

## A critical threshold for the population fraction of L2 speakers necessary and sufficient to bring about contact-induced language change

In an ideal world, a solution to the actuation problem (Weinreich et al., 1968) would have the force of a deductive–nomological explanation: if such-and-such conditions prevail, then (and possibly only then) is actuation of a linguistic change predicted. In reality, it would be naive to think of predictions of this kind to apply to complex socio-historical systems with full accuracy (Lass, 1980). However, progress on complex issues such as the actuation of linguistic change can be made through the study of formal models which set up a ‘toy world’ employing a set of reasonable idealizing assumptions. Such models have the same relation to reality as idealized models in physics which neglect the effect of secondary forces such as friction, yielding predictions that are *sensu stricto* false but approximately correct and epistemologically useful.

This contribution describes such an idealized model of contact-induced linguistic changes. Both theoretical and empirical work in sociolinguistic typology has suggested that the fraction of L2 learners in a language community may serve as an important external control parameter, determining whether or not the language undergoes simplification of a grammatical variable (such as the loss of case distinctions, or the loss of a syntactically complex option) due to the effect of difficulty encountered in L2 acquisition (Bentz & Winter, 2013; Sessarego, 2015; Sinnemäki & Di Garbo, 2018; Trudgill, 2011; Walkden & Breitbarth, 2019). The more L2 learners there are in the speech community in relation to the number of L1 speakers, the more likely such mutations of the language are to trickle into the usage of the entire community over extended time.

We model such interactions by generalizing the variational learner (Yang, 2002) for a mixed population of L1 and L2 speakers. For L2 learners, the extended model includes an inherent difficulty term that works against the adoption of the L2-difficult linguistic variant. The inter-generational dynamics of the combined L1–L2 population can be studied in much the same way as those of the standard model. In the extended model, however, the fraction of L2 speakers in the population, notated  $\sigma$ , turns out to act as a bifurcation parameter, controlling whether or not simplification of the language — in other words, actuation of a linguistic change triggered by the presence of L2 learners — happens. The critical threshold is shown to occur at

$$\sigma_{\text{crit}} = (\alpha - 1)(D + 1)/(\alpha D),$$

where  $\alpha$  is the advantage ratio of the two competing grammatical options (Kauhanen & Walkden, 2018) and  $D$  is a measure of the strength of L2-difficulty of the L2-difficult option. Change occurs if  $\sigma > \sigma_{\text{crit}}$  but fails if  $\sigma < \sigma_{\text{crit}}$ .

If all three parameters ( $\sigma$ ,  $\alpha$  and  $D$ ) can be empirically estimated, then the model’s prediction (change vs. non-change) can be assessed directly. We apply the model to two case studies, the loss of verbal inflection in Afrikaans (Trudgill, 2011) and the partial loss of null subjects in Afro-Peruvian Spanish (Sessarego & Gutiérrez-Rexach, 2018). In the Afrikaans case, the change went to completion (all verbs are reduced to a single form corresponding to the Dutch stem in all parts of the paradigm), whereas in Afro-Peruvian Spanish use of null subjects remains non-categorical; moreover, apparent-time investigations suggest that the younger generations are again moving in the direction of a full null-subject grammar (Sessarego, 2015). These facts are predicted by the model, in the sense that  $\sigma > \sigma_{\text{crit}}$  in the former case but not in the latter, when estimated from available demographic and linguistic data.

These findings illustrate that relatively simple models of language dynamics can be fruitfully used to tackle complex questions such as the actuation problem. It is important to note that such models offer empirical predictions not despite their simplicity, but *because* of it — more complex models remain, regrettably, analytically intractable. The modelling also raises important theoretical questions, such as whether failed changes should be considered actuated, or whether changes that stabilize for probabilistic optionality (as opposed to full categorical use of one variant) ought to be considered actuated. These will be discussed briefly.

## References

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