Vowel duration and tongue root advancement in Italian and Polish

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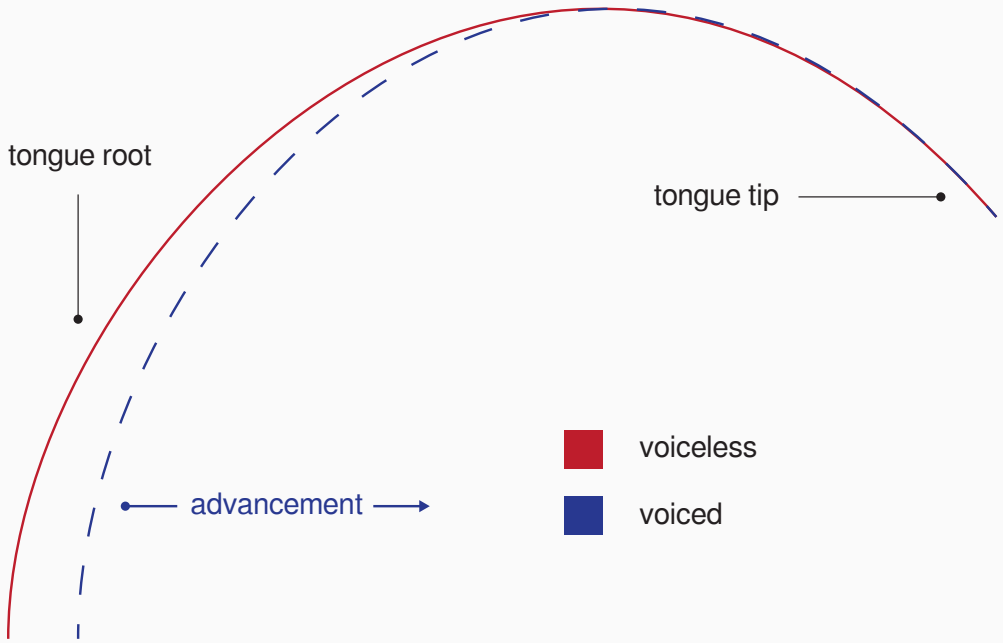
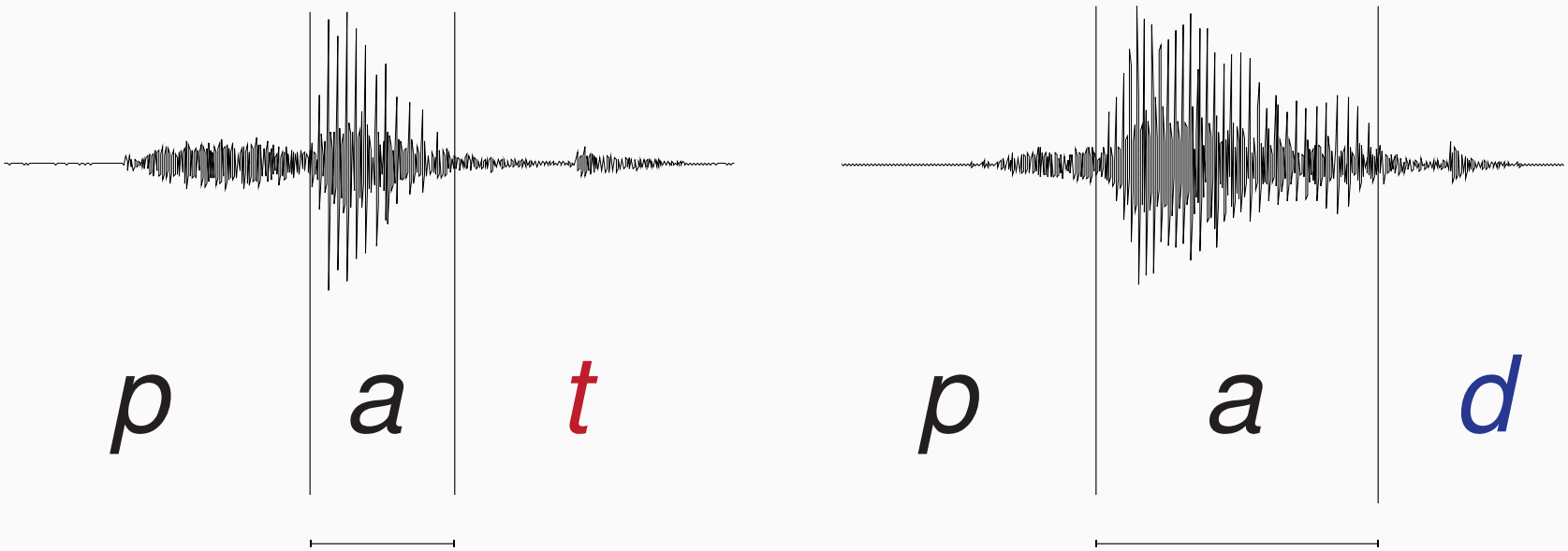
Background

- tongue root advancement (**TRA**)
  - voicing (Westbury 1983)
  - VOT (Ahn 2015)
  - also *vowel duration*?



Background

- voicing effect
  - House & Fairbanks (1953), Chen (1970), Klatt (1973), Lisker (1973)
  - no consesus on which factors play a role



Background

- assessment of tongue contour using ultrasonography
- **Italian** (Farnetani & Kori 1986), **Polish** (Keating 1984)

→ **H1a**: No TRA in Polish.

→ **H1b**: TRA in Italian at closure onset and maximum displacement.

→ **H2**: TRA in Italian at closure onset is smaller that maximum displacement.

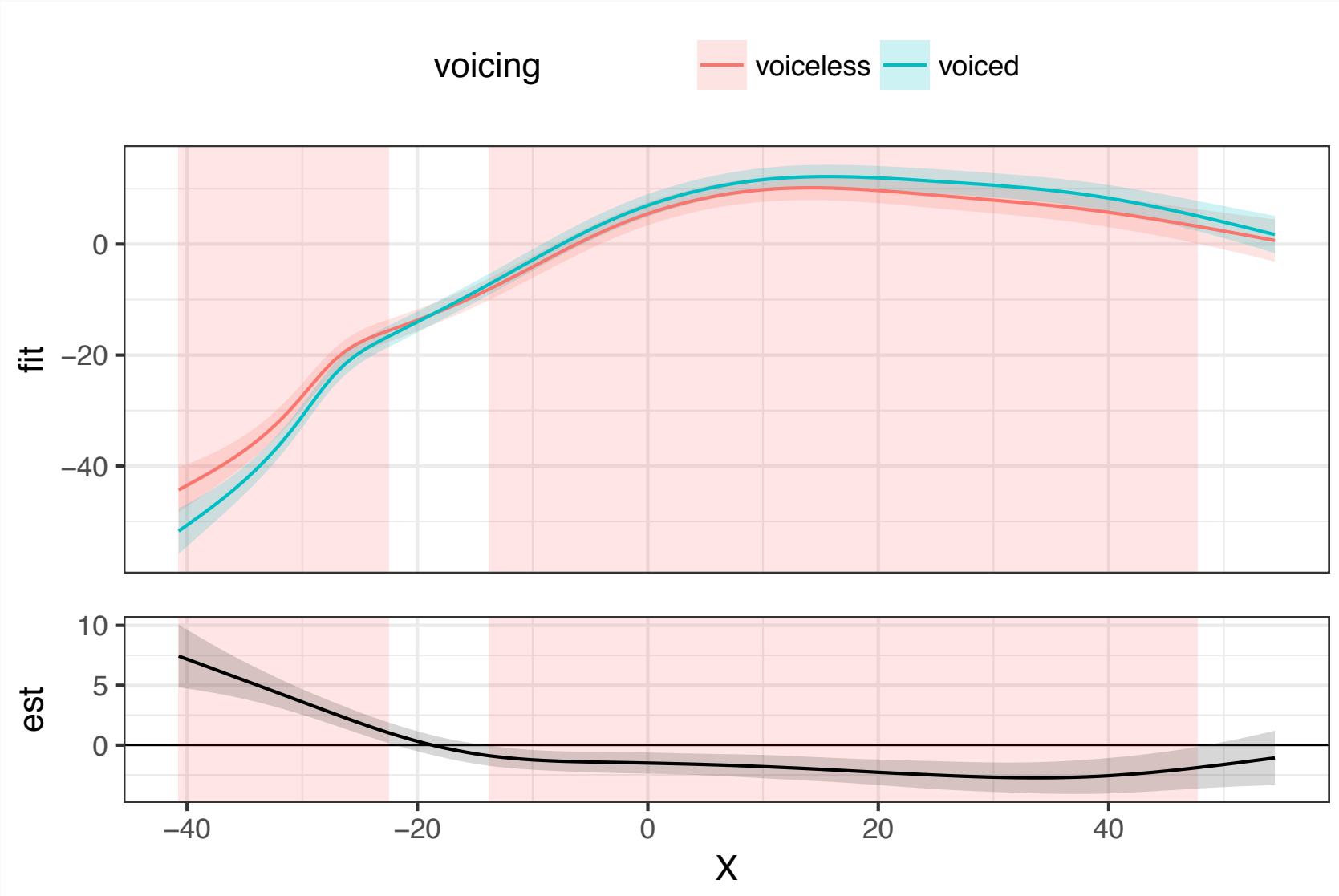
Methods

- **pilot** study
- Italian (*2 males*), Polish (*1 female, 1 male*)
- $C_1V_1C_2V_1$
    - C_1 = /p/, V_1 = /a, o/, C_2 = /t, d, k, g/
    - *pata*, *pada*, *paka*, ..., *poto*, *podo*, ...
- frame sentence
    - *Dico X lentamente*, 'I say X slowly'
    - *Mówię X teraz*, 'I say X now'

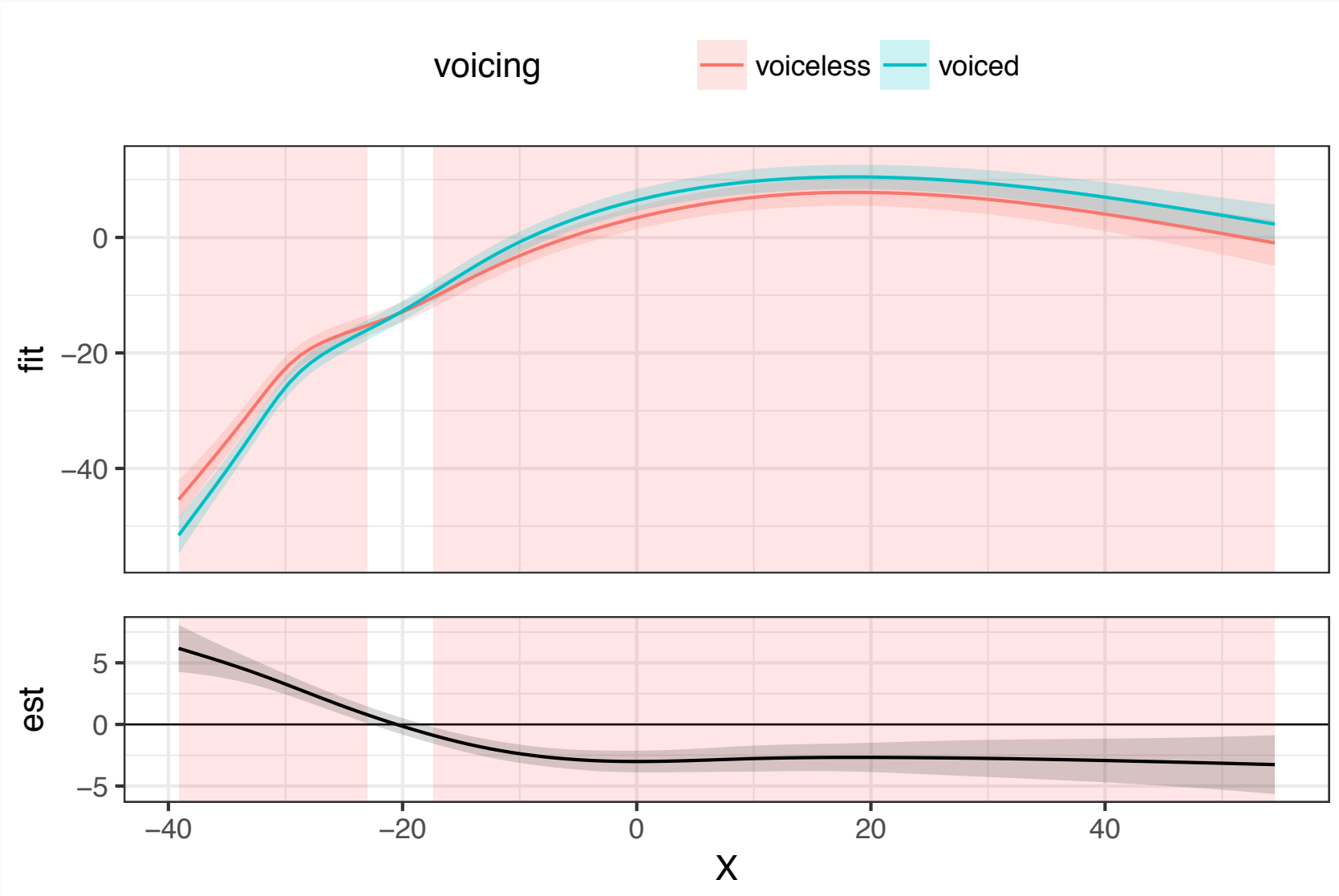
Methods

- equipment
  - Articulate Instruments set-up with probe stabilisation headset (Articulate Instruments Ltd 2011)
    - Echo Blaster 128, frame rate = 60 fps
- data
  - tongue contours
    - maximum tongue displacement (from ultrasound, Strycharczuk & Scobbie 2015)
    - closure onset (from acoustics)
- analysis
  - generalised additive mixed effects models (Wood 2006)

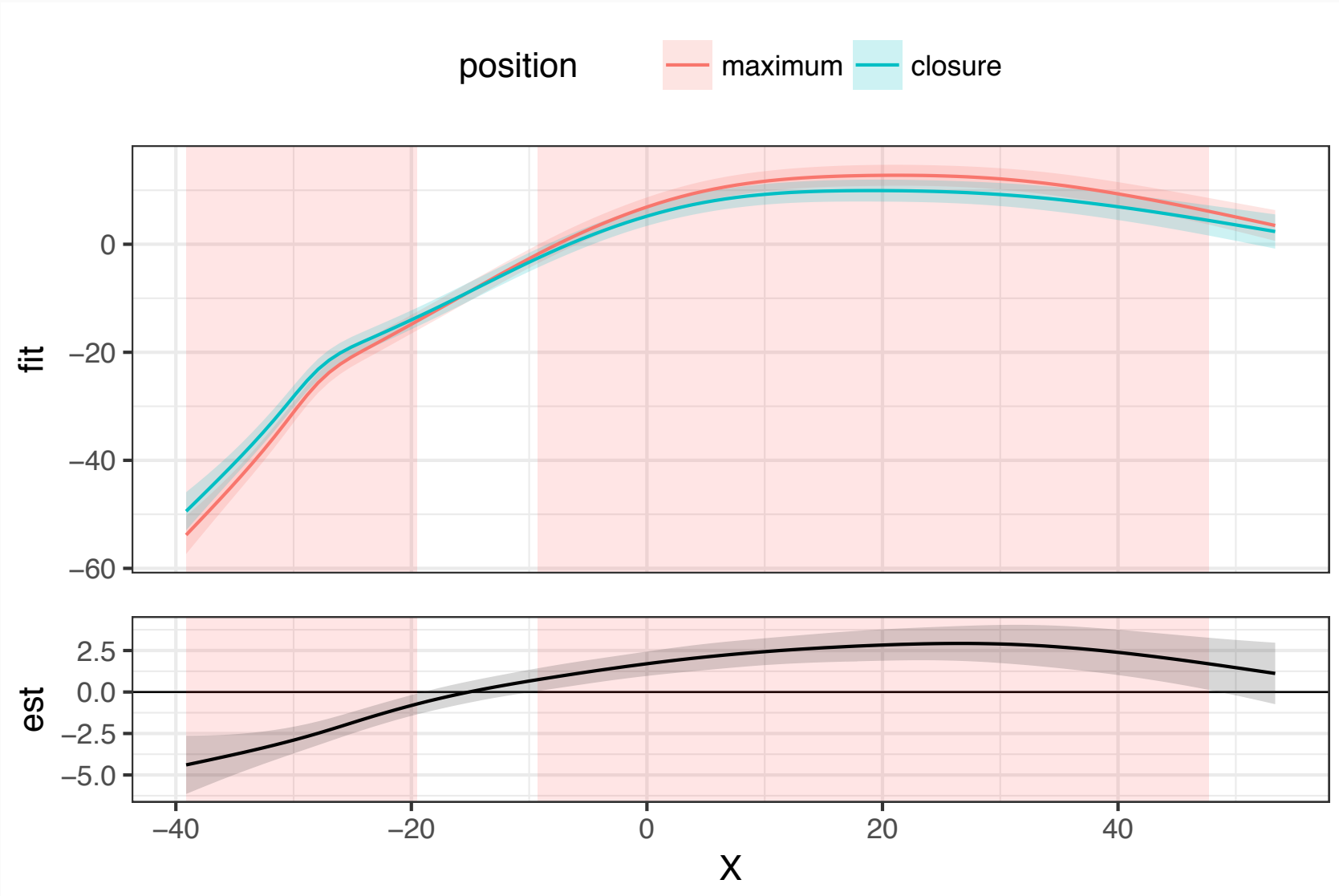
Results: Italian (maximum displacement), speaker IT01



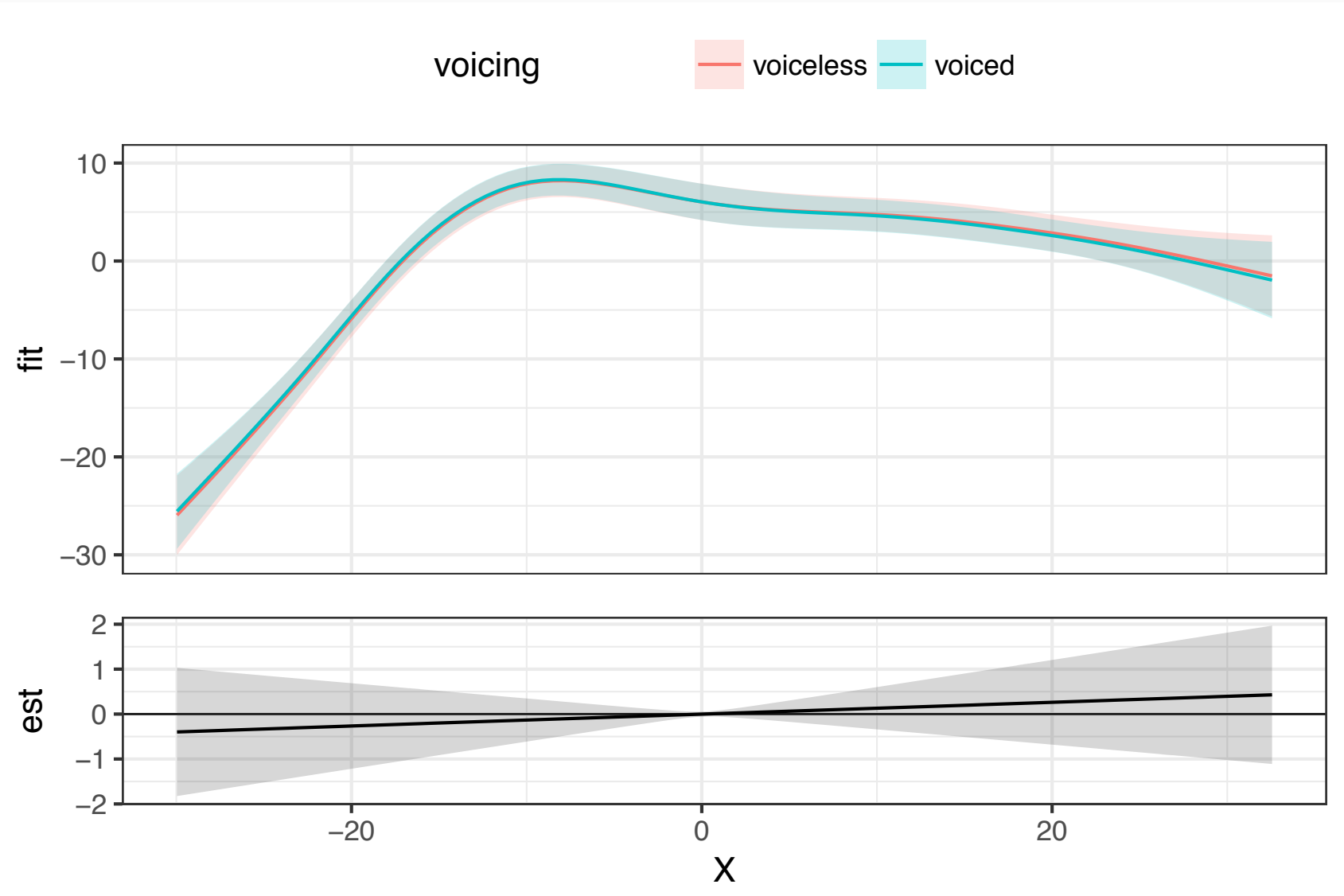
Results: Italian (closure onset), speaker IT01



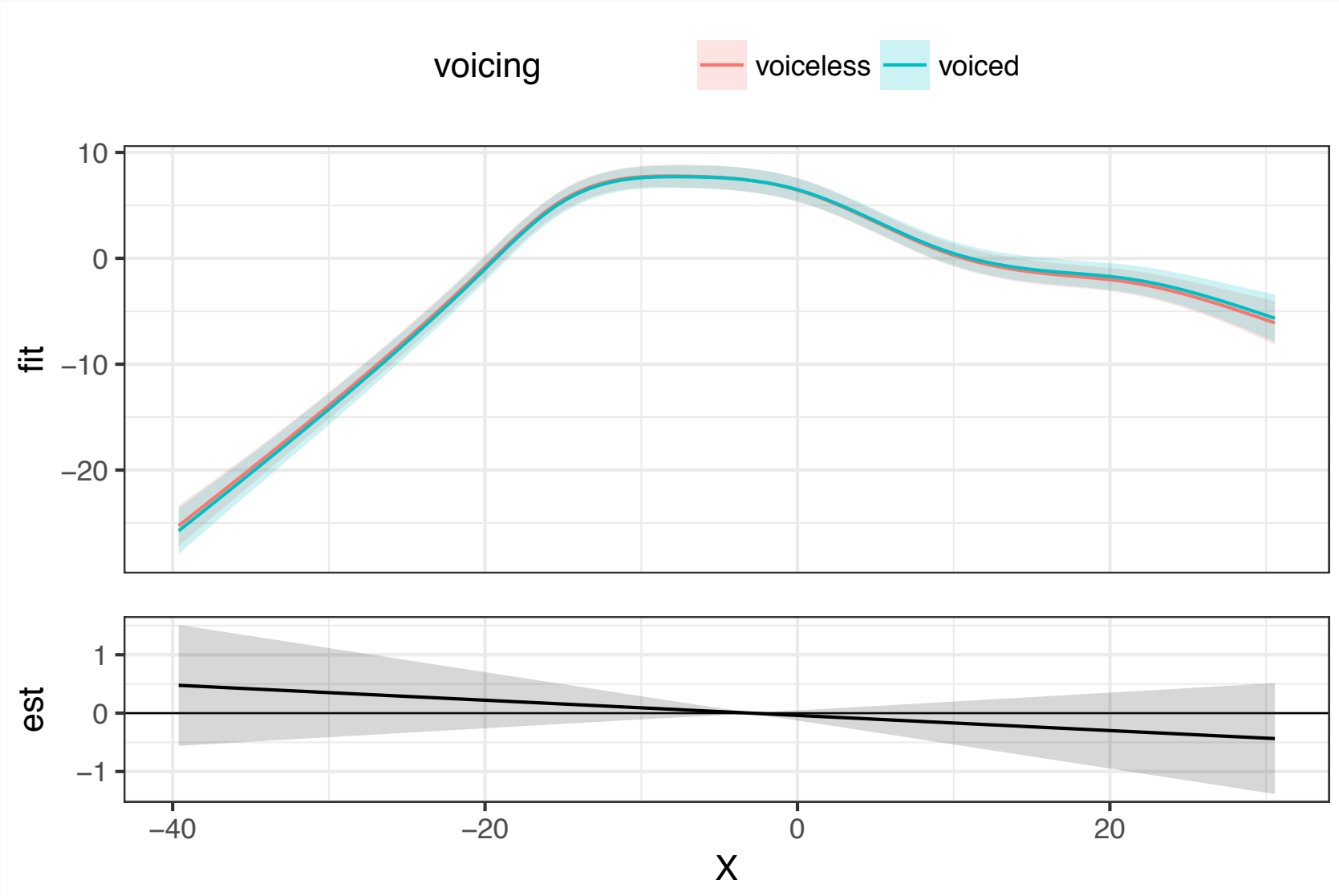
Results: Italian (closure onset vs. maximum displacement), speaker IT01



Results: Polish (maximum displacement), speaker PL04



Results: Polish (closure onset), speaker PL04



Summary

- **results**
  - no TRA in Polish (**H1a**)
  - **TRA in Italian** at closure onset *and* maximum displacement (**H1b**)
  - *increases from closure onset to maximum displacement* (**H2**)
    - TRA is **initiated before closure onset**
- correlation between voicing effect and tongue root advancement is supported by the data
  - time to allow TRA → longer vowel (cf. Halle & Stevens 1967)

THANK YOU!

Vowel durations

- methods
  - vowel durations from acoustics
  - four speakers per language, /a, o, u/
  - linear mixed effects models (Bates et al. 2015)
- results
  - Italian: **22** (±6) msec voicing effect
    - $\chi^2(3) = 16.61$, $p = 0.00085$ ***
  - Polish: **8** (±3.3) msec voicing effect
    - $\chi^2(1) = 5.4$, $p = 0.02$ *
- discussion
  - the Italian estimate is in line with previous work
  - Polish is suprising
    - one speaker had bigger slope

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