Regional variation in loanword adaptation
Phonological or acoustic repair?

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Questions

1. How are English loanwords adapted into Spanish?
2. Do different varieties of Spanish differ in the phonological forms of loans?
3. If loans are adapted into similar varieties differently, what does this mean?
4. When is loanword adaptation phonologically-aware, and when is it phonologically-naive?
5. **What drives the selection of loanword adaptation mechanisms?** Does variation in loanword adaptation correspond to variation in the mechanism of adaptation itself, or in some aspect of the phonological grammar, or in the perceptual and acoustic space? How do we know?

Two mechanisms for loanword adaptation

A classification after Calabrese (2009):

- **Phonological repair**: *L2 phonological information is involved in adaptation.* Speakers acquire an underlying representation of an item in L2, and coerce this into the phonological grammar of L1, producing a surface form that conforms to L1 phonotactics (but not necessarily to L2 *phonetic* detail) (LaCharité & Paradis 2005).
  - Assumption: An initial population of speakers must have underlying forms for both recipient (R) & source (S) languages → that is, a *bilingual population.*
- **Acoustic repair**: *L2-naive reanalysis.* Repairs are driven solely by the action of L1 perceptual systems on the foreign acoustic signal, with no recourse to L2 phonological systems (Silverman 1992, Peperkamp & Dupoux 2003, Peperkamp 2005).
  - Assumption: No *phonological* knowledge of the source language is involved.

If two similar phonologies treat the same loanword differently, what does it mean about the mechanism by which adaptation took place?

Loanword adaptation in Spanish

What do Spanish listeners do with English /ʌ/? We consider the adaptation of /ʌ/-containing English words (such as *Tupper(ware)*, *punk*, *rugby*) into different varieties of Spanish, all of which share the same 5-vowel system /i-e-a-o-u/.

- English /ʌ/ is often both fronted and lowered – [ʌ ~ ɜ ~ ɐ] – particularly in American varieties. The perceptual input is in the lower half of the vowel space; see figure 2.
- **Candidate /a/ wins** → this is a plausible acoustic repair, particularly in a system in which cardinal /a/ is relatively centralised.
- **Candidate /o/ wins** → this is less acoustically close, and adds [+round]. Can this still be phonologically-driven (L2-sensitive) repair?
- **Candidate /u/ wins** → orthographic motivation?

If the winning candidates differ across Spanish-speaking regions:

1. Either: different outcomes are caused by different adaptation strategies; or
2. The type of repair doesn't vary; all dialects apply the same acoustic repair, but different dialects have different perceptual spaces.

Survey 1: Adaptations

We carried out an online survey which asked subjects from different Spanish-speaking countries (N=188) about adaptations of English words containing /ʌ/. The survey showed pictures corresponding to these words and asked subjects to choose one of three possible adaptations: transliterations into Spanish, e.g. *panc, ponc, punc*, or an "I don't use this word" option. Results appear in Figure 1.

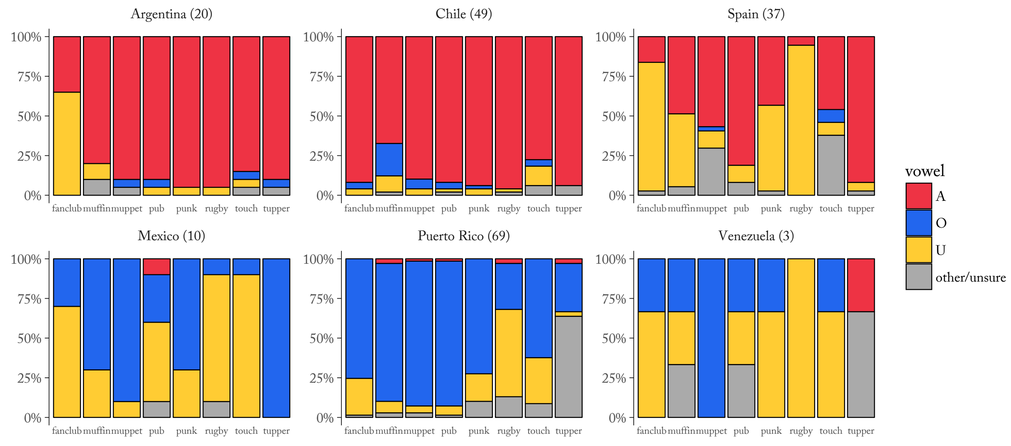

Figure 1: Adaptations of 10 English words in Spanish in 6 different countries.

Results

- Two defined patterns in terms of non-orthography motivated (GLM, $\chi^2 = 837.67$, $df = 1$, $p < 0.01$)
  - /a/-preferring varieties: Argentina, Chile, Spain
  - /o/-preferring varieties: Puerto Rico, Mexico
- /o/-adaptations are more frequent in countries with higher rates of bilingualism (do not conflate this with L2-proficiency!). If /o/-adaptations are 'phonological repair', then this is in line with hypotheses that phonological repair corresponds to rates of bilingualism (Heffernan 2007).
- How does this correspond to acoustics? Across Spanish, there is a spectrum of vowel-spaces from 'most centralised' (Chile; see Sadowsky 2012 for a detailed overview) to 'most peripheral'; Mexico (Grijalva et al. 2013), Argentina (Godínez 1978).
- **What can we find out about the perceptual space?**

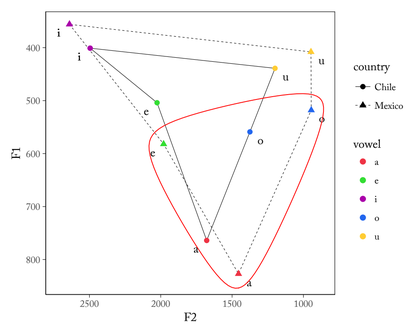

Figure 2: F1–F2 reference values for Chilean and Mexican speakers of Spanish.

Survey 2: The /a/ – /o/ perceptual space

A second online experiment, this time with a perceptual task. Acoustic stimuli along two 7-step continua built with the Praat Klatt synthesizer (Boersma & Weenink 2017). Continua extrapolated from two sets of endpoint values: Chilean (Sadowsky, 2012) and Mexican (Grijalva et al 2013) reference values for /a/ and /o/. Figure 2 shows reference values. Listeners from Chile (N=7) and Mexico (N=6) categorised the stimuli into the Spanish categories /a/, /e/, and /o/. Each listener heard stimuli from both continua, 4 times each.

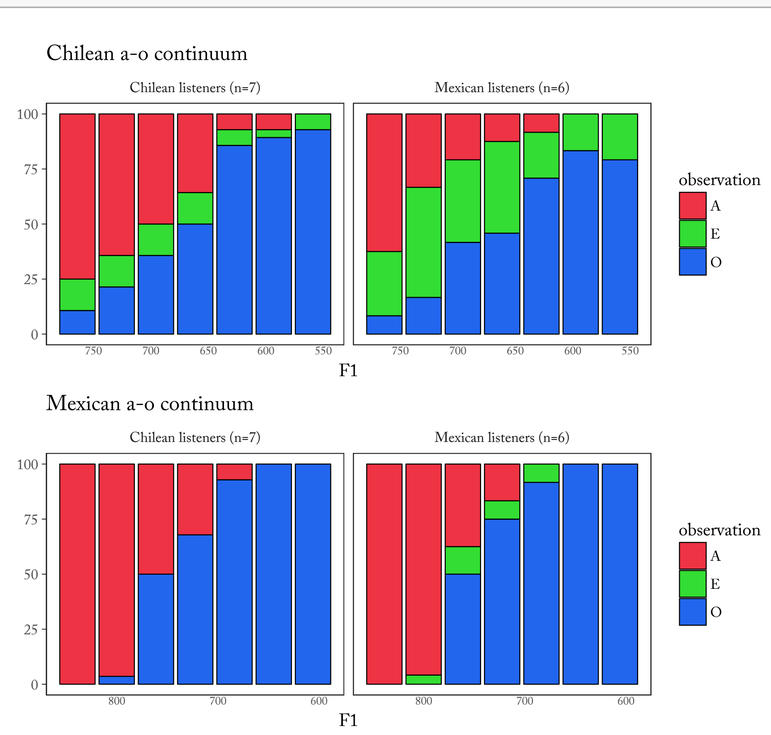

Figure 3: Perception of the Chilean and Mexican /a/-/o/ space by Chilean and Mexican speakers of Spanish.

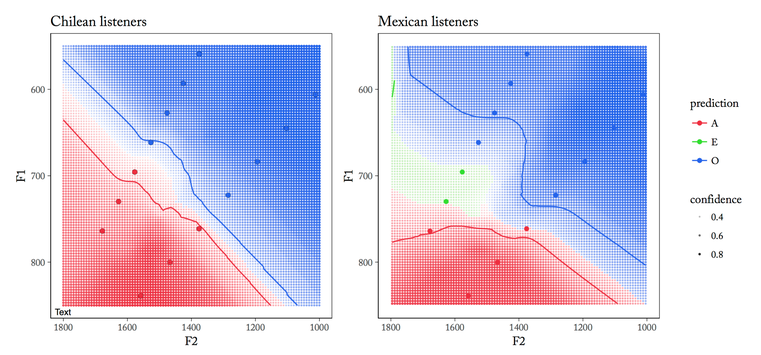

Figure 4: k-NN simulation: Chilean vs. Mexican /a/ - /o/ perceptual space.

Results

- Figure 3: Chilean listeners more readily accept centralised values as tokens of either endpoint than Mexican listeners do. Values that are most /ʌ/-like are well-categorised as /a/ by Chilean listeners, and very variably categorised by Mexican listeners. Rate of /a/-responses on Chilean stimuli shows a significant effect of the listener's country of origin (GLM, $\chi^2 = 9.774$, $df = 1$, $p < 0.01$).
- Along the 'Mexican' continuum, performance is very similar; along the 'Chilean' continuum, Mexican listeners perceive much more *fronting* (GLM, $\chi^2 = 23.48$, $df = 1$, $p < 0.01$).
- In order to think about these results in F1-F2 space, k-nearest neighbours-classification (kNN) trained on the set of results, applied to a test dataset consisting of a grid of points at 5Hz spacing. Misclassification error ~ 0.2. Figure 4 gives best-guess interpolated perceptual boundaries.

Interim conclusions

- For Chilean listeners, there is a neat match between the expected output of **acoustic strategies** (/a/), and perceptual response: Chilean listeners categorise the most /ʌ/-like points in the space as /a/.
- Although Mexican listeners differ in perceptual response from Chilean listeners, there is a **mismatch** between their perceptual response and the output of loanword adaptation. Our best option seems to be the suggestion of **phonological repair**.
- Heffernan 2007: loanword adaptation is driven by acoustic information and perception when bilingualism is low-incidence, and representations when bilingualism is high-incidence. *This works*: Mexico and Puerto Rico pattern together both in best candidate vowel and in high incidence of functional bilingualism; Argentina and Chile pattern together in the opposite way.

References

Boersma, P. & Weenink, D. 2018. Praat: doing phonetics by computer [computer program]. Version 6.0.40, retrieved 11 May 2018 from http://www.praat.org/.

Calabrese, A. 2009. Perception, production and acoustic inputs in loanword phonology. In Calabrese, A & Wetzels, W. (Eds.) Loan Phonology. Amsterdam: John Benjamins. 59 - 114.

Godínez, M. 1978. A comparative study of some Romance vowels. UCLA Working Papers in Phonetics, 4, 3-19.

Grijalva, C., Piccinini, P. E., & Arvaniti, A. 2013. The vowel spaces of Southern Californian English and Mexican Spanish as produced by monolinguals and bilinguals. In Proceedings of Meetings on Acoustics ICA2013 (Vol. 19, No. 1, p. 060088). ASA.

Heffernan, K. 2007. The role of phonemic contrast in the formation of Sino-Japanese. Journal of East Asian Linguistics 16: 61-86.

LaCharité, D. & Paradis, C. 2005. Category preservation and proximity versus phonetic approximation in loanword adaptation. Linguistic Inquiry 36(2), 223-258.

Peperkamp, S. 2005. A psycholinguistic theory of loanword adaptations. BLS 30. 341–352.

Peperkamp, S. & Dupoux, E. 2003. Reinterpreting loanword adaptations: the role of perception. In M. J. Solé, D. Recasens & J. Romero (eds.) Proceedings of the 15th International Congress of Phonetic Sciences. Barcelona: Causal Productions. 367–370.

Sadowsky, S. 2012. Sociolinguistic stratification and phonetic description of the vowel allophones of Chilean Spanish. PhD dissertation. Univ. de Concepción. Concepción, Chile.

Silverman, D. 1992. Multiple scansions in loanword phonology: evidence from Cantonese. Phonology 9, 289–328.