A stationary frequency effect in Manchester English

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The impact of lexical token frequency on phonetic implementation has been argued to support Exemplar Theory in the following way (Bybee 1998, 2002; Pierrehumbert 2001, 2002):

(a) Synchronically, high-frequency lexical items exhibit more coarticulation and reduction than low-frequency items (e.g. Dinkin 2008, Gahl 2008, Myers & Li 2009, among many others).
(b) This is because, in diachronic processes of lenition, frequent words change at a faster rate than infrequent ones.
(c) In turn, this is because high-frequency items suffer greater exposure to phonetic biases in production and perception than low-frequency items, and the effects of this difference are directly registered in phonetically detailed lexical representations.

This argument suffers from several problems. Hypothesis (b) has not been corroborated by actual diachronic observations in real or apparent time. Indeed, (a) does not logically entail (b): as acknowledged by Hay *et al.* (2015), frequent items can be ahead of infrequent ones, and yet change at the same rate. In such a scenario, the impact of frequency gives rise to a **constant rate effect** (CRE) in the sense of Kroch (1989): when modelled as logistic functions, the curves of change for high- and low-frequency items exhibit different intercepts but equal slopes. The existence of CREs in phonology was established by Fruehwald *et al.* (2013). Zellou & Tamminga (2014) report change in nasal coarticulation affecting high- and low-frequency items at the same rate. As regards (c), the empirical predictions of Exemplar Theory remain unclear. Sóskuthy (2014) shows that, in the absence of *ad hoc* stipulations, the inertia of a large exemplar cloud will cancel out the effects of greater exposure to phonetic bias. In addition, Hay *et al.* (2015) propose an exemplar-based account for a sound change apparently led by **low-frequency** words.

In this paper, we challenge (b) with evidence from a CRE in /t/-glottalling in Manchester. As expected, token frequency has a strong effect on /t/-glottalling, but there is no significant difference in the diachronic growth rates of glottalling in high- and low-frequency words. We demonstrate this statistically using LOESS-smoothers, mixed effects logistic regression, and Kauhanen & Walkden's (2015) mathematical model of the CRE. Our data come from a sociolinguistically stratified sample (62 speakers born between 1926-1985; 9,187 tokens of /t/ auditorily coded). Figure 1 (with data from word-medial /t/) shows that the curves of change in apparent time for high- and low-frequency items are not significantly different. Figure 2 shows the results of applying Kauhanen & Walkden's CRE model, which uses time-invariant contextual biases to derive context-specific curves from a single logistic growth function for all contexts (in this case, for all frequency bins). The model can be used diagnostically by comparing the error rates of CRE-constrained curves against independent logistic curves for each frequency bin. Fitting this more constrained model, with the CRE built in, leads to no increase in error over a model with completely independent logistic curves.

Further support comes from generalized mixed-effects logistic regression, which shows that an interaction between Zipf-scaled frequency (SUBTLEX-UK; van Heuven *et al.* 2014) and birthyear does not improve on a model without the interaction (by AIC or BIC). We conclude that the evidence stacks in favour of a scenario in which high- and low-frequency words change at the same rate, thus providing support for a CRE in Manchester /t/-glottalling.

The absence of evidence for (b) suggests that alternatives to (c) should be considered. Frequency-driven CREs are consistent with modified versions of classical modular architectures in which neogrammarian innovation is effected through change in phonetic implementation rules referring to phonological categories in surface representations, whilst the impact of frequency is produced by orthogonal mechanisms (e.g. cascading activation, listener modelling).

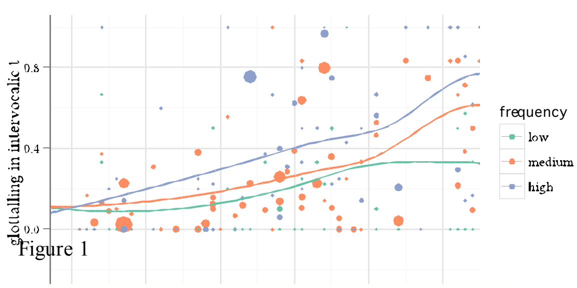

Figure 1

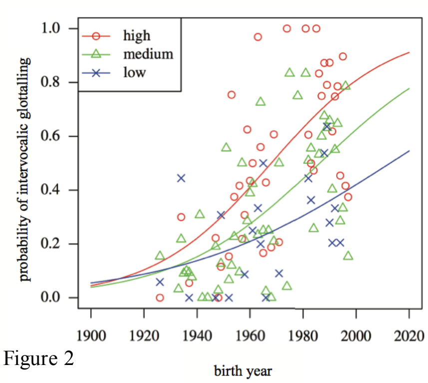

Figure 2