Appendices to

Gradience and categoricity in s-retraction: An ultrasound study of Manchester English

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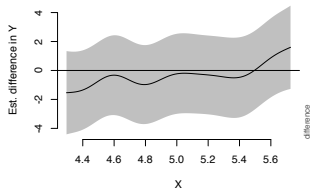
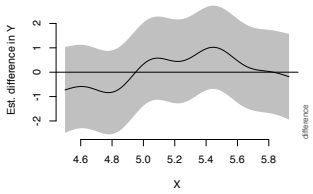
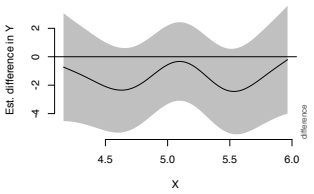
A Difference smooths for /stɹ/–/stj/ comparisons



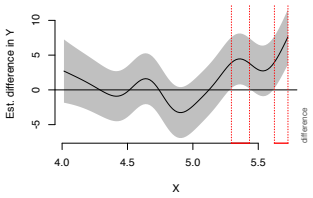
F. 1: /stɹ/~/stj/ DS for **M01**



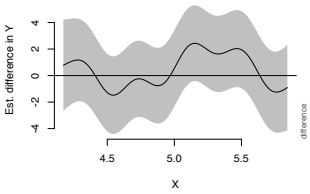
F. 2: /stɹ/~/stj/ DS for **M02**



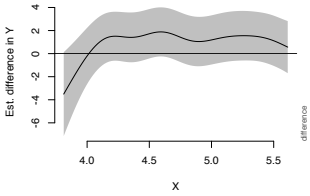
F. 3: /stɹ/~/stj/ DS for **F01**



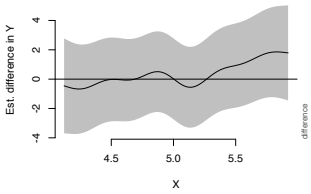
F. 4: /stɹ/~/stj/ DS for **F03**



F. 5: /stɹ/~/stj/ DS for **F06**



F. 6: /stɹ/~/stj/ DS for **F07**



F. 7: /stɹ/~/stj/ DS for **F08**

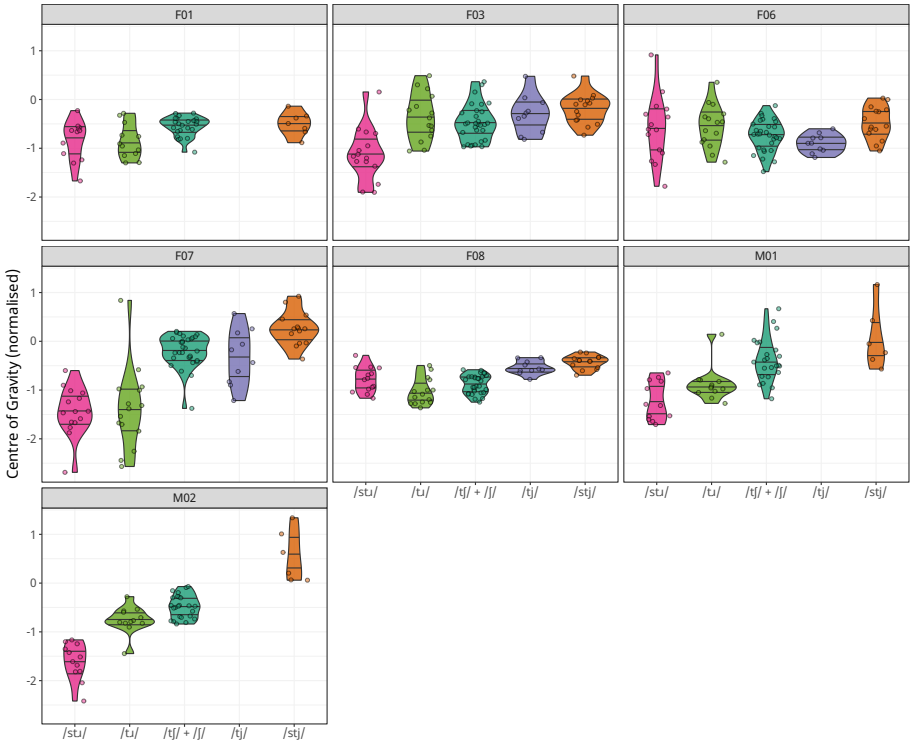
B Some cross-linguistic perspective

- There may be a phonetic bias or tendency for retraction of /s/ pre-consonantally:
  - In our data, for 4 speakers, we find some degree of gradient retraction even in /st/.
    - ~ See also Stevens & Harrington (2016) for a discussion of the phonetic precursors of *s*-retraction present in Australian English.
  - In German, there was diachronic change of [s] → [ʃ] syllable-initially before another consonant (Cercignani 1979).
    - ~ E.g. *Stein* [ʃt], cf. English *stone* [st]
  - And a similar change—i.e. [s] → [ɕ~ʃ]—can be seen in certain varieties of Italian (e.g. South Tyrol, Lazio, Abruzzo, Molise, Campania; Spreafico 2016, Huszthy 2017).
    - ~ E.g. *spedale* 'hospital' [ʃp], *sconto* [ʃk] 'sale'
  - Also, diachronic change in English and German of [sk] → [ʃ]
    - ~ Proto-Germanic **skuldrô*
      - → English *shoulder* [ʃ], German *Schulter* [ʃ]
      - → Cf. Dutch *schouder* [sx]
  - In McrE, perhaps there is a "gang effect" of some sort in which the bias towards pre-consonantal *s*-retraction combines with assimilation triggered by *t*-affrication before /ɹ/ and /j/.

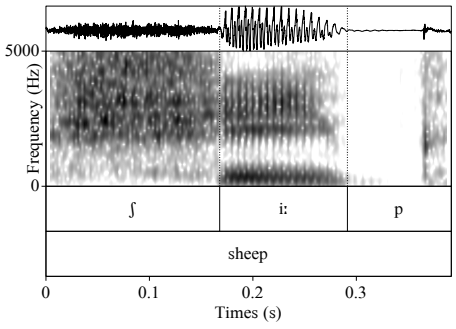
~ Is this what leads to more substantial retraction and possibly its stabilisation into a categorical rule in the phonology? (see §D below)

C More on *t*-affrication

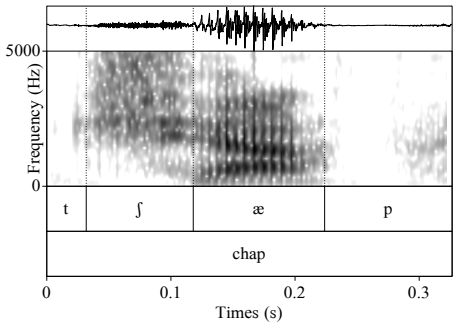
- There is inter- and intra-speaker variation in the spectral properties of affricated /**t**/ in /**tɹ**/ (and /**tj**/) clusters.



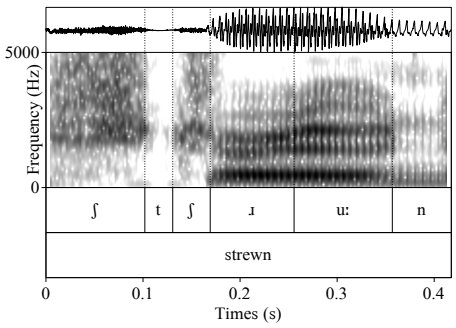
F. 8: CoG for all speakers in [(**t**)ʃ]-like contexts



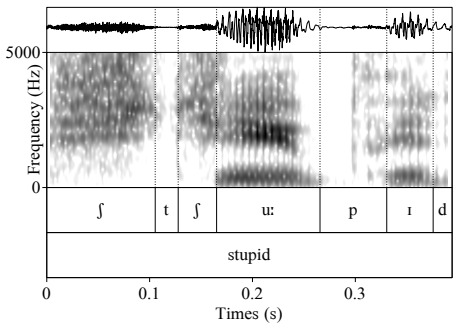
F. 9: /ʃ/*heep* for **M01**



F. 11: /**tʃ**/*ap* for **M01**



F. 10: /ʃ**tɹ**/*ewn* for **M01**



F. 12: /**stj**/*upid* for **M01**

- Pre-rhotic affricate-desibilantisation:
  - Voiceless post-alveolar non-sibilant affricate, e.g. [ʃt̺̊ɹ]*eet*
  - /tɹ/ → /tʃɹ/ → [t̺̊ɹ]
- Pre-/ɹ/ affrication of /t/ is a widespread process throughout varieties of English (Cruttenden 2014)
- Extra evidence of the categorical nature of this process can be seen in child spellings such as **CHRIE** for *try*, **CHRAC** for *track* and **JRAGIN** for *dragon* (O'Neil 2013:198).
- It is also possible that F3 trajectories may also provide supporting phonetic evidence for this (Bermúdez-Otero p.c.).
- For some speakers, for some tokens, the plosive is also fricated: [ʃt̺̊ɹ], [ʃtʃ].
  - Cf. Lawrence's (2000:83) linking of *s*-retraction to the change in Russian of /stʂ/ → /ʂtʂ/ → /ɕː/ (e.g. *считать*).

D *S*-retraction as feature spreading?

- If *s*-retraction becomes purely phonological/categorical rule, it could be accounted for featurally.
- Using features and specifications take from Jensen (1993:30), retraction would amount to regressive spreading/assimilation of [-anterior] with a concomitant change of [-strident] to [+strident] for /t/ → [tʃ].

s	**t**	**ɹ**
[-son]	[-son]	[+son]
[+cont]	[-cont]	[+cont]
[+cor]	[+cor]	[+cor]
[+ant]	**[+ant]**	**[-ant]**
[+str]	**[-str]**	[-str]
[-bk]	[-bk]	[-bk]
[-voi]	[-voi]	[+voi]

→

ʃ	**tʃ**	**ɹ**
[-son]	[-son]	[+son]
[+cont]	[-cont]	[+cont]
[+cor]	[+cor]	[+cor]
[-ant]	**[-ant]**	**[-ant]**
[+str]	**[+str]**	[-str]
[-bk]	[-bk]	[-bk]
[-voi]	[-voi]	[+voi]

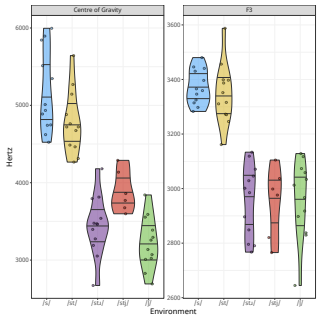
s	**t**	**j**
[-son]	[-son]	[+son]
[+cont]	[-cont]	[+cont]
[+cor]	[+cor]	[-cor]
[+ant]	**[+ant]**	**[-ant]**
[+str]	**[-str]**	[-str]
[-bk]	[-bk]	[-bk]
[-voi]	[-voi]	[+voi]

→

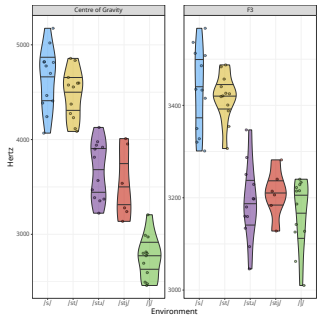
ʃ	**tʃ**	**j**
[-son]	[-son]	[+son]
[+cont]	[-cont]	[+cont]
[+cor]	[+cor]	[-cor]
[-ant]	**[-ant]**	**[-ant]**
[+str]	**[+str]**	[-str]
[-bk]	[-bk]	[-bk]
[-voi]	[-voi]	[+voi]

E Rounding and F3

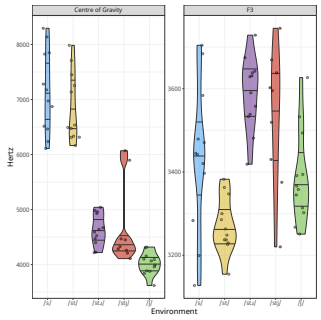
- We might expect slight labialisation for /s/ and strong labialisation for /ʃ/ (Rutter 2011:31).
- F3 can be used as a proxy for lip-rounding (Fant 1960, Stevens 2000).
  - Lower F3 suggests more lip-rounding.
- In some preliminary F3 data, for some of our speakers, there is a clear relationship between CoG and lip-rounding (measured by F3), where more [ʃ]-like tokens exhibit lower CoG and more lip-rounding.



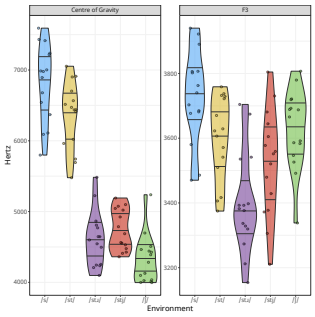
F. 13: CoG and F3 for **M01**



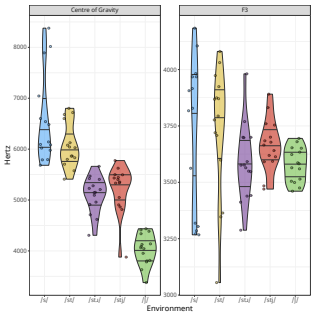
F. 14: CoG and F3 for **M02**



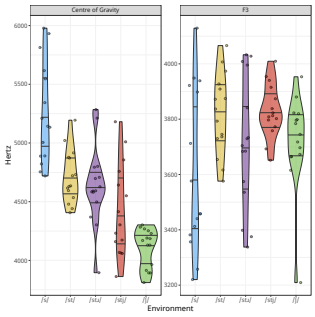
F. 15: CoG and F3 for **F01**



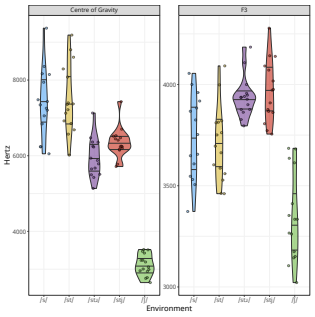
F. 16: CoG and F3 for **F03**



F. 17: CoG and F3 for **F06**



F. 18: CoG and F3 for **F07**



F. 19: CoG and F3 for **F08**

- However, many speakers show no such pattern, with much higher category-internal variation with respect to F3 values for sibilants.
  - Perhaps they are not suppressing within-category variation because it isn't being used as a primary cue in sibilant production? (cf. Bang et al. 2018 on the change rôles of tone and voice-onset time in Seoul Korean)
- In order to determine precisely what is happening with lip-rounding, we would need to capture video footage.

References

Bang, Hye-Young, Morgan Sonderegger, Yoonjung Kang, Meghan Clayards & Tae-Jin Yoon. 2018. The emergence, progress, and impact of sound change in progress in Seoul Korean: Implications for mechanisms of tonogenesis. *Journal of Phonetics* 66. 120–44.

Cercignani, Fausto. 1979. *The Consonants of German*. Milan: Cisalpino-Goliardica.

Cruttenden, Alan. 2014. *Gimson's pronunciation of English*. Oxford: Routledge.

Fant, Gunnar. 1960. *Acoustic Theory of Speech Production*. The Hague: Mouton.

Huszthy, Bálint. 2017. The "untamed" /s/ of Italian dialects: An overview of the singular behaviour of Italo-Romance sibilants. *Verbum* 1–2. 191–216.

Jensen, John T. 1993. *English Phonology*. Amsterdam: John Benjamins.

Lawrence, Wayne P. 2000. /str/ → /ʃtr/: Assimilation at a distance? *American Speech* 75. 82–7.

O'Neil, Wayne. 2013. The Phonology of Invented Spelling. In Massimo Piattelli-Palmarini & Robert C. Berwick (eds.), *Rich Languages from Poor Inputs*, 220–6. Oxford: Oxford University Press.

Rutter, Ben. 2011. Acoustic analysis of a sound change in progress: The consonant cluster /stɹ/ in English. *Journal of the International Phonetic Association* 41(1). 27–40.

Spreafico, Lorenzo. 2016. S-retraction in Italian-Tyrolean bilingual speakers: A preliminary investigation using ultrasound tongue imaging technique. In Marie-Hélène Côté, Remco Knooihuizen & John Nerbonne (eds.), *The future of dialects*, 321–30. Berlin: Language Science Press.

Stevens, Kenneth N. 2000. *Acoustic Phonetics*. Cambridge, MA: MIT Press.

Stevens, Mary & Jonathan Harrington. 2016. The phonetic origins of s-retraction: Acoustic and perceptual evidence from Australian English. *Journal of Phonetics* 58. 118–134.