(1) Labov’s principles of chain shifting (Labov 1994: 116, 176)
   I. In chain shifts, long/tense vowels rise — no exceptions
   II. In chain shifts, short/lax vowels fall — exceptions
   III. In chain shifts, back vowels move to the front — few exceptions

(2) Generalizations
   a. Height: Long/tense vowels tend to rise, short/lax vowels tend to fall
   b. Fronting: All vowels tend to become more fronted

(3) Acoustics: Long/tense vowels and low F1 (cf. high vowels)
   a. Low F1 is the primary acoustic correlate of [+ATR] vowels (Niger-Congo: Starwalt 2008)
   b. Southern British English (Deterding 1997)
   c. German (livonen 1987)
   d. Finnish (Wiik 1965)
   e. German unstressed Vs: tense higher than lax, but more peripheral in terms of frontness (Jessen 1993)

(4) Articulatory bias: ATR and conservation of volume → Height
   Maybe advancing the tongue root tends to raise the tongue blade (cf. Ladefoged 2005: 128 fig. 12.7)

(5) Articulatory bias: Vowel length and time to achieve constriction → Height
   a. Long vowels have a longer time to achieve constriction → Long vowels rise
   b. Short vowels have a shorter time to achieve constriction → Short vowels fall
   c. But short vowels also have a shorter time for the lips and jaw to open → Exceptions to (b)

(6) Coarticulatory bias: Coarticulation with /i/ → Raising, fronting
   a. /i/ is the vowel most resistant to coarticulation
      (Italian: Farnetani et al. 1985; Catalan, Spanish: Recasens 1987; Turkish: Beddor & Yavuz 1995;
   b. “Presumably … the high-front gesture for /i/ places severe constraints on tongue dorsum variability”
      (Bradlow 2002: 251-2)
c. If /i/ tends not to coarticulate with other vowels, but other vowels coarticulate normally with /i/,
all vowels may tend to become more similar to /i/.

d. Raising and fronting of other vowels → Chain shift pushing /i/ out of the way

(7) Summary

I. In chain shifts, long/tense vowels rise — Articulatory and coarticulatory biases (4, 5a, 6)
II. In chain shifts, short/lax vowels fall — Articulatory bias (5b) with exceptions (5c)
III. In chain shifts, back vowels move to the front — Coarticulatory bias (6), exceptions unexplained

References


