooks as Gimson (1980), Wells (1990), and the OED. The data in (7) show the regular vocalic correspondences in an open syllable. These include words where the English tense vowel appears word finally or, as in the case of *bar* and *foul*, where the vowel ends up in final position in the loan through the truncation of a coda consonant. To avoid notational clutter we have not transcribed the tones. There is a regular correspondence between the primary stress of English and the Cantonese high level (55) tone in the loan (Kiu 1977, Silverman 1992).

³ We have been unable to find this citation in Chao (1947).

(7) English (RP) tense vowel - open syllable correspondences

<u>English</u>	<u>Cantonese</u>
[i:] CD	[i:] si:ti:
[u:] boot	[u:] pu:t
[eɪ] gay	[ej] kej
[əʊ] OK	[ow] owkhej
[a:] bar	[a:] pa:
[aɪ] high	[a:j] ha:j
pie	[ɐj] phɛj
[aʊ] powder	[a:w] pha:wta:
foul	[ɸw] fɸw
ounce	[ɔ:] ɔ:nsi:
account	[a:] a:kha:ŋ
pound	[ɔ:] pɔ:ŋ

English diphthongs [aɪ] and [aʊ] with a low vowel nucleus are adapted as Cantonese diphthongs in open syllables. The nucleus varies between long [a:] and short [ɐ]: *high* > [ha:j], *pie* > [phɛj]; *powder* > [pha:w.ta:], *chowder* > [tʃɸw.ta:]. In closed syllables the off-glide and coda consonant compete for the single post-nuclear rime slot with the post-nuclear glide normally winning out: *slide* > [si:la:j], *foul* > [fɸw]. This behavior appears regular for [aɪ], while [aʊ] has a number of alternative realizations that depend on which of the [+high], [+back], [+round] features of the off-glide are reflected in the nucleus or in the coda, or in both. For *ounce* > [ɔ:n.si:] [+back, +round] appear in the nucleus, for *account* > [a:kha:ŋ] [+high, +back] appear in the coda, while *pound* > [pɔ:ŋ] shows both effects.

Next are words where an English lax vowel appears in an open syllable in the Cantonese loan either because the original word is disyllabic or because it is a monosyllable whose coda [s] regularly opens the syllable through epenthesis.

(8) English lax vowel > Cantonese Open syllable

<u>English</u>	<u>Cantonese</u>
[ɪ] Miss	[i:] mi:si:
civil (engineering)	si:fow
[ɛ] jelly	[ɛ:] tsɛ:lej
[æ] gas	[ɛ:] kɛ:si:
[ʌ] bus	[a:] pa:si:
hustle	ha:sow
husband	ha:tcɪ:pɛ:ŋ
[ɒ] boss	[ɔ:] pɔ:si:
philosophy	fi:lɔ:
body	pɔ:ti:

In these data we see that the native requirement for all syllables to be bimoraic is satisfied by lengthening the vowel and thus creating a mismatch with the short vowel in the English source word, as in *jelly* > [tsɛ:lej] and *boss* > [pɔ:si:].⁴

(9) shows examples where an English lax vowel corresponds to a vowel in a closed syllable in the adaptation.

(9) English lax vowel in closed syllable

<u>English</u>	<u>Cantonese</u>
[ɪ] kid	[i:] khi:t

⁴ There are a number of loans in which a lax English vowel is adapted by filling the coda with a consonant, which is typically homorganic with the following onset. This strategy seems to occur mostly with high vowels. Examples include *guitar* [ɪ] > [ki:t.tha:], *disco* [ɪ] > [ti:k.si.khow], *cookie* [ʊ] > [khu:k.khej].

	pin		phi:n
	lift		li:p
[ɛ]	chemistry	[ɛ:]	khɛ:m
	sex		sɛ:k.si:
	to check		tshɛ:k
[ʌ]	fun	[ɐ]	fɐn
	cut		khət
[ɒ]	cocktail	[ɔ:]	kɔ:k.tɛ:

For the [ɛ] > [ɛ:] and [ɒ] > [ɔ:] correspondences, faithfulness to vowel timbre takes precedence over faithfulness to vowel length: a short lax vowel of English is adapted as long in Cantonese in order to match the mid-open/round vowel quality. Following Yip (2006), this choice can be expressed with the OT constraint ranking schema Ident-V Quality » Ident-V Length⁵. The tableaux in (9) show the effect of this ranking when the vowel quality feature is [ATR] (assuming that this is the feature that differentiates open and close mid vowels). The short vowels in Cantonese [ts^hɛk] and [kok], which are phonotactically permissible before velars, are rejected in favor of the long vowels of [ts^hɛ:k] and [kɔ:k] in order to remain faithful to the vowel quality of the English source words *to check* [ɛ] and *cocktail* [ɒ].

(10) (a)

/tʃ[ɛ]k/	Ident-[ATR]	Ident-[round]	Ident-[long]
☞ tʃ ^h ɛ:k			*
tʃ ^h ɛk	*!		

⁵ A handful of loans reverse this ranking so that a lax English vowel is adapted with a short vowel at the expense of a match in vowel quality. These include *lemon* [ɛ] > [lɛŋ.mu:n], *Miss* [ɪ] > [mɛt.si:], *winner* [ɪ] > [wɛn.na:], and *jazz* [æ] > [tsɔk.si:]. They also require the insertion of a coda consonant to satisfy the prosodic requirement of bimoraicity. Korean provides a consonantal analog of the Quality » Quantity ranking. As discussed by Kang (this volume) and Kenstowicz and Sohn (2001) an English lateral in medial position geminates to block the native grammar tap realization of the intervocalic liquid: *Aladdin* > [allatin] vs. *aerobic* > [eəropik].

	tʰɛk	*!		
(b)	/k[ɒ]k/	Ident-[ATR]	Ident-[round]	Ident-[long]
	☞ kɔ:k			*
	kok	*!		
	kɛk		*!	

However, faithfulness to vowel quality is overridden when a long vowel is required in order to satisfy the prosodic constraint that the syllable be bimoraic. This is shown in tableau (11). First, [ɛ] is the best match for the English wedge [ʌ] and is regularly selected in a closed syllable, as in *fun* > [fɛn]. But the English [ʌ] is adapted as [a:] when a long vowel is required in an open syllable, as in *hustle* > [ha:sow]. Other examples showing this correspondence include *husband* > [ha:tcɪ:pɛ:ŋ] and *bus* > [pa:si:].

(11)	(a)	/fʌn/	Bimoraic	Ident-[ATR]	Ident-[long]
		☞ fɛn			
		fa:n		*!	*
	(b)	/hʌsl/			
		☞ ha:sow		*	
		hɛsow	*!		

Finally, the data in (12) show the baseline matching of English stops and nasals with the corresponding coda consonants in Cantonese. Where possible, we cite examples where the nucleus is a low vowel, which is compatible with all three places of articulation for the following consonant.

(12)	<u>English</u>		<u>Cantonese</u>
	[p]	jeep	[p] tʃi:p
	[t]	cut	[t] khət
	[k]	mark	[k] ma:k
	[m]	hum	[m] həm
	[n]	fun	[n] fən
	[ŋ]	king	[ŋ] kheŋ

With the baseline vocalic correspondences enforced by the Bimoraic » Ident-Quality » Ident-Length ranking schema in place, we now proceed to investigate how the four VC phonotactic constraints mentioned above in (6) are enforced on Cantonese loans.

4. Phonotactic Constraint-1: Front Nonhigh Vowels

In the Cantonese native vocabulary the front vowels [ɛ:] as well as [e] and [œ:] are barred before labial and coronal consonants. A few loanwords raise their vowel or change the coda to velar in order to conform to this constraint (13a). But the majority (13b) violate it, creating a new rime combination (Bauer 1985).

(13)	<u>English</u>		<u>Cantonese</u>
a.	[ɛ]	cents	[i:] si:n.si:
		pence	pi:n.si:
		cassette	[e] ka:sek
		offset	ɔ:sek
	[eɪ]	straight	si:tek.lek

	chocolate		tʃy:ku:lek ⁶
	[æ] jam		tsi:m
b.	[ɛ] Benz	[ɛ:]	pɛ:n.si:
	[æ] cancer	[ɛ:]	khɛ:n.sa:
	jam		tsɛ:m
	band		pɛ:n
	captain		khɛ:p.thøn

When viewed from the Optimality Theory perspective, the variation among these adaptations revolves around whether the *ET phonotactic from (6) is respected, and then if it is, where a change is made to enforce it at the cost of a faithfulness violation. The adaptation of *pence* involves a demotion of faithfulness for [high] (and [ATR]) while *offset* involves demotion of faithfulness to the coda consonant. In the adaptation of *Benz* the phonotactic is demoted in order to remain faithful to the vowel quality and coda consonant in the original foreign word. The following tableaux illustrate these three ranking scenarios for *pence*, *offset*, and *Benz*.

(14) (a)	/pens/	*ET	Ident-Coronal	Ident-[high]
	☞ pi:n.si:			*
	pɛ:n.si:	*!		
	pɛ:ŋ.si:		*!	
(b)	/ɔfset/	*ET	Ident[high]	Ident-Coronal
	☞ ɔ:sek			*
	ɔ:sɛ:t	*!		
	ɔ:si:t		*!	

⁶ The [t] > [k] coda change in the adaptation of *chocolate* suggests that the vowel of the final syllable was interpreted as [ɛ̃], perhaps based on the spelling.

(c)

/bɛnz/	Ident-[high]	Ident-Coronal	*ET
☞ pɛ:n.si:			*
pi:n.si:	*!		
peŋ.si:		*!	

It is interesting that the adaptation of English [ɛ] as Cantonese [ɔ:] is never found. Feature economy cannot be the reason since this adaptation involves two vowel quality changes (in [back] and [round]), the same number as in [ɛ] to [i:] ([ATR] and [high]). A similar asymmetry has been noted by Lin (2008) in a study of English loans into Mandarin, where changes in vowel height are much more common than changes in backness. This observation is all the more striking since in Mandarin vowel height is contrastive while, for nonhigh vowels, backness is predictable from the surrounding consonants. Nevertheless, faithfulness to the noncontrastive vowel backness dominates faithfulness to the contrastive vowel height. One possible explanation for this asymmetry is that stops are unreleased in the coda in Cantonese. Consequently, the VC formant transitions in the vowel are the only cues to the place of articulation of the following coda consonant. Among these transitions those of the second and third formants are the critical ones in distinguishing one consonantal place from another, while first formant transitions do little if any work here. If Cantonese speakers are especially attuned to the VC transitions in F2 and F3, they may wish to preserve them in the vowel adaptation and hence be more prone to change vowel height, which plays little role in distinguishing coda place.

5. Phonotactic Constraints 2 and 3: *IK and *oT

We recall that the short close mid vowels [e, o] have a very restricted distribution in Cantonese native grammar. They are only permitted before dorsal codas as well as in the nucleus of off-glide diphthongs. The loanword phonology supports this analysis since English words with a high vowel plus dorsal coda are regularly realized with the close mid vowels. The corpus

unfortunately lacks examples of English [i] before a dorsal such as *leek*, *beak*, etc. that would allow us to determine its behavior in this context.⁷

(15)	<u>English</u>		<u>Cantonese</u>
	[i]	tick	[e] thek
		sink	seŋ
		king	kheŋ
		slick	si:lek
		stick	si:tek
	[ʊ]	snooker	[o] si:lokka:
		cookie	khokkhi:
	[u]	fluke	[o] fu:lok
		cartoon	ka:toŋ
		saloon	sa:loŋ

So here the native grammar phonotactic constraint *IK consistently overrides faithfulness to the English vowel. Thus, in comparison to the *ET constraint discussed in the preceding section, *IK is more resistant to foreign influence--perhaps because it is formally a dissimilation constraint, at least if formulated in features, as in (6) above. The restriction of front mid vowels to dorsal codas (*ET) is not an instance of any natural phonetic category and so might more easily give way to loanwords.⁸ The repair to the *IK constraint consistently involves lowering the high vowel to a close mid vowel. Consequently, faithfulness to [+high] in the vowel is demoted below *IK. Other possible repairs such as changing the coda consonant or lowering the vowel to open mid will be blocked by faithfulness to dorsal place and [ATR], respectively. The tableau in (16a) shows the adaptation of *king* to [k^heŋ] given the ranking in (16a).

⁷ The loans for *cartoon* and *saloon* may have passed through Mandarin.

⁸ Feng-fan Hsieh (p.c.) observes that [i] is lowered/laxed before velar codas in Hakka and Chaozhou while an excrescent schwa is inserted in Taiwanese. Edward Flemming reminds us of the English sound change seen in *hoop* [u:], *hoot* [u:], but *hook* [ʊ] where a similar change before dorsals occurred.

(16) a. *IK, Ident-Dorsal, Ident-[ATR] » Ident-V[high]

b

/kiŋ/	*IK	Ident-Dorsal	Ident-[ATR]	Ident-V[high]
☞ k ^h eŋ				*
k ^h i:ŋ	*!			
k ^h i:n		*!		
k ^h ɛ:n			*!	

There is one case where arguably the constraint barring the high vowels before a dorsal is enforced by changing the coda: *cigar* is adapted as [ʃy:t.ka:]. Normally when a coda consonant is inserted after a lax vowel in the English word in order to satisfy bimoraicity, it is homorganic with the following consonant, as in *copy* > [khəp.phi:], *cookie* > [khok.khi:], *cutter* > [kət.ta:], *fussy* > [fət.si:]. The coda [t] of *cigar* > [ʃy:t.ka:] may be a strategy to retain the [+high] feature on the vowel in the face of the phonotactic banning a high vowel before a high (dorsal) consonant.

The *oT constraint helps to explain the adaptations in (17) where a coronal coda consonant has been changed to dorsal in order to obtain a better vowel-quality match for the nuclear vowel. Also included here are cases where the inserted coda departs from the default homorganic coda-onset cluster.

(17)	<u>English</u>	<u>Cantonese</u>
	[əʊ] coat	[o] khok
	volt	fok
	notes	nok.si:
	cone	khon
	saxophone	sek.si:.fon
	mignon	mi:n.jon

donut

toŋ.let

Thus, rather than simply being a positional variant of the high vowel, the loanword phonology indicates that [o] is sufficiently distinct to serve as an attractor. Moreover, it indicates that the gap of (short) [o] plus coronal coda in the rime table of (5) is not an accidental one or a mere byproduct of a context-free ban on [e, o]. Rather, a constraint explicitly barring closed [o] before an anterior coda consonant is required: *oT. In contrast to *IK, the repair to *oT consists in changing the coda consonant to dorsal. Thus, Ident-Coronal must be demoted below *oT. The alternative repair changing the coda to labial can be excluded by the labial constraint *OP. Finally, changing the vowel to high or open mid can be blocked by the Ident-V[high] and Ident-[ATR] constraints invoked in the discussion of *ET. The required rankings are shown in (18a) and the adaptation of *coat* > [khok] is shown in (18b).

(18) a. *oT » Ident-Coronal

*OP » Ident-Coronal

Ident-[ATR], Ident-V[high] » Ident-Coronal

b.

/khəʊt/	*oT	*OP	Ident-[ATR]	Ident-V[high]	Ident-Coronal
☞ k ^h ok					*
k ^h ot	*!				
k ^h op		*!			
k ^h u:t				*!	
k ^h ɔ:t			*!		

It is worth observing that the syllable nuclei of the tense mid vowels are higher in RP than in Standard American (Ladefoged 2006:88). Moreover, the rime tables in Kao (1971) as well as Bauer and Benedict (1997) show close vowel nuclei for Cantonese [ej] and [ow] in contrast to the open nuclei in [ɛ:w] and [ɔ:j]. The close mid vowel nuclei in *coat* > [k^hok] (and

straight > [si:teklek] from (13) are thus good matches. But given undominated *oT, they entail a change of the coda consonant.⁹

Our analysis predicts that loans containing a close mid vowel followed by a dorsal consonant should be adapted faithfully since they violate no phonotactic constraint. The examples in (19) show that this is a correct prediction. Unfortunately, the corpus lacks an example like *coke* that would allow us to test this prediction for the back vowel.

(19)	<u>English</u>		<u>Cantonese</u>
	[eɪ]	cake	[e] khek
		shake	sek
		Laker	lekka:

Given the vowel quality » vowel length ranking established earlier, English short open mid vowels before a dorsal have no other motivation to raise to close since they violate no native grammar phonotactic and hence are predicted to adapt as open. The data in (20a) confirm this prediction and the tableau in (20b) shows this adaptation.

(20)	a.	<u>English</u>		<u>Cantonese</u>
		[ɛ]	sex	[ɛ:] sɛ:k.si:
			electrical (engineering)	ji:lɛk
		[ɒ]	block	[ɔ:] pɔ:k.lɔ:k

b.	/sɛks/	Ident-[high]	Ident-[ATR]	Ident-[long]
	☞ sɛ:k.si			*
	sek.si		*!	

⁹ In a study of the speech of one young male Hong Kong Cantonese speaker, Zee (1999) finds that 10 out of 14 words with an [-ɔ:n] rime have velarized the consonant to [-ɔ:ŋ] and 3 of 3 rimes in [-ɔ:t] appear as [-ɔ:k]. It is thus possible that the *oT constraint is being generalized to include the open mid vowel. It could then combine with *ET to form a general ban on mid vowels and coronal codas.

si:k.si	*!		
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To summarize, in this section we have seen that the *IK constraint barring a high vowel plus velar coda is consistently enforced by lowering the vowel to close mid. We also found that English close mid vowels before a velar are adapted as Cantonese [e, o] with the familiar vowel timbre » vowel length ranking. A number of loans with English [əʊ] change their coda to dorsal indicating that the close vowel [o] is psychologically salient and that the rime-table gaps of *[ot] *[on] are not accidental but actively enforced by the constraint *oT. Finally, since mid open vowels are permitted before dorsal codas in the native rime table, English [ɛ] and [ɔ] are regularly adapted as Cantonese [ɛ:] and [ɔ:] with the vowel timbre » vowel length mismatch.

6. Phonotatic Constraint-4: Labial dissimilation

It is well known that in the core vocabulary of Cantonese labial onsets are incompatible with labial rimes. Yip (1989) cites the Middle Chinese-Cantonese correspondences in (21) that show a dissimilation of coda nasals with respect to the onset. According to Bauer (1985) loans like *pump* > [pəm] indicate that this constraint is no longer enforced in the contemporary language. But aside from the diphthong [ow], the constraint against a round vowel and labial coda found in the rime tables of Hashimoto (1972), Kao (1971), and Bauer and Benedict (1997) is still in effect (Light 1977).

(21) Middle Chinese – Cantonese correspondences (Hashimoto 1972)

*biəm >	pən	cf.	*ləm > ləm
*biam	pi:n		*liam > li:m

To demonstrate the viability of the restriction on labials, Yip (1989) points to a reflex in the Lami secret language (22). In this speech disguise if the base vowel is /i/ then /i-i/ is dissimilated to /i-u/, as in *kin* and *yit*. But as shown by *t'im*, this dissimilation is blocked if the coda is a labial.

(22) La-mi secret language

yat	>	lat yit	
kin		lin kun	
yit		lit yut	
t'im		lit t'im	*lit t'um

Can we find reflexes of the VC labial dissimilation constraint in the loanword phonology? The most direct place to look would be for words like *home*, *hope*, *soup*, *loom*. The corpus has very few examples: [ɔ:] *chloroform* > [kɔ:lɔ:fɔ:ŋ]. However, the constraint can be detected more subtly. First, the data in (23a) show that the English back low rounded vowel [ɒ] is normally adapted as [ɔ:]. But if the coda contains a labial (23b), then unround [ɐ] is chosen instead. An alternative strategy, seen in (23c), modifies the coda consonant.

(23)	<u>English</u>	<u>Cantonese</u>
a.	[ɒ] boxing	[ɔ:] pɔ:k.seŋ
	cocktail	kɔ:k.tɛ:
	franc	fat.lɔ:ŋ
b.	[ɒ] copy	[ɐ] khɐp.phi:
	CompLit	khɐm.li:t
	composition	khɐm.phow
	ping-pong ball	peŋ.pɐm.pɔ:
c.	[ɒ] zombie	sɔ:ŋ.bej
	hamburger	hɔ:n.bow
	prom	pɔ:ŋ

The cases in (23b) involve violation of faithfulness to the rounding of the vowel in the English source, while (23c) retains rounding in the vowel at the cost of changing the place of articulation of the nasal consonant. The tableaux in (24) show how the variant repair strategies changing the vowel or the coda labial play out in the adaptations of *cocktail*, *Complit*, and *zombie*.

(24) (a)	/kɔktel/	*OP	Ident-V[labial]	Ident-C[labial]
	☞ kɔ:k.tɛ:			*
	ka:k.tɛ:		*!	
(b)	/kɔmp/	*OP	Ident-C[labial]	Ident-V[labial]
	☞ khɔm			*
	khɔ:m	*!		
	khɔ:n		*!	
(c)	/zɔmbi/	*OP	Ident-V[labial]	Ident-C[labial]
	☞ sɔ:ŋ.bej			*
	sɔ:m.bej	*!		
	sa:m.bej		*!	

Another reflex of the labial dissimilation phonotactic concerns the coda filling strategy that provides the extra mora called for by the bimoraic requirement on full syllables. In this situation the inserted consonant normally tracks the place of articulation of the following onset (25a). But if that onset is labial and the vowel is round, then the coda assumes a different point of articulation to avoid a round vowel + labial coda (25b).

(25)	<u>English</u>	<u>Cantonese</u>
a.	spring	si:bi:t.li:ŋ
	salmon	sa:m.mən
	franc	fət.lɔ:ŋ
	cocoa	kok.ku:
	cookie	khok.khi:
	Fascism	fət.saisi:
	gaberdine	gap.ba:di:n
	hysteria	gi:t.si:dailei

	shilling		si:n.li:ŋ
b.	[əŋ]	romance	lɔ:ŋ.ma:n.si:
	[ɔ]	sauna	sɔ:ŋ.na:

For the [ɒ] > [ɐ] adaptation of (25b), a minimal change of just [round] is made rather than a more drastic change to [ɛ:], which would alter the feature of [back] as well.

7. Other Phonotactic Constraints

It is well known that back rounded vowels in Cantonese may combine with either coronal onsets or codas but not with both (Chao 1947). The loanword corpus has a few words that show the viability of this constraint. They are listed below in (26). The fronting of the [juw] diphthong seen in *duce* is a regular development independent of the onset or coda and hence cannot be taken as evidence for the *TUT constraint: *IQ* > [a:j.khi:w], *fuse* > [fi:w.si:]. The clearest example is *shoot* > [sɔt]. The next best are *tenderloin* > [thi:n.ta:lɔn], where truncation of the offglide of the [oj] diphthong (cf. *coin* > [khɔ:n]) would have yielded an open back vowel [ɔ:] that is here replaced by its short front rounded counterpart [ø], and *rumba* [ɒ] > [lœ:n.pa:], where the coda [m] has been changed to avoid a labial-labial violation that in turn forces the otherwise expected [ɔ:] to front to [œ:]. Finally, the [ɒn] rime seen in the fabric names *orlon*, *nylon*, and *dacron* is adapted variably with fronting [ɔ:lɔn], change of coda [na:lɔŋ], or strangely both [tek.khɔ:k.lœ:ŋ].

(26)	fluke	fu:lok
	boot	pu:t
	horn	hɔ:n

shoot	søt
tenderloin	thi:n.ta:løn
duce	ti:w.si:
rumba	læ:n.pa:
function	fɛŋ.søn
gallon	ka:løn
nylon	na:loŋ
orlon	ɔ:løn
dacron	tɛk.khɔ:k.lœ:ŋ

8. Summary and Implications

In (27) we summarize the rankings posited in our analysis of the loanword adaptations in the face of the four VC rime constraints discussed in this paper.

(27) *ET \approx Ident-V[high] \approx Ident-Coronal

*OP \gg Ident-[round] \approx Ident-Labial

*IK, Ident-Dorsal \gg Ident-V[high], Ident-Coronal, Ident-Labial

*oT, Ident-V[high], Ident-[ATR] \gg Ident-Coronal

The *ET constraint is enforced variably while *IK, *oT, and *OP are undominated. The repairs to *ET and *OP include a change of the nuclear vowel or the coda consonant. For *IK only the vowel is changed and for *oT only the coda consonant.

A major goal of theoretical research into loan phonology is to develop a typology of the possible repairs that bring the loan in line with native grammar constraints. One hopes that ultimately the results obtained in this domain will mesh with judgments of sound similarity in the

domains of rhyme and general phonological faithfulness (Steriade 2009). Let us summarize the findings of this study of Cantonese loanwords in light of this more general endeavor. Our first result is that faithfulness for vowel quality dominates faithfulness for length (confirming the finding of Yip 2006). This explained why the short vowel of *to check* [ɛ] was adapted with long [ɛ:] over short [e]. It suggests that in the grammar of Cantonese vowel length enhances the ATR/height contrast.¹⁰ Our second finding is that faithfulness for vowel backness dominates faithfulness for vowel height ([high] and [ATR]) as well as vowel roundness ([round]). We suggested that a vowel's identity in a CVC context is more sensitive to the features of the surrounding consonants that affect F2; a change in vowel height will not alter the CV and VC formant transitions as much as a change along the front-back dimension. The asymmetry between vowel height and backness shows up in other domains where perceptual similarity and distance are at play. For example, the famous study of Peterson and Barney (1951) on confusion among English vowels finds that {ɪ, ε, æ} and {ʊ, ɔ, ʌ, ɑ} form distinct sets with confusions along the height dimension but essentially few or none along the front-back dimension. Zwicky's (1976) study of slant rhymes in English rock song lyrics has a similar finding.

A third generalization that emerges from the Cantonese loanword adaptations is that when the coda consonant is altered, the change is almost always to dorsal. For *oT we find both t > k and n > ŋ: *coat* > [khok], *cone* > [khon]. For *ET we have t > k: *offset* > [ɔ:sek]. And for *OP we find several instances of m > ŋ such as *prom* > [pɔ:ŋ] and *zombie* > [sɔ:ŋbej] but just a couple of m > n (*hamburger* > [hɔ:n.bow], *rumba* > [lœ:n.pa:]). Two possible explanations for this dorsal coda preference suggest themselves. It could reflect the faithfulness wing of the familiar Ident-Dorsal » Ident-Labial » Ident-Coronal hierarchy (de Lacy 2004). The front to back change of coda place is of course well known to students of Chinese historical phonology since the important study of Chen (1973). In a survey of over 20 Chinese dialects Chen found that mergers of place contrasts in the coda invariably proceed in the direction labial > coronal >

¹⁰ It would be interesting to conduct a study along the lines of Escudero (2005) in which the F1 and duration of the Cantonese mid vowels are systematically varied to see whether vowel height or vowel duration is the major cue to how the vowels are identified. The loanword phonology suggests that Cantonese would align with Southern British English (where vowel quality predominates in the tense-lax opposition of *sit* vs. *seat*) as against Scottish English where duration is the major distinction.

dorsal with changes in stops typically occurring before changes in nasals. However, faithfulness cannot be the entire story since when a coda labial is changed to satisfy the *OP constraint the *Dorsal » *Labial » *Coronal markedness hierarchy predicts a coronal repair. This outcome is found (*hamburger* > [hɔ:n.bow], *rumba* > [lœ:n.pa:]). But we have the impression that a dorsal coda is more prevalent, as in *zombie* > [so:ŋ.bej], *prom* > [pɔ:ŋ], *romance* > [lɔ:ŋ.ma:n.si:], *sauna* > [sɔ:ŋ.na]. An alternative explanation is frequency. Since Cantonese coda stops are unreleased and the place cues to coda nasals are relatively weak, one can easily imagine conditions such as noise in which speakers may fail to attend to the VC formant transitions that would be the principal cue to coda place. In such states of uncertainty speakers may resort to statistical reasoning and substitute the place feature that is most common in the lexicon. This line of reasoning leads us to ask for the frequency of Cantonese codas. We are grateful to Xinzhong Liu for the data reported in (28) showing the number of possible CVC combinations (ignoring tone) for each coda consonant in Guanzhou and Hong Kong Cantonese. Remarkably for both the nasals and the stops, the dorsal > coronal > labial hierarchy obtains.¹¹

(28)

CVm	38
CVp	34
CVn	79
CVt	73
CVŋ	108
CVk	100

This mirrors the typology of mergers across the various Chinese dialects observed by Chen (1973) and suggests that the dorsal > coronal > labial hierarchy is present statistically in dialects that still preserve the ternary place contrast for nasals and stops. Further study is necessary in

¹¹ More telling would be the type frequencies for the codas, i.e. how many distinct lexical items end in p, t, k, etc. As far as we know, this information is not available.

order to determine whether frequency or markedness or both underlies the oral place hierarchy for Chinese codas.¹²

Another point worth making is that for both the *ET and *OP constraints, repairs changing the coda consonant or the nuclear vowel were found. This finding casts some doubt on the speculation in Kenstowicz (2006) that when a conflict arises between changing a vowel or a consonant in order to satisfy a CV or VC phonotactic constraint, it will be the more salient vowel that is preserved and the onset or coda consonant that changes. Some of the strongest instances of this phenomenon include the preservation of nondistinctive vowel height in Moroccan Arabic over a distinctive pharyngealization of adjacent consonants (Kenstowicz and Louriz 2010) or the preservation of nondistinctive backness over nasal place in the Mandarin adaptation of English loans (Hsieh, Kenstowicz, and Mou 2009). In both cases there is good evidence that the nondistinctive vowel features enhance the adjacent consonantal contrasts and function as cues for the recovery of the consonantal distinction. For the Cantonese *ET and *OP constraints, the nuclear vowel and coda consonant do not stand in an enhancing relation. Hence, that motivation is missing. But it is still not clear that the relative saliency of vowels over adjacent consonants plays no role in the similarity judgments underlying loanword adaptation. When asked to provide online adaptations, our informants seem to privilege faithfulness to the vowel, as in the following examples: *home* > [hɔ:ŋ], *hoop* > [hu:], *mate* > [mej], *tape* > [t^hej], *bet* > [bɛ:t], *sit* > [si:t], *seat* > [si:t]. It is possible that the phonetic salience of the vowel compared to the coda consonants (where stops are unreleased) comes to the fore when the English model is fresh in the Cantonese speaker's consciousness. Perhaps this factor recedes as the loan is transmitted through the speech community, giving rise to the vocalic height changes we have seen in this paper. A systematic sociolinguistic investigation would be required to corroborate this speculation.

Another implication of our study is more general support for phonological constraints as opposed to rules. From a traditional generative perspective, any context-sensitive rule changing

¹² Two recent phonetic studies on the identification of final unreleased stops do not seem to elucidate the front-to-back merger. Chu et al. (2008) find that the identification of unreleased [p, t, k] is significantly affected by the preceding vowel with [ip], [ut] and [ak] being the most optimal combinations, presumably because they show the sharpest VC formant transitions. Marty (2012) finds that French subjects (whose coda stops are typically released) identified unreleased stops most often as [p] since it has the weakest burst and hence is most similar to a stop with zero burst.

X when adjacent to Y creates an *XY, *YX gap in the immediate output. But almost from outset of the generative approach (Stanley 1967), phonological generalizations that do not submit to this interpretation were noted, necessitating static morpheme-structure or surface-structure constraints. From this perspective what is phonologically illicit is the combination of XY regardless of how it may have arisen in the synchrony or diachrony of the language. The fact that we found changes of either the nuclear vowel or the coda consonant for some of the VC rime constraints is thus expected.

Finally, the loanword adaptations reviewed here demonstrate that the gaps in the rime tables noted by Hashimoto (1972), Kao (1971), and Bauer and Benedict (1997) are significant generalizations that are respected (to varying degrees) as a loan is adapted by the native grammar. The loans are thus comparable to the secret language changes Y-R. Chao appealed to in order to demonstrate the psychological reality of a CV restriction in Mandarin in his famous nonuniqueness paper (1934). More generally, loanword adaptations reveal sound substitutions of comparable interest and complexity to the phonological alternations that have been the staple of the generative approach. They allow the more “static” languages of East Asia such as Chinese to occupy a central place in phonological analysis and theory.

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Appendix

<u>Loanword</u>	<u>RP English</u>	<u>Cantonese</u>
accountancy	ə-k ^h awn-t ^h ən-sɪ	a:-kha:ŋ
ace	ejs	ej-si:
alongside	ə-lɔ:ŋ-sajd	a:-lɔ:ŋ-səj
apple	æpəl	ɛ:-pɔ:
arts	ɑ:ts	a:t-si:
argue	ɑ:-gju	a:-kiw
assignment	ə-sajn-mənt	a:-saj-mən
ATM	ej-thi:-ɛ:m	ej-thi:-ɛ:
auntie	ɑ:n-t ^h i:	a:n-thi:
baby	bɛɪbi	pi:-pi:
baccarat	bakərə	ba:k-ga:-lɔ:k
ball	bɔ:l	pɔ:
ball-bearing	bɔ:l-beə-ɪŋ	pɔ:-pɛ:-leŋ
ballet	bæ'leɪ or bæle	ba:-lej (21)
band	bænd	pɛ:n
bar	bɑr	pa:
BBC	bi:-bi:-si:	pi:-pi:-si:
BBQ	ba:-bi:-khjuw	pa:-pi:-khi:w
bearing	beə-ɪŋ	pɛ:-leŋ
Beatles	bit-lz	phej-thəw-si:
beer	bɪər	pɛ:

Benz	benz	pɛ:n-si:
berry	bɛrɪ	pɛ:-lej
billiards	bɪl-jædz	pi:-lɛ:t
biology	baj-ɒ-lə-dʒɪ	pɛj-ɔ:
blouse	blaws	pow-ləw-si:
body	bɒ-dɪ	pɔ:-ti:
boot	bu:t	pu:t
boss	bɒs	pɔ:-si:
bow tie	bəw t ^h aj	pow-tha:j
bowling	bəw-lɪŋ	pow-leŋ
boxing	bɒk-sɪŋ	pɔ:k-seŋ
boy	bɔj	pɔ:j
boycott	bɔj-k ^h ɒt	pu:j-kɔ:t
brake	b.rɛjk	pɛk-lek
brandy	b.ræn-dɪ	pa:k-la:n-tɛj
broker	b.rəw-k ^h ə	pɒk-ka:
buffet	bu-fej	pow-fɛj
bumper	bəm-p ^h ə	pəm-pa:
bun	bʌn	pɛn
bus	bʌs	pa:-si:
bye-bye	baj-baj	pa:j-pa:j
cake	k ^h ɛjk	khek
call	k ^h ɔ:l	khɔ:
callback	k ^h ɔ:l-bæk	khɔ:-pɛ:k
calorie	k ^h æl-ə-ɪ	ka:-low-lej
cancer	k ^h æn-sə	khɛ:n-sa:
cap	kæp	gi:p
captain	k ^h æp-t ^h ɪn	khɛ:p-thɒn
carat	kærət	ka:
card	k ^h ɑ:d	kha:t or khət
carnival	k ^h ɑ:-nɪ-vəl	ka:-nɪ:n-wa:
cartoon	k ^h ɑ-t ^h un	ka:-tɒŋ
case	k ^h ɛjs	khej-si:
cash	k ^h æʃ	khɛ:-ʃy:
cashmere	k ^h æʃ- mɪə	khɛ:-si:-mɛ:
cassette	k ^h ə-sɛt	k ^h ɑ:-sek
cast	kha:st	kha:-si:
CD	si:-di:	si:-ti:
cello	tʃ ^h e-ləw	tshe:-low
cents	sɛnts	si:n-si:
cha cha	tʃɑ tʃɑ	tsa:-tsa:
chalk	tʃɔk	tshɔ:k
chance	tʃha:ns	tsha:n-si:

cheap	tʃ ^h i:p	tʃhi:p
check	tʃ ^h ɛk	tshɛ:k
cheese	tʃhi:z	tʃi:-si:
chemistry	k ^h ɛm-ə-stɪ	khɛ:m
cherries	tʃ ^h ɛ-ɪz	tshɛ:-ləj-tʃi:
chocolate	tʃ ^h ɒk-lət	tʃy:-ku:-lek
chowder	tʃaʊdər	tsəw-ta:
CID	si:-a:j-di:	si:-a:j-ti:
cider	saidər	sai:-da:
cigar	sɪ-ga:	ʃy:t-ka:
civil	sɪ-vɪ	si:-fow
class	k ^h lɑ:s	k ^h a:-si:
click	k ^h lɪk	khek
clip	k ^h lɪp	ki:p
clutch	k ^h lətʃ	kek-lek-tʃi:
cocktail	k ^h ɒk-t ^h ejl	kɔ:k-tɛ:
cocoa	k ^h əw-k ^h əw	kɒk-ku:
coffee	khɒ-fi	ka:-fɛ:
cognac	khɒn-jæk	kɔ:n-jɛp
coil	k ^h ɔj	khɔ:j-low
coin	k ^h ɔjn	khɔ:n
cola	k ^h əw-lə	kɔ:-la:
cologne	k ^h ə-ləʊn	ku:loŋ
commission	k ^h ə-mɪ-ʃn	khɛm-mi:-sɒn
Comp. Lit.	khɒmp-lɪt	khɛm-li:t
composition	k ^h ɒm-p ^h ə-zɪ-ʃn	khɛm-phow
computer	k ^h əm-p ^h ju-t ^h ə	khɛm-phi:w-tha:
condenser	khɒn-dɛn-sa	khɔ:n-tɛ:n-sa:
cone	koʊn	koŋ
cookie	k ^h ʊk-ɪ	khok-khi:
copy	k ^h ɒp-ɪ	khɛp-phi:
corner	k ^h ɔ:-nə	khɔ:n-na:
court	kɔrt or koʊrt	kɔ:t
cousin	kʌzən	ka:-sɛn
cover	k ^h ʌv-ə	kɛp-fa:
coxswain	k ^h ɒk-sn	khɔ:k-sɛn
cracker	k ^h ræk ^h ə	ha:k.lek.ka:
cream	k ^h i:m	kej-li:m
curry	k ^h ʌ-ɪ	ka:-ləj
cushion	k ^h ʊ-ʃn	khɪ:-san
cut	k ^h ʌt	khɛt
cutlet	k ^h ʌt-lət	kɛt-li:t
cutter	k ^h ʌt-ə	kɛt-ta:

dacron	dæ-k ^h .ɹən	tek-khə:k-læ:ŋ
daddy	dæ-dɪ	tɛ:-ti:
darling	dɑrlɪŋ	da:-leŋ
DDT	di:-di:-thi:	ti:-ti:-thi:
deuce	dju:s	tiu-si:
dinner	dɪnər	di:n-na:
disco	dɪs-k ^h əw	tek-si:-kow
DJ	di:-dʒej	ti:-tsej
dockyard	dɒk-jɑ:d	tɔ:k-ja:
doctor	dɒk-tər	dɔ:k-ta:
dollar	dɒ-lə	ta:-la:
donut	dəw-nət	toŋ-lət
dozen	dʌz-ən	ta:
duce	dju:s	ti:w-si:
dynamo	daj-nə-məw	ta:-la:m-mow
economics	i:-k ^h ə-nəm-ɪks	ji:-khə:n or ji:-khə:n
electrical	ɪ-lek-t ^h ɪ-k ^h ɪ	ji:-le:k
encore	ɑŋkər	ɛ:n-khə:
Eng. Lit.	ɪŋ-lit	ɛ:ŋ-li:t
engine	en-dʒɪn	ɛ:-tʃɪ:n
essay	es-ej	ɛ:-sej
fibre	fɑɪbə	fa:ipa:
face	fejs	fei-si:
fans	fænz	fe:n-si:, fa:n-sy:
fail	feɪl	fej-low
Ferrari	fə-ɹɑ-ri	fa:t-lai-lei
fare	feə	fej
fashion	fæ-ʃɪn	fa:-sən
fibre	faj-bə	fa:j-pa:
file	fajl	fa:j-low
film	fɪlm	fej-ləm
flange	flændʒ	fət-la:n
flannel	flæ-nəl	fa:t-la:n
floor-show	flɔ:-ʃəw	fɔ:-sow
fluke	flu:k	fu:-lok
forecast	fɔ:-kɑ:st	fɔ:-kha:-si
foreman	fɔ:-mən	fɔ:-mən
foul	fawl	fəw
frank	fɹæŋk	fa:t-lɔ:ŋ
freezer	fɹi:-zə	fli:-sa:
friend	fɹɪnd	fɛ:n
fun	fʌn	fən
fuse	fju:z	fi:w-si:

function	fəŋk-ʃn	fəŋ-sən
fussy	fʌs-ɪ	fət-si:
gabardine	gæ-bə- di:n	ka:-pa:-ti:n
gallon	gæl-lən	ka:-lən
game	geɪm	ke:m
gas	gæs	gɛ:-si:
gay	geɪ	kej
gin fizz	dʒɪn fiz	tʃi:n-fej-si
gin sling	dʒɪn slɪŋ	tʃi:-si:-leŋ
golf	gɒlf, ɡɔlf, or ɡɒf	go:-yi:-fu:
good-bye	ɡʊd-baj	ku:t-pa:j
gross	ɡrɔws	lɔ:
guard	ɡɑ:d	ɡət
guitar	ɡɪ-tʰɑ:	ki:t-tha:
Gurkha	ɡɜ:-kʰə	kœ:ka:
guts	ɡʌts	kət-si:
hello	hə-ləw	ha:-low
hi-fi	haj-faj	høj-fej
high	haj	ha:j
high-class	haj-kʰlɑ:s	ha:j-kha:-si:
Hillman	hɪl-mən	hej-low-mən
hormone	hɔr-moʊn	ho:-yi:-muŋ
horn	hɔ:n	hɔ:n
hum	hʌm	həm
husband	hʌz-bənd	ha:-si:-bən
hysteria	hɪstɪəriə	gi:t-si:-tai.ei
inch	ɪntʃ	i:n-tʃi:
insure	ɪn-ʃʊə	ji:n-sə:
IQ	a:j-khju:w	a:j-khi:w
jack	dʒæk	tsek
jacket	dʒæk-ɪt	tse:k-khe:t
Jaguar	dʒæɡ-ʤʊə	tse:-ka:
jam	dʒæm	tse:m
jeans	dʒɪnz	tʃi:n
jeep	dʒɪp	tʃi:p
jelly	dʒe-lɪ	tse:-lej
jersey	dʒɜ:-zɪ	tse:-si:
jockey	dʒɒk-ɪ	tsɔ:k-khi:
jumbo	dʒʌmbɒʊ	tsən-pow
jump ball	dʒʌmp bɔ:ɫ	tsəm-pɔ:
kid	kʰɪd	khi:t
king	kʰɪŋ	kheŋ
king size	kʰɪŋ-sajz	kheŋ-sa:j-si:

KMB	khej-ε:m-bi:	khej-ε:m-pi:
Kodak	k ^h əw-dæk	khə:-ta:t
label	lej-bəl	lei-pou
lace	lejs	lej-si:
lacquer	læk-ə	lek-ka:
laser	lej-zə	løy-se:
last	lɑst	la:-si:
LC	ε:l-si	ε:-low-si
lemon	lɛmən	li:ŋ-mu:ŋ
letter	lɛt-ə	lɛ:t-tha:
license	laj-snɪs	la:j-sɛn
lift	lɪft	li:p
linen	lɪn-ən	li:n-jɛn
literature	lɪtərətʃər	li:t
lorry	lɒ-ɪ	lɔ:-li:
lotion	lʊʃən	lɔ:-ʃɛn
Lysol	laj-sɒl	la:j-sow
madam	mædəm	mɛ:-du:m
major	mɛj-dʒə	mɛ:-tʃa:
margarine	mɑ:-dʒə-ɪ:n	ma:-tʃɪ:-li:n
margin	mɑ:-dʒɪn	ma:-tʃɪ:n
mark	mɑ:k	mɑ:k (verb) mɛk (noun)
market	mɑ:kɪt	ma:-kɛ:t
mask	mɑ:sk	ma:-si:
maths	mæθs	mɛ:t-si
MC	ε:m-si:	mə
mechanical	mə-k ^h æŋ-ɪ-k ^h l	mɛ:k-khɛ:n
meter	mi-t ^h ə	mɛj
microphone	maj-khrə-fəwn	mɛj-kow-fɔŋ
microphone	maj-k ^h ɪə-fəwn	mɛj
mild	majld	mɛj
mile	majl	mɛj
minced	mɪnst	mɪ:n-tʃɪ:
mink	mɪŋk	mi:ŋ
Miss	mɪs	mi:-si:
mold	məwld	mow
mommy	mɑ:-mɪ	ma:-mi:
Morris (car)	mɒ-ɪs	mɔ:-lej-si:
motor	məw-t ^h ə	mɔ:-ta
movie	mu:-vi	mu:-fi:
MTR	ε:m-thi:-a:	ε:m-thi:-a:-low
NG	ε:n-dʒi:	ε:n-tʃɪ:
nickle	nɪkəl	nik-kow

notebook	nɒʊt-bʊk	lɔ:-bok
notes	nəʊts	nok-si:
number	nʌm-bə	nəm-pa: or ləm-pa:
number one	nʌm-bə wʌn	nəm-pa:-wən
nylon	naj-lɒn	na:-lɒŋ
off	ɒf	ɔ:-fu:
office	ɒf-əs	ɔ:-fej-si:
OK	ow-khej	ow-khej
omelette	ɒm-lit	əm-li:t
oral	ɔ:-rəl	ɔ:-low
orange	ɔrɪndʒ	ɔ:-lɒn-tʃi:
order	ɔ:-də	ɔ:-ta:
orlon	ɔ:-lɒn	ɔ:-lɒn
OT	ow-thi:	ow-thi:
Ovaltine	əw-vɫ-thi:n	ow-wa:-thi:n
over	əw-və	ɔ:-fa:
ounce	awns	ɔ:n-si:
P	phi:	phi:
pair	p ^h eə	phe:
pan	p ^h æn	pha:ŋ
pancake	p ^h æn-k ^h ejk	pa:n-khek
paper	peɪpər	pej-pa
park	p ^h ɑ:k	pha:k
pass	pha:s	pha:-si:
partner	p ^h ɑ:t-nə	pha:t-na:
party	p ^h ɑ:-t ^h ɪ	pha:t-thi:
passport	p ^h ɑ:s-p ^h ɔ:t	pha:-si:-phɔ:t
pence	phens	pi:n-si:
penny	pheni	pen:-ni:
percent	p ^h ə-sent	pa:-si:n or phœ:-sen
philosophy	fi-lɒ-sə-fi	fi:-lɔ:
physics	fɪz-ɪks	fi:
pie	p ^h aj	phøj
pin	pin	pi:n
ping-pong ball	p ^h ɪŋ-p ^h ɒŋ-bɔ:l	peŋ-pəm-pɔ:
pizza	p ^h ɪ:t-sə	phej-sa:
place	p ^h lejs	phej-si: or phej-lej-si:
plum	p ^h lʌm	pow-ləm
poker	pɒkər	pɔk:-ka
political	p ^h ə-lɪt-ɪ-k ^h ɪ	phow-li:t
port	p ^h ɔ:t	pu:t
pose	phəwz	phow-si:

post	phəwst	phow-si:
postcard	p ^h əwst-k ^h ɑ:d	phow-si:-kha:t
poster	pəʊstər	pə:-sta
potential	p ^h ə-t ^h en-ʃt̩	phow-thɛ:n-sow
pound	p ^h awnd	pə:ŋ
powder	paʊdər	pha:w-ta
professor	p ^h ɪə-fɛ-sə	phow-fɛ:-sa:
psychology	saj-k ^h ɒ-lə-dʒɪ	saj-khə:
pump	p ^h ʌmp	pɛm
PVC	phi:-vi:-si:	phi:-wi:-si:
qualification	k ^h wɒ-lɪ-fi-k ^h ej-ʃn̩	khwə:-li:
quart	k ^h wɔ:t	kwɛt
quarter	k ^h wɔ:-t ^h ə	kwɛt
quinella	k ^h wɪ-nel-ə	khwi:n-nɛ:-la:
quinella	k ^h wɪ-nel-ə	khi:w
ream	i:m	li:m
roller	rəw-lə	low-la:
Rolls	rəwls	low-si:
Royce	rɔjs	lə:j-si:
rouble	ru:-bɫ̩	low-pow
round	rəʊnd	la:n
rum	rʌm	lɛm
rumba	rʌm-bə	lɛ:n-pa:
rupee	ru:-p ^h i:	low-pej
salad	sæl-əd	sa:-lət
salmon	sæmən	sa:-mu:n
saloon	sə-lu:n	sa:-ləŋ
sample	sɑ:m-p ^h ɫ̩	sa:m-phow
sandwich	sæn-wɪdʒ	sa:m-mɛn-tʃi:
satay	sɑ-teɪ	sa:-tɛ:
sardine	sɑ:-di:n	sa:-ti:n
sauna	sɑʊ-nə	sə:ŋ-na:
saxophone	sæk-sə-fəʊn	sek-si:-fəŋ
score	skɔ:	si:-kɔ:
sergeant	sɑ:-dʒənt	sa:-tʃɪn
set	sɛt	sət
sex	sɛks	sɛ:k-si:
shaft	ʃɑ:ft	səp
shake	ʃejk	sek
sharp	ʃɑ:p	sa:p
shilling	ʃɪl-lɪŋ	si:n-lɛŋ
shirt	ʃɜrt	sɛ:t
shoot	ʃu:t	sət

show	ʃəw	sow
shutter	ʃət-ə	sət-ta:
sideboard	sajd-bɔ:d	səj-pu:t
sink	sɪŋk	seŋ
sir	sɜ:	a:-sœ:
sirloin	sɜ:-ləjn	səj-la:ŋ
size	sajz	sa:j-si:
slick	slik	si:-lek
slide	slajd	si:-la:j
smart	sma:t	si:-ma:t or si:-ma:k
snooker	snʊk-ə	si:-lok-ka:
social	səw-ʃɪ	sow-sow
sociology	səw-si-ɒ-lə-dʒɪ	sow-si:
socket	sɒk-ət	sɔ:-ki:t
soda	səw-də	sɔ:-ta:
sofa	səw-fə	sɔ:-fa:
soft	sɒft	sɔ:-fu:
solicitor	sə-lɪs-ɪ-tʰə	sow-li:t
sorry	sɒ-ɪ	sɔ:-li:
souffle	su:-flej	sɔ:-fu:-lej
spanner	spæn-nə	si:-pa:-la:
spare	speə	si:-pɛ:
spark	spɑ:k	si:-pa:k
sports shirt	spɔ:ts-ʃɜ:t	si:-pu:t-sət
stamp	stæmp	si:-ta:m
start	stɑ:t	si:-tha:t
statistics	stə-tʰɪs-tɪks	si:-te:t
steam	sti:m	si:-ti:m
stick	stɪk	si:-tek
store	stɔ:	si:-tɔ:
straight	strejt	si:-tek-lek
strawberry	strɔ-bɛ-ɪ	si:-tɔ:-pɛ:-lej
style	stajl	si:-ta:j-low
sugar	ʃʊgər	su:-ka:
sundae	sʌn-dej	sən-tej
Sunkist	sʌn-kʰɪst	sən-khej-si
switch	swɪtʃ	si:-wi:t-tʃi:
T-shirt	tʰɪ-ʃɜ:t	thi:sət
table	teɪbəl	tej-bow
tart	tɑ:t	tha:t
taxi	tʰæk-sɪ	tek-si:
TB	thi:-pi:	thi:-pi:
tenderloin	tʰen-də-ləjn	thi:n-ta:-løn

tennis	t ^h en-ɪs	the:ŋ-nej-si: or the:n-ni-si:
thank you	θæŋk-ju:	teŋ-ki:w
tick	t ^h ɪk	thek
tie	t ^h aɪ	tha:j
tips	t ^h ɪps	thi:p-si:
tire	t ^h aɪə	tha:j
toast	t ^h əʊst	tə:-si:
TOEFL	θəʊ-fəl	θəʊ-fəʊ
ton	t ^h ʌn	tən
tonic	t ^h ɒnɪk	θɔ:n-nek
tutor	t ^h ju:-t ^h ə	thi:w-tha:
tutorial	t ^h ju:-t ^h ɔ:-ɪ-əl	thi:w-θɔ:
TV	ti:-vi:	thi:-wi:
uncle	ɛŋ-k ^h l̩	ɛŋ-kəʊ
understand	ən-də-stænd	ən
valve	vælv	wɑ:-ləʊ
van	væn	wɛ:n
vanilla	və-nɪl-ə	wən-ni:-lə:
vaseline	væ-sə-li:n	fɑ:-si:-leŋ
very good	ve-ɪ-gʊd	wɛ:-li:-ku:t
vitamin	vɪtəˈmɪn, vɪtəˈmɪn	wɛ:-tɑ:-mɪŋ
volley	vɒli	wɔ:-leɪ
Volkswagen	vɔwks-wɑ:-gən	fɒk-si:
volt	vəʊlt	fɔ:t
volume	vɒl-ju:m	wɔ:-ləm
wafer	wɛɪfə	wɛj-fɑ:
waiter	wɛj-t ^h ə	wɛj-tha:
walkman	wɔk-mən	wɔ:k-mən
warrant	wɒrənt	fɑ:-leŋər wɔ:-leŋ, wɔ:lən
waste	wɛjst	wɛj-si:
watt	wɒt	wɔ:k
whiskey	hwɪs-k ^h ɪ	wɛj-si:-keɪ
wide-angle	wɑɪd-æŋ-gl̩	wɑ:j-ɛ:ŋ-kəʊ
wife	wɑɪf	wɛj-fu:
winner	wɪn-ə	wən-nɑ:
wire	wɑɪə	wɛj-jɑ:
yeast	ji:st	ji:-si: