COMPLEXITY REDUCTION VERSUS MANNER FEATURE RESILIENCE IN LOANWORD ADAPTATION[*]

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1. Introduction

When a borrowed word enters into another language, the form of the word is normally changed (adapted) in order to fit foreign elements to the phonological system of the borrowing language (L1); e.g. French 'déjà vu' [deʒavy] → [deʒɑvu] in English. Previous research has shown that these changes are widely predictable and that they are conditioned by several principles including the Preservation Principle, which states that phoneme insertion has precedence over phoneme deletion, and the Minimality Principle, which predicts that an adaptation should be the least costly in terms of structure and processes as possible (Paradis and LaCharité 1997, among others). However, often more than one change can be considered minimal. Recently, some authors (e.g. Miao 2005; Steriade 2009) have proposed that during the adaptation process of a foreign segment, the phonological features of manner of articulation are more resistant to change than are the phonological features of voice and place of articulation. Steriade (2009) proposes that the least perceptible phonological feature will be changed. According to Miao, cross-linguistically, manner features such as [±continuant] and [±nasal] are more resistant to modification than are place and laryngeal features (2005). This proposal is formally presented in (1).

(1)   Hypothesis of the greater resistance of manner features
       An adaptation implicating the modification (insertion or the deletion) of *x* will be preferred over an adaptation involving a modification of *y*, if *x* is a place or laryngeal feature and *y* is a manner feature.

Our hypothesis however is that in loanword adaptation manner of articulation features are not more resilient to change than others. Instead, we will suggest that loanword adaptation eliminates marked features and results in less marked structures, a hypothesis that will be formally presented in (3) below. The objectives of this paper are formally presented in (2).

(2)   The objectives of this paper are to:

       a)   verify the hypothesis in (1) that states that phonological features of manner of articulation (e.g. [±nasal], [±lateral], [±sonant], [±strident] and [±continuant]) are more resistant to modification during loanword adaptation than are place of articulation features (e.g. Labial, Dorsal, Coronal and [±anterior]) and laryngeal features (e.g. [±glottal constriction] and [±voice]);

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b) examine an alternative proposal where the phonological adaptation of problematic phonemes in loanwords results in less marked segments, i.e. determine if there is a movement towards the unmarked in phonological adaptations.

A careful study of our data indicates that manner of articulation features such as [±continuant] are just as likely to be involved in the adaptation process as are laryngeal features such as [±voice] and place of articulation features such as [±anterior]. For example, French /ʒ/ is usually not tolerated at the beginning of a word in English. Adaptation options include /ʒ/ → [z] (change of place), /ʒ/ → [ʃ] (change of voicing) and /ʒ/ → [dʒ] (change of continuancy). The primary adaptation is /ʒ/ → [dʒ] (e.g., French [ʒelatin] 'gélatine' → English [dʒɛlətɪn]) where the manner feature is in fact the less resistant. In Moroccan Arabic the primary adaptation of ill-formed /v/ in French loanwords is to [b] (change of continuancy), 58/81 cases, 72%, despite the availability of /v/ → [f] (change of voicing) (e.g. [savɔ̃] → [sabʊn] → *[safʊn]). In our data, the feature [±continuant] is modified slightly over the rate of the place feature [±anterior]. For instance, it is shown in section 4.1 that when a language had the choice, for a given ill-formed segment, between the adaptation targeting [±continuant] and another targeting [±anterior], in 195/384 cases (51%) the feature [±continuant] was changed as opposed to 189/384 cases (49%) where [±anterior] was modified. Instead of manner features being more resilient, we observe that during loanword adaptation there is a clear tendency towards unmarkedness. This proposal is formally presented in (3).

(3) <u>Hypothesis of complexity reduction in loanword adaptation</u>
Languages overwhelmingly adapt with the goal of eliminating the complexities of the second language (L2); change that involves the elimination of marked features is preferred to the addition of marked features, or complexity.

For instance, we note that [+continuant] is rarely inserted in order to repair a problematic segment, yet it is regularly deleted. Also, our data includes no case where a language adds the complexity of nasality or [+lateral] to a non-sonorant even when the option of repair by insertion of [+nasal] or [+lateral] is available (e.g.,*/b/ → [p], not *[m] in Lama as in French *Zébédée* [zebede] → Lama [se**p**ete], not *[se**m**ete], from Ulrich 1997).
This paper is organized as follows. In section 2 previous literature is presented with a focus on the role of the notion of perceptual salience. The corpus and the methodology used in this study are presented in section 3. Section 4 deals with our results. In section 4.1 we compare cases where modifications to the features [±continuant] and [±anterior] are both available to repair an ill-formed segment. Section 4.2 deals with cases where the manner feature [±nasal] is modified during the repair of ill-formed segments. In section 4.3 there is a comparison between [±continuant] and [±voice]. Section 4.4 contains the results for the repair of interdental fricatives where modifications to the place node Coronal and the manner features [±continuant] and [±strident] are

all three theoretically available as a repair strategy. Section 5 is the discussion and the conclusion is in section 6.

2.   Background

Reasons for the claimed greater resistance of manner features in (1) are based in large part on the notion that a modification to manner features is avoided in repair since manner features have greater perceptual salience. Instead, a change involving a place or laryngeal feature is claimed by some such as Steriade (2009) and Miao (2005), to be less perceptible and thus less resistant when involved in a repair process. In other words, they propose that a modification that targets manner features is more distinctive on a perceptual level than is a change of voice or place. For example, Steriade (2009) is concerned about whether a given change results in a salient modification of the input (Steriade 2009). In fact, one of the reasons for the recent interest in perceptual salience is that some authors such as Steriade maintain that rankings in OT (Optimality Theory) are (or should be) restricted or motivated to some extent by perceptual salience. That is to say, constraints may be perceptually-based.

The notion of *perceptual salience* has become a prominent term in the phonology literature with the advent of a, "[...] revived interest in the role of perception in a variety of phonological phenomena" (Wright 2001: 252). In the literature there are three major themes or notions that recur when the notion of perceptual salience is discussed. These three notions correspond to implicit definitions of perceptual salience. They are not mutually exclusive. These three notions are, a) dissimilarity; b) recoverability c) robustness. Perceptual salience has been evoked by such authors as Steriade (2009), Hsieh, Kenstowicz and Mou (2009), Yip (1993), among many others. Hsieh, Kenstowicz and Mou (2009) identify perceptual salience as a determining factor in the direction of adaptations. For Shinohara (2006), Adler (2006) and Yip (1993; 2002), salience plays a determining role in patterns of segment deletion (although they do not necessarily agree over whether or not it is the only factor). According to for instance Uffmann (2006) and Shinohara (1997) the epenthetic vowel is determined by perceptual salience.

Steriade incorporates perceptual salience into a grammatical model and employs perceptual salience in order to explain the "too-many-solutions" problem that has plagued the Theory of Optimality (OT) since its conception. According to Steriade, the optimal solution (or repair to say it otherwise) is usually the least perceptually salient. Thus, for example, perceptual salience is employed to explain why a repair targeting nasality is not preferred to a repair favoring a modification of voicing in the case of a voiced coronal stop in coda position in German (i.e. the neutralization of /d/ → [t], not →*[n], word finally).

3.   Corpus and methodology

Our corpus is mainly the repertoire of malformations of *Project CoPho*[1] dated 2008. This repertoire includes over 25 000 cases of phonological adaptations of malformations (ill-formed segments) from the main and some targeted corpora of the loanword database of Project CoPho and from the data provided by Ulrich (1997) for Lama and by Leslau (1997) for Afar. The Project CoPho loanword database is, as far as we know, the largest computerized database of loanwords studied from a phonological perspective and which provides detailed statistics. Our corpus includes English loanwords in Japanese, Quebec and Parisian French, Lama, Calabrese Italian and Mexican Spanish as well as French loanwords in Moroccan Arabic, Kinyarwanda, Lama, Fula, Lingala and Canadian English. We also added data from more recent targeted corpora of Project CoPho including English loans in Thai. For each individual case of segmental malformation, we have compiled the possible minimal adaptations available based on the existing phonemes in the borrowing language. We then studied the behavior of the features implicated in the chosen adaptation strategy.

4.   Results

4. 1   Comparison of manner [±continuant] and place [±anterior]

When the features [±continuant] and [±anterior] can both be employed in order to repair (minimally) an ill-formed segment the hypothesis of the greater resistance of manner features predicts: delinking or inserting the feature [±anterior] (a place feature) should take precedence over delinking or inserting [±continuant], since place of articulation features are claimed to be less anchored than are manner features. In (4) the results for the individual cases where these two options are minimal and available are presented.

(4)   Malformations in our corpus for which there is a choice between changing manner feature [±continuant] or place feature [±anterior]

Feature targeted	No. of malformations	Percentage
[±continuant]	195	51% (195/384)
[±anterior]	189	49% (189/384)

When looking at the preferred adaptation of phonemes, no strong preference for either changing [±anterior] or [±continuant] is noticeable and there is even a slight preference for targeting the manner feature [±continuant]. This is contrary to the hypothesis in (1). The problematic phonemes in our corpus that provide the data in (4) are shown in (5) with their preferred adaptation (over 70% of cases) noted.

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[1] Project CoPho (**Co**nstraints in **Pho**nology) is a project focused on constraints and supervised by Carole Paradis at *Université Laval*.

(5)   Repairs with a choice between [±anterior] and [±continuant] in our corpus: feature targeted, main phoneme adaptation pattern and language.

Feature targeted	Phoneme	Language
[±anterior]	/ʃ/ → /s/, not → */tʃ/	Fula
[±anterior]	/ʃ/ → /s/, not → */tʃ/	Lama
[±anterior]	/ʒ/ → /s/, not → */dʒ/	Fula
[±anterior]	/ʒ/ → /s/, not → */tʃ/	Lama
[±continuant]	/dʒ/ → /ʒ/, not → */d/, */z/	Quebec French
[±continuant]	/tʃ/ → /ʃ/, not → */t/, */s/	Quebec French
[±continuant]	/ʒ/ → /dʒ/, not → */z/	English
[±continuant]	/ʃ/ → /tʃ/, not → */s/	Mexican Spanish
[±continuant]	/ʃ/ → /tʃ/, not → */s/	Thai

In (6), we summarize the main adaptation patterns in (5) according to the feature targeted for each phoneme.

(6)   Preferred adaptation of an illicit phoneme where there is a choice between changing manner feature [±continuant] or place feature [±anterior]

Feature targeted	No. of phonemes	Percentage
[±continuant]	5	55.6% (5/9)
[±anterior]	4	44.4% (4/9)

In table (6), we can see that there are 5/9 phonemes (55.6%) that target the manner feature [±continuant] over the place feature [±anterior], which represents a slight preference for altering the manner feature, which is again contrary to the hypothesis in (1). In 4.1.1 we will see in detail two of the adaptations presented in table (5) involving a change of manner feature.
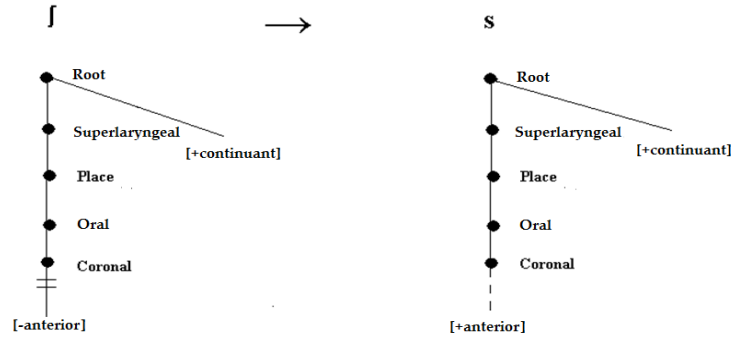
*4.1.1   Adaptation of English */ʃ/ in Mexican Spanish and in Thai*

The segment */ʃ/ is illicit in Mexican Spanish and in Thai in all positions as a result of the constraint presented in (7).

(7)   Parameter: [+continuant] ~ [-anterior] ~ [-sonant]?
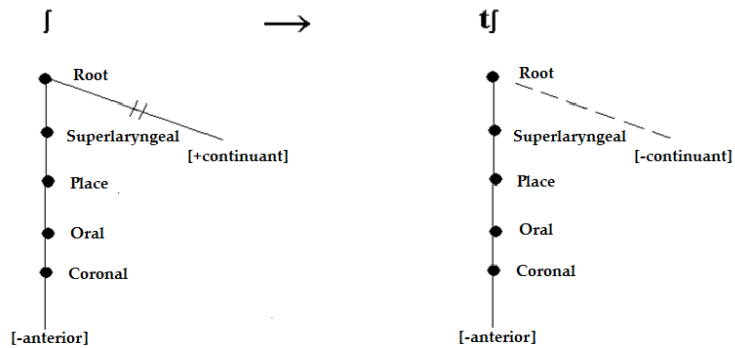   English: yes; Mexican Spanish, Thai: no

Two of the possible strategies of repair are the following: a) delink [-anterior] (place feature), b) delink [+continuant] (manner feature). The hypothesis that manner features are more resistant to change (i.e. less often altered) predicts delinking [-anterior] over delinking [+continuant] which is not verified in either Spanish or Thai. In (8), an illustration of option (a), where the place feature [-anterior] is delinked, is presented.

(8)   Representation of unselected /ʃ/ → /s/.

ʃ   ⟶   s

Root	Root
Superlaryngeal [+continuant]	Superlaryngeal [+continuant]
Place	Place
Oral	Oral
Coronal	Coronal
[-anterior]	[+anterior]

In (9) selected option (b) is presented. It involves delinking of the manner feature [+continuant].

(9)   Representation of selected /ʃ/ → /tʃ/.

ʃ   ⟶   tʃ

Root	Root
Superlaryngeal [+continuant]	Superlaryngeal [-continuant]
Place	Place
Oral	Oral
Coronal	Coronal
[-anterior]	[-anterior]

The adaptation strategy chosen is thus /ʃ/ → /tʃ/. In 37/38 (97.4%) cases in Mexican Spanish the adaptation strategy chosen is /ʃ/ → /tʃ/ which involves modification to the manner feature. In Thai the most frequent adaptation of /ʃ/ is to /tʃ/, with an adaptation involving the modification of [±continuant] accounting for 10/14 cases (71.4%).

(10)   *Examples from Mexican Spanish and Thai*
        Engl. *shop* /ʃɑp/   →   Mexican Spanish [tʃɔp], *[sɔp];
        Engl. *squash* /skwɑʃ/   →   Mexican Spanish [skwatʃ], *[skwas];
        Engl. *shampoo* /ʃæmpu/   →   Thai [tʃampʰu:], *[sampʰu:];
        Engl. *show* /ʃo/   →   Thai [tʃo:], *[so:].

4. 2 Comparison of manner feature [±nasal] and place Labial

Although it is rare that a non-sonorant is adapted into a [+nasal], there are ample cases in the literature of the nasal feature (a manner feature) being modified to adapt other sonorants. For example, in Tlingit, an aboriginal language spoken in and around the Alaskan panhandle, /n/ is permitted but not */m/. Two of the possible repair strategies available are: a) delink [+nasal] (/m/ → /w/); b) Labial → Coronal (/m/ → /n/). The hypothesis that manner features are more resistant to change (i.e. less often altered) predicts Labial → Coronal (/m/ → /n/) over delinking [+nasal] (/m/ → /w/). However, the adaptation strategy chosen is /m/ → /w/ (Denzer-King 2010) as can be seen in (11).

(11)   *Examples from Tlingit*
       Chinook Jargon /sitka**m**/   →   Tlingit [sɪtka:**w**] 'part'
       Chinook Jargon /tʃan**m**an/   →   Tlingit [tʃa:**nwa**:n] 'Chinese man'
       Chinook Jargon /skul**m**an/   →   Tlingit [sku:**nwa**:n] 'student,' lit.
                                               "school-man"

Below, in (12), further examples of loanword adaptations where the manner feature [±nasal] is modified are presented.

(12)   Further examples of the manner feature [±nasal] targeted in loanword
       adaptation
       Thai /l/ → /n/
       Engl. *apple* /æpəl/   →   Thai [appə**n**]
       Engl. *central* /sɛntɹəl/   →   Thai [sɛnta**n**]
       Vietnamese /l/ → /n/
       French *dentelle* /dãtɛl/   →   Vietnamese [dãŋtɛ**n**]
       French *balle* /bal/   →   Vietnamese [ba**n**]
       French *pédale* /pedal/   →   Vietnamese [be:da**n**]
       French *fil* /fil/   →   Vietnamese [fi:**n**]

4.3   Comparison of manner [±continuant] and laryngeal [±voice]

When the features [±continuant] (a manner feature) and [±voice] (a laryngeal feature) can both be employed in order to repair (minimally) an ill-formed segment, the hypothesis of the greater resistance of manner features predicts delinking or insertion of the feature [±voice] should take precedence, since laryngeal features are claimed to be less anchored than are manner features. Above, in section 1, we presented the example of */v/ in Moroccan Arabic that could be adapted either into [f] or [b], since both /f/ and /b/ exist in the phonological inventory of Moroccan Arabic and are thus theoretically available options as repair strategies. In (13) the figures presented show the targeted feature for all malformations in our corpus where there is a choice between an adaptation targeting the manner feature [±continuant] and the laryngeal feature [±voice] are available.

(13) Malformations in our corpus for which there is a choice between changing manner feature [±continuant] or laryngeal feature [±voice]

Feature targeted	No. of Malformations	Percentage
[±voice]	413	66% (413/623)
[±continuant]	210	34% (210/623)

At first glance, the statistics in (13) show a preference for repair that targets the laryngeal feature voice over the manner feature continuant. However, some phonemes are inordinately represented in (13). When examining the main adaptation patterns of problematic phonemes along language lines in (14) no strong preference for either changing [±voice] or [±continuant] is noticeable.

(14) Repairs with a choice between [±voice] and [±continuant] in our corpus: feature targeted, main phoneme adaptation pattern and language.

Feature targeted	Phoneme	Language
[±voice]	/z/ → /s/, not → */d/	Fula
[±voice]	/z/ → /s/, not → */d/	Mexican Spanish
[±voice]	/p/ → /b/, not → */f/	Moroccan Arabic
[±voice]	/ʒ/ → /ʃ/, not → */dʒ/	Calabrese Italian
[±voice]	/ʒ/ → /s/, not → */dʒ/	Fula
[±continuant]	/ʒ/ → /dʒ/, not → */ʃ/	(Canadian) English
[±continuant]	/z/ → /d/, not → */s/	Afar
[±continuant]	/v/ → /b/, not → */f/	Moroccan Arabic
[±continuant]	/v/ → /b/, not → */f/	Mexican Spanish

Table (14) is summarized in (15) below. Note that for a strategy to be identified as the selected strategy, it has to claim at least 70% of the cases. Generally, the selected strategy claims 100% of cases, or close thereto.

(15) Preferred adaptation of an illicit phoneme where there is a choice between changing manner feature [±continuant] or laryngeal feature [±voice]

Feature targeted	No. of phonemes	Percentage
[±voice]	5	55.6% (5/9)
[±continuant]	4	44.4% (4/9)

In table (15), we can see that there are 5/9 phonemes that target the laryngeal feature [±voice] over [±continuant], which represents only a slight preference for preserving the manner feature. In 4.3.1 we will see in detail one of the adaptations presented in table 14 involving a change of manner feature.
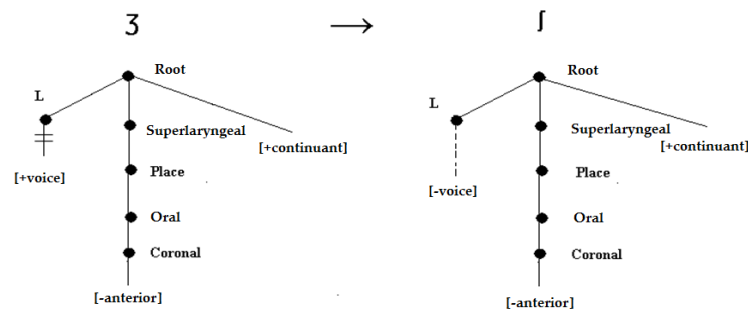
4.3.1 Adaptation of French */ʒ/ in (Canadian) English

The voiced fricative */ʒ/ is illicit in English at the beginning and the end of a word, which is formalized in (16), although it is often imported, especially at the end of a word such as French *beige* /beʒ/ → English [beʒ].

(16) Parameter: [+continuant] ~ [+voice] ~ [-anterior] at beginning and end of a word?
French: yes; English: no

In order to repair this malformation, there are two strategies available in (Canadian) English: a) delink [+voice], b) delink [+continuant]. The hypothesis of the greater resistance of manner features predicts the delinking of the feature [+voice]. In (17) the unselected adaptation (*/ʒ/ → /ʃ/), in which the feature [+voice] is delinked followed by the default insertion of [-voice], is illustrated.

(17) Representation of unselected /ʒ/ → /ʃ/.

The schema in (18) shows the selected adaptation strategy in (Canadian) English involving delinking of manner feature [+continuant], followed by the insertion of the redundant feature value [-continuant].

(18) Representation of selected /ʒ/ → /dʒ/.
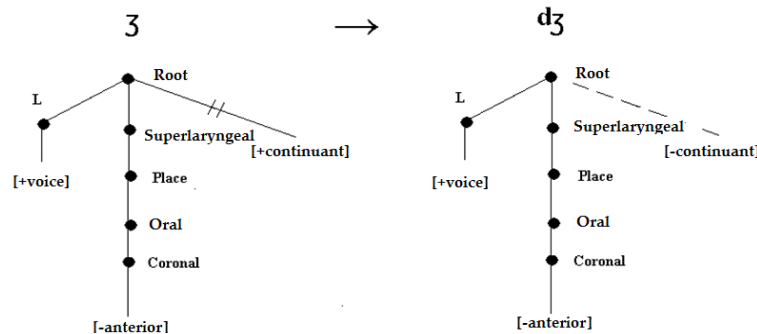
In 35/35 cases, the adaptation chosen is to /dʒ/ at the beginning and end of a word. In other words, in 100% of cases in this language, the segment /ʒ/, when adapted, was adapted in modifying the manner feature [±continuant], despite the available option of modifying [±voice]. Examples are presented in (19).

(19) *Examples of /ʒ/ to /dʒ/ from Canadian English*
      French *gélatine* /ʒelatin/   →   Canadian English [**dʒ**ɛlətɪn], *[ʃɛlətɪn];
      French *genre* /ʒɑ̃ʁə/   →   Canadian English [**dʒ**ɑnɹə], *[ʃɑnɹə];
      French *garage* /ɡaʁaʒ/   →   Canadian English [ɡəɹɑ**dʒ**], *[ɡəɹɑʃ].

A similar situation is in Moroccan Arabic where the choice exists to adapt the illicit segment */v/ into /f/ (change of the laryngeal feature [±voice]) or into /b/ (change of the manner feature ([±continuant]). In 58/81 (72%) cases the adaptation strategy chosen is /v/ → /b/. Thus the primary strategy involves modifying a manner feature as opposed to a laryngeal feature.

(20) *Examples of /v/ to /b/ in Moroccan Arabic*
      French *valise* /**v**aliz/   →   Moroccan Arabic (MA) [**b**ɛliza];
      French *caravane* /kaʁa**v**an/   →   MA [kara**b**an];
      French *lavabo* /la**v**abo/   →   MA [la**b**abʊ].

4. 4   Comparison of manner [±continuant], [±strident] and place Coronal

When the features [±continuant], [±strident] and Coronal can all be employed in order to repair (minimally) an ill-formed interdental-fricative (i.e. /θ/ and /ð/), the hypothesis of the greater resistance of manner features predicts: delinking Coronal should take precedence, since place of articulation is claimed to be less anchored than are manner features such as [±continuant] and [±strident]. The results for individual malformations which have these repair options in our corpus are presented in (21).

(21) Malformations in our corpus for which there is a choice between changing manner feature [±continuant], the manner feature [±strident] and Coronal (place).

Feature targeted	No. of malformations	Percentage
[±continuant]	152	81.3% (152/187)
[±strident]	33	17.6% (33/187)
Coronal	2	1.1% (2/187)

A strong preference for targeting a manner feature, especially [±continuant], is clearly noticeable in (22) when looking at the data on the basis of the preferred adaptation of the interdental phonemes in the various languages of our corpus where these phonemes are ill-formed.

(22) Preferred adaptation of illicit /θ/, /ð/ where there is a choice between changing manner feature [±continuant], manner feature [±strident] and Coronal (place).

Feature targeted	No. of phonemes	Percentage
[±continuant]	7	70% (7/10)
[±strident]	3	30% (3/10)
Coronal	0	0% (0/10

The seven phonemes in our corpus where [±continuant] is modified to the detriment of [±strident] and Coronal are: /θ/ → /t/ in Quebec French; Calabrese Italian, Mexican Spanish and Lama; /ð/ → /d/ in Quebec French, Calabrese Italian and Mexican Spanish. The three phonemes where [±strident] is modified to the detriment of [±continuant] and Coronal are: /ð/ → /z/ in Parisian French; /θ/ → /s/ and /ð/ → /z/ in Japanese. As for /θ/ in Parisian French, there was no clear preference between /t/ and /s/ in the loanwords of our corpus, so it was not included in the table in 21 as no one strategy claimed over 70% of cases.[2] In 4.4.1, we will see in detail the adaptations presented in table (22) involving a change of the manner feature [±continuant].

4.4.1 *Adaptation of θ/ and /ð/ in various languages*

The interdental fricatives */θ/ and */ð/ are illicit in many languages as shown in (23).

(23)   Parameter: [+continuant] ~ [-strident] ~ [-sonant]?
       English: yes;
       Quebec French, Mexican Spanish, Calabrese Italian,
       Pennsylvania German: no

Three possible repairs available are: a) Coronal → Labial (place feature), b) delink [-strident] (manner feature), c) delink [+continuant] (manner feature). The hypothesis that manner features are more resistant to change (i.e. less often altered) predicts delinking Coronal over delinking [+continuant] or [-strident]. Option (a), involving a change to place, is illustrated in (24).

(24)   Representation of unselected /ð/ → /v/.
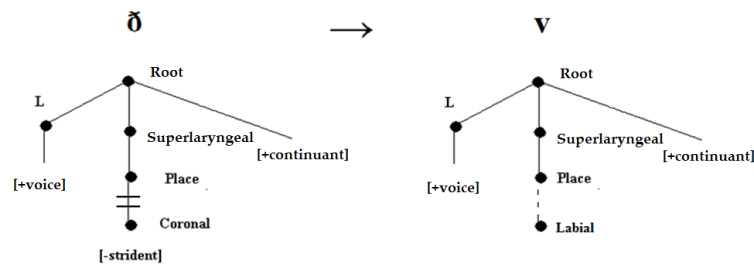
Option (b) involving modification of the manner feature [-strident] is illustrated in (25).

[2] We are aware however that the principal adaptation strategy in Parisian French is most likely /θ/ → /s/ (see for example Paradis and LaCharité, to appear) but our corpus does not include enough examples of /θ/ → /s/ to pass the 70% threshold.

(25) Representation of /ð/ → /z/.
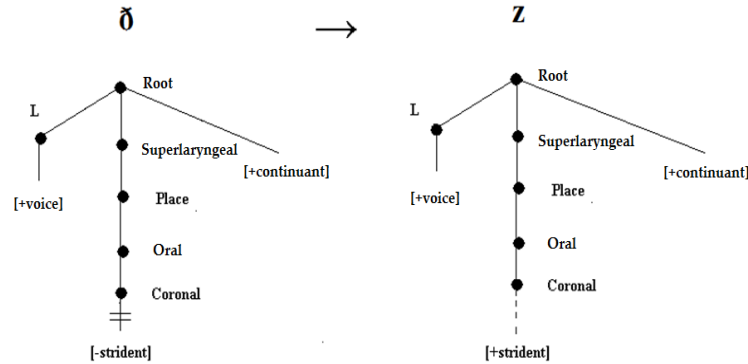
The schema in (26) illustrates option (c) involving modification to the manner feature [+continuant].

(26) Representation of /ð/ → /d/.
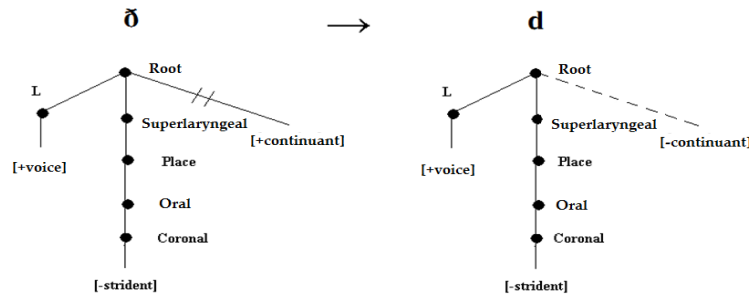
The adaptation strategy most often chosen in our corpus and on a typological basis (see Paradis and LaCharité, to appear) is /ð/ → /d/ (and corresponding /θ/ → /t/) involving modification of the manner feature [+continuant]. Examples from our corpus and Paradis and LaCharité (to appear) are presented in (27).

(27) *Examples of /ð/ to /d/ and /θ/ to /t/*
Engl. *that's it* /ðætsɪt/   →   Quebec French [datsɪt]
Engl. *thrill* /θɹɪl/   →   Quebec French [tʁɪl];
Engl. *path* /pæθ/   →   Calabrese Italian [pat];
Engl. *bother* /bɑθəɹ/   →   Pennsylvania German [bɑdəɾɐ].

5. Discussion

It has been shown that certain manner features, such as [±continuant] do indeed change at a rate comparable to place and the laryngeal feature [±voice], contrary to the hypothesis of the greater resistance of manner features. In fact, a closer

look at the findings reveals that manner feature changes go overwhelmingly in one direction: they are almost never added to a segment during the adaptation process. Instead, when the manner feature is manipulated, it is nearly always delinked. For example, in Lama, Mexican Spanish and in Japanese, the voiced [+continuant] fricative /v/ is adapted primarily into the voiced stop /b/ that has default [-continuant], as in French *savon* [savɔ̃] 'soap' → Moroccan Arabic [sabʊn]. Below in (28), other examples of fricatives that become stops as their primary adaptation are provided.

(28) *Non-exhaustive list of examples of fricatives becoming stops (change of manner feature)*

Moroccan Arabic:	/v/	→	/b/,
Mexican Spanish:	/v/	→	/b/,
Japanese:	/v/	→	/b/,
Afar:	/ɣ/	→	/g/ (Leslau 1997),
French	/ɣ/	→	/g/
Mexican Spanish	/ʃ/	→	/tʃ/,
English:	/ʒ/	→	/dʒ/,
Afar:	/z/	→	/d/ (Leslau 1997),
Mexican Spanish:	/θ/	→	/t/,
Quebec French:	/θ/	→	/t/,
Calabrese Italian:	/θ/	→	/t/,
Mexican Spanish:	/ð/	→	/d/,
Quebec French:	/ð/	→	/d/,
Lama:	/ð/	→	/d/ (Ulrich 1997),
French:	/x/	→	/k/,
English:	/x/	→	/k/.

The opposite, however, where the primary adaptation is, for example, */b/ → /f/ rarely occurs. For instance, in only 2/134 cases in Moroccan Arabic does the problematic segment from French, */p/, become /f/ (in 132/134 cases the adaptation is into /b/). We propose that the reason manner features are deleted rather than inserted is that their insertion, contrary to their deletion, results in a less marked segment than the ill-formed segment in question, whereas the insertion of a manner feature would result in a more marked segment. This is formalized in the hypothesis formulated in (3).

The cases in the corpus where the preferred adaptation strategy available would yield the insertion of a marked feature such as [+continuant] are typically the foreign phonemes where the importation levels are the highest. For example, /dʒ/, in the rare cases where it is adapted becomes [ʒ] in French after insertion of [+continuant]. However, this is overwhelmingly avoided through importation. Overall /dʒ/, /tʃ/ and /p/ yield the highest rates of importation in the corpus. The importation rates of /dʒ/ is 96.4% in Mexican Spanish (110/114), 94.8% in Québécois French (257/271) and 98.5% in Japanese (134/136). Overall, the affricate /tʃ/ is imported in 85% of cases (461/541) and /dʒ/ is imported in 91% of cases (606/663). This occurs in order to avoid a repair that inserts marked [+continuant]. The repair, /p/ to /b/ in Moroccan Arabic, follows with the third highest importation rate in our corpus, 70.5% (320/454). Here importation is preferred to insertion of marked [+voice]. The general importation rate of

foreign segments in the CoPho database is only 28.7% (14,391/50,092), much lower than for /tʃ/, /dʒ/ and /p/. In our corpus no other segments match these importation rates. That is, the data shows that when no suitable option exists to delink a marked feature, the segment is overwhelmingly imported rather than have a marked feature inserted. Examples for /dʒ/ and /tʃ/ are provided in (29).

(29)   *Examples of the importation of /dʒ/ and /tʃ/*
      Engl. *digital* /dɪ**dʒ**ətəl/   →   Japanese [de**dʒ**itɑɾɯ]
      Engl. *engine* /ɛ**ndʒ**ən/   →   Japanese [e**ndʒ**in]
      Engl. *jello* /**dʒ**ɛlo/   →   Mexican Spanish [**dʒ**elo]
      Engl. *jet* /**dʒ**ɛt/   →   Mexican Spanish [**dʒ**ɛt]
      Engl. *Dow-Jones* /daw**dʒ**onz/   →   French [dow**dʒ**ons]
      Engl. *gadget* /ɡæ**dʒ**ət/   →   French [ɡa**dʒ**ɛt]
      Engl. *chapel* /**tʃ**æpəl/   →   Japanese [**tʃ**aperɯ]
      Engl. *chess* /**tʃ**ɛs/   →   Japanese [**tʃ**esɯ]

To conclude, in the corpus there are a large number of cases of fricatives becoming stops but there is no case where a majority of ill-formed stops become fricatives. Those few problematic stop phonemes, that when adapted become fricatives, are the same phonemes where importation of L2 phonemes predominate so that the segment remains a stop in a majority of cases, as in the examples in (29) above. Repair strategies seek not to target laryngeal and place features as opposed to manner features, but rather, the patterns show that what is at work is a movement towards the unmarked as stated in (3). In other words, consistent with the hypothesis of complexity reduction in (3), a repair deleting marked information present in the input is preferred to a repair inserting marked information.

6.   Conclusion

The first objective was to test the hypothesis that states that phonological features of manner of articulation (such as nasal, strident, continuant, etc.) are more resistant to modification during loanword adaptation than are place and laryngeal features. Our hypothesis was that in loanword adaptation manner features are not more resistant to change than are features of place of articulation and laryngeal features. The findings are that change targeting the manner feature [±continuant] is the means employed to repair an ill-formed segment in nearly half of the cases in the corpus. There are also examples of other manner features being targeted such as [±nasal]. The hypothesis that manner features are rarely modified is thus not confirmed. The second objective was to determine if there was instead a movement towards complexity reduction in loanword adaptation. It has been shown that manner features are very rarely inserted but are deleted because their insertion would bring a more marked segment and there is a clear preference to import the segment rather than end up with a segment with more marked features.

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