

# What is Stable Variation? (And what is the rest?)

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November 14, 2014  
Manchester Forum in Linguistics (MFiL)

# Introduction

Variation in grammar is often described as falling into one of two categories.

## 1. Competing Grammars

- Leads to language change via the **replacement** of one grammatical process by another.

## 2. Optionality (within a grammar?)

- Diachronically stable variation between grammatical processes.

## Introduction

**Hypothesis:** all variation, including grammatical optionality, is formally **competing grammars**, with the following consequences (Fruehwald and Wallenberg 2013, *In Prep*):

- We expect variation (apparent optionality) between two grammatical forms to be diachronically unstable.
- True(st) optionality = stable(st) variation, and its difference from usual language change must be explained by some mechanism of language use, outside of the grammar itself, which slows the change.
- We argue that it depends on the mathematical character of some extragrammatical dimension (i.e. external to the variable's grammar) with which the variation interacts.
  - Partial specialization of variants along a continuous dimension.

# Outline

## Introduction

## Blocking and Contrast

How doublets resolve, and why.

## Competing Grammars

Syntactic Optionality as Competing Grammars

A Minimalist Hypothesis for Variation/Optionality

Example: Embedded Polar Questions

## Stable Variation

Example: Topicalization

Examples: h-dropping, -m~-m

Simulation: Acquisition of Specialization

Case Study: Relative Clause Extraposition

Within Speakers and Diachronically, PCEEC

Diachronically, Crosslinguistically

## Conclusions

## Blocking and Contrast

### “Blocking Effect” (Aronoff, 1976)

- General cognitive pressure against two forms existing for one function (“doublet”), unstable (Kroch, 1994).  
 {*lough*, *laughed*} (laugh-PST; ME, Taylor 1994)  
 {*jimmies*, *sprinkles*} (candy topping, Philadelphia)

### “Principle of Contrast”

- A strategy that children use in acquiring language: assume that two forms have two meanings (or uses)(Clark, 1987, 1990, *inter alia*).
- Children hypothesize that novel words also refer to novel objects (as in Markman and Wachtel, 1988, among many other replications of the effect).

## The Principle of Contrast

- A strategy that children use in acquiring language: assume that two forms have two meanings (or uses) (E. Clark 1987, *inter alia*).
  - Synonyms should only be acquired as a last resort.
- Demonstrated in experiments such as Markman and Wachtel (1988).
  1. 20 children
  2. 6 pairs of one familiar item (banana, cow, cup, plate, saw, spoon) and one unfamiliar item (cherry pitter, odd shaped wicker container, lemon wedgepress, radish rosette maker, studfinder, tongs).
  3. **Control:** “Show me one”
  4. **Test:** “Show me the X” (X = nonsense syllable)
- Control children pick the unfamiliar object at chance levels, but test children choose unfamiliar objects significantly higher than chance.

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## Blocking = Contrast + Selection

- A doublet is two variants competing for finite resources, as in e.g. biological evolution.
  - Instead of competing for something like food, they are competing for use (time in the mouths/brains of speakers).
  - **Selection** operates on the number of times a variant is heard (and accurately analyzed) by an acquirer.
- Either one variant has an advantage, and so **replaces** the other (following a logistic function; Nowak, 2006).
- Or neither variant has an advantage (or much of one), in which case random walk and drift.
- But in linguistic doublets, random walk cannot persist indefinitely because of the acquisition pressure of the Principle of Contrast (**specialization**).

## Doublets = Competing Grammars (Kroch, 1994)

“**Competing Grammars**”, **general form**: 2 variants are available to a speaker, in the relevant inventory of grammatical formatives, with overlapping functions (e.g. the same meaning).

- E.g. two featural versions of the same syntactic head.
- E.g. two different output mappings for the same phonological input.
- E.g. two different Spell-outs of a morpheme.

A fact about language use: at some point in the derivation, the speaker reaches a **decision-point**.

- The speaker has a choice between formatives to continue the derivation, and either will result in a grammatical utterance and a meaning close enough to the speaker’s intention.
- It is speaker “choice” more in the sense of an urn problem.



## Doublets = Competing Grammars

- Necessary for the description of **any** linguistic change in a categorical dimension.
  - E.g. word-order parameters (Pintzuk, 1991; Santorini, 1992); a phonological rule like German final stop devoicing (Fruehwald, Gress-Wright, & Wallenberg 2009).
  - In any such case, a speaker in the middle of the change in progress (code-)switches between categorical variants (Kroch, 1989).

## Summary: Blocking and Contrast

So, doublets are Competing Grammars, and the possible historical outcomes (**replacement**, **specialization**) are driven by selection and the Principle of Contrast.

**Proposal:** every case of categorical linguistic variation or optionality can be reduced to Competing Grammars, leading to one of these two outcomes.

This simplifies the grammatical architecture necessary to account for both optionality and language change (in pursuit of a Minimalist hypothesis).

## Example: English “Topicalization”

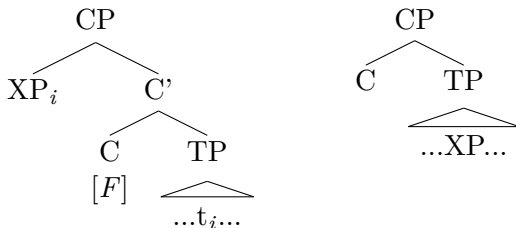
- Prince (1985, 1998, 1999): felicitous in two English discourse contexts, both of which require a certain type of contrast to appear on the fronted XP.
  - (1) She’s going to use three groups of mice. One, she’ll feed them mouse chow, just the regular stuff they make for mice. Another she’ll feed them veggies. And the third she’ll feed junk food.
  - (2) She was here two years. [checking transcript] Five semesters she was here.  
(Prince, 1999, 8,9)
- However, it is **never** obligatory.

## Example: English Topicalization

- As long as the accent pattern is kept constant, both orders are felicitous:
  - (3) She's going to use three groups of mice. One, she'll feed them mouse chow, just the regular stuff they make for mice. Another she'll feed them veggies. And **the third** she'll feed **junk food**.
  - (4) She's going to use three groups of mice. One, she'll feed them mouse chow, just the regular stuff they make for mice. Another she'll feed them veggies. And she'll feed **the third junk food**.

## Topicalization in Minimalism

- Re-merge is triggered by the feature content of some head.
- Given “Merge...preempts Move” (Chomsky, 2000), a feature cannot encode optional movement.
- Therefore, optional movement must involve a choice (for the **Numeration**) between two variants of a functional head, out of an inventory of possible heads:



- This is the core case of morphosyntactic doublet (i.e. competing heads) described in Kroch (1994).

## A Minimalist Hypothesis

Given that:

- these mechanics are necessary to encode syntactic optionality in a Minimalist system,
- the same mechanics are necessary to describe a change in progress,

Then, the system is simplest if no more machinery is added to deal with optionality/variation.

- Note: syntactic optionality represented as multiple formal (featural) versions of a functional head, competing for the speaker's choice in the speaker's inventory, is a logical consequence of the “Borer-Chomsky Conjecture” (Borer 1984, so named in Baker 2008).

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## Minimalist Theory of Variation

- **Prediction:** every case of syntactic optionality or variation is one of the following:
  1. A replacement change in progress (outright competition going to completion).
  2. A specialization change in progress (specialization for different functions going to completion).
  3. **“Stable” variation, or optionality:** variants have partially specialized along a continuous (or ordinal) dimension, e.g. style, prosodic weight.
- If categorical variants specialize along a categorical dimension, complete specialization should eventually result.
- If categorical variants specialize along a continuous or ordinal dimension, then complete specialization can **never** result, but replacement can still be “arrested” (**Caveat**).

## Example: Embedded Polar Questions

A quantitative study of embedded *yes/no*-questions in English and Icelandic, comparing the use of *whether* vs. *if*, and *hvert* vs *ef* found **specialization** in English, and **replacement** in Icelandic (Bailey, Wallenberg, & van der Wurff 2012).

- (5) John wondered whether Mary was coming to the party.
- (6) John wondered if Mary was coming to the party.

Bailey et al. (2012) suggest the Proto-Gmc dual pronoun cognate with *whether* is reanalyzed as a polarity wh-word in clauses containing a disjunction.

I asked *whether<sub>i</sub>* (“which of two”) he wants *t<sub>i</sub>*, A or B.

→

I asked *whether* (“Q-Polarity”) he wants A, or B?



## Example: Embedded Polar Questions

In all stages of English and in historical Icelandic, a disjunction favors *whether*.

### English

#### Disjunction:

- (7) I wonder {**whether**,if} John or Bill is bringing coffee.
- (8) I wonder {**whether**,if} John is bringing tea or coffee.

#### Simple:

- (9) I wonder {whether, **if**} Bill is bringing coffee.

## Example: Embedded Polar Questions

### Disjunction:

- (10) eftir því **hvort** maður vill heitt eða  
 according it-DAT whether man wants hot or  
 kalt  
 cold

“According to whether one wants hot or cold”

(*Sagan Öll*, date: 1985, from IcePaHC)

### Simple, (older) Icelandic:

- (11) vér vitum eigi, **hvort** vér tökum öndina  
 We know not whether we take soul-the

- (12) og spurðu, **ef** hann væri Kristur  
 and asked if he were Christ

(*Icelandic Homilies*, date: 1150, from IcePaHC)

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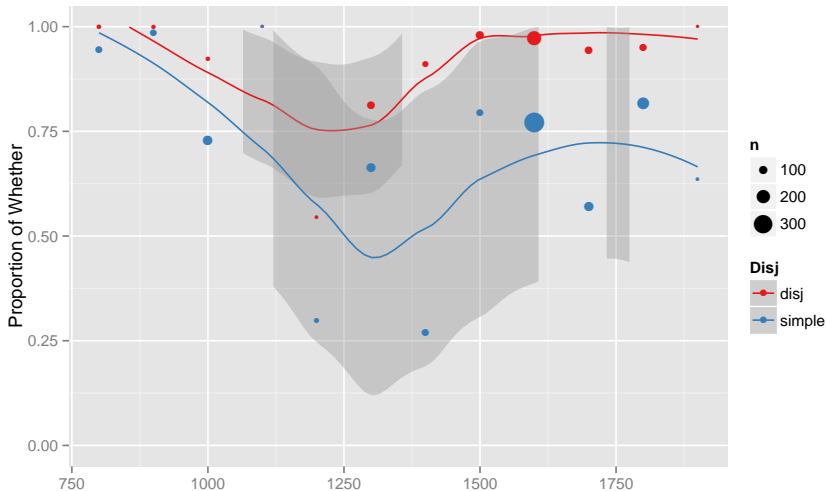
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# Specialization in English (N = 1929 clauses)

Parsed Corpora: YCOE, PPCME2, PPCEME, PPCMBE



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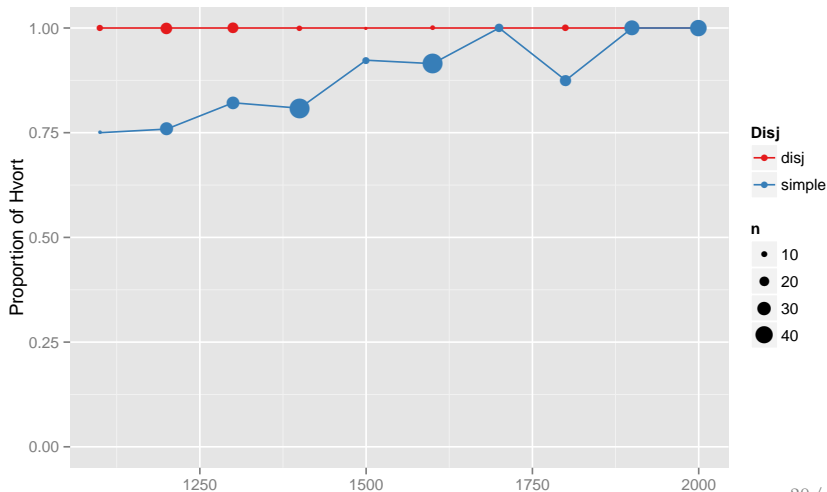
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# Replacement in Icelandic (N = 397 clauses)

IcePaHC (Wallenberg et al., 2011)



## Stable Variation

**Hypothesis:** Stable variation, i.e. optionality, results from categorical variants specializing along a continuous dimension.

There are many possible continuous dimensions, including language internal dimensions of specialization like

- weight (word or phrase length, or other prosodic measure)
- prosodic accent (number of aligned prosodic peaks, degree of stress clash between two positions)

and language external dimensions like

- style
- speech rate

## Example: English Topicalization

- Is the frequency stable over time? Possibly since Late Middle English (Speyer, 2010). (Though this is subject to revision).
- Is it specialized for different speech styles (registers)? Not that we know of.
- Is it sensitive to prosody? Definitely (Speyer, 2008, 2010).

## Prosodic Sensitivity

- Speyer (2008, 2010) shows experimentally that prosodically ill-formed topicalization is subject to prosodic repair.

- (13) **The first group** she'll feed mouse chow, **the second** she'll feed veggies, and **the third** she'll feed junk food.
- (14) ? **The first** Caitlin will feed, **the second** Joe will feed, and **the third** Maggie will feed.
- (15) ?? **Joel<sub>i</sub>** Caitlin will pay  $t_i$ , **Bob<sub>j</sub>** Joe will pay  $t_j$ , and **Ann<sub>k</sub>** Maggie will pay  $t_k$ .
- (16) ??? **Joel<sub>i</sub>** Caitlin will pay  $t_i$  10 dollars, **Bob<sub>j</sub>** Joe will pay  $t_j$  15 dollars, and **Ann<sub>k</sub>** Maggie will pay  $t_k$  20 dollars.

## Example: *h*-dropping in Manchester

- Syllable-initial /h/ has zero variant, leading to apparently stable sociolinguistic variation (Baranowsky & Turton *to appear*).
- The variation is phonological in nature (i.e. a new allophone, or total loss of a phoneme), as it interacts with the phonological rule of [ɹ]-insertion (“linking” *r*)

(17) *Harpurhey*

a. [hɑ:pə'hɛɪ]

b. [ɑ:pə'ɹɛɪ]

- Is the frequency stable over time? Yes, as far as current measurements based on apparent time can tell us.
- Is it specialized for categorical dimensions? Yes, grammatical category: Adv > V > N > Adj
- Is it specialized for continuous dimensions? Yes, style.



## Example: -ɪn ~ -ɪŋ

(18) John has been {singing/singin'}.

(19) {Dunking/Dunkin'} Donuts.

- Is the frequency stable over time? Possibly, for many dialects; has roots in OE morphology (Houston 1985), and both variants were present in Middle English texts (Labov, 1989).
- Is it specialized for different grammatical contexts? Yes, in part, along a nominal ↔ verbal dimension (Labov, 1989).
- Is it specialized for different speech styles? Yes, in part, along a continuous dimension of formality.

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## Example: $-m \sim -m$

A proof of concept simulation shows that plausibly, under minimal acquisition assumptions:

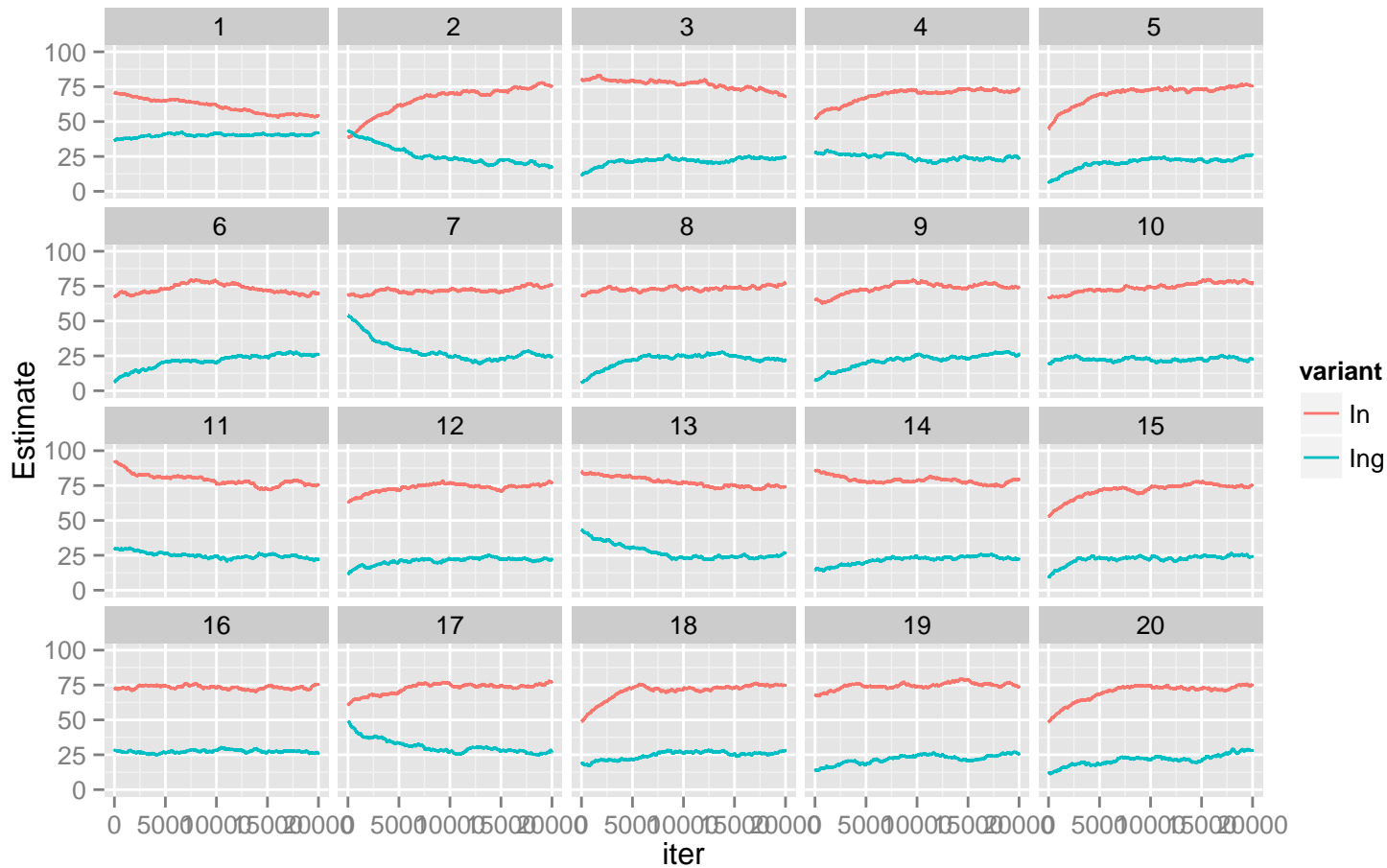
- Variants specialize along a continuous dimension like style.
- For a continuous dimension, the process will stabilize at **partial** specialization (**Caveat**).

**Gen 0:**  $-m \sim -m$  doublet is innovated, with no stylistic conditioning.

**Gen 0** picks a style to speak in, and produces a variant, repeats.

**Gen 1:** **Gen 1** learns an estimate for the (mean) style value of  $-m$ ,  $m$ , as soon as they hear the first tokens of each from **Gen 0**. She adjusts this estimate as they get more data from **Gen 0**.

**Gen 2:** **Gen 1** picks a style, produces one of the variants with a probability weighted by how far her style estimates are from the current style, repeats. **Gen 2** learns style estimates for variants as above.



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## When Specialization vs. Replacement?

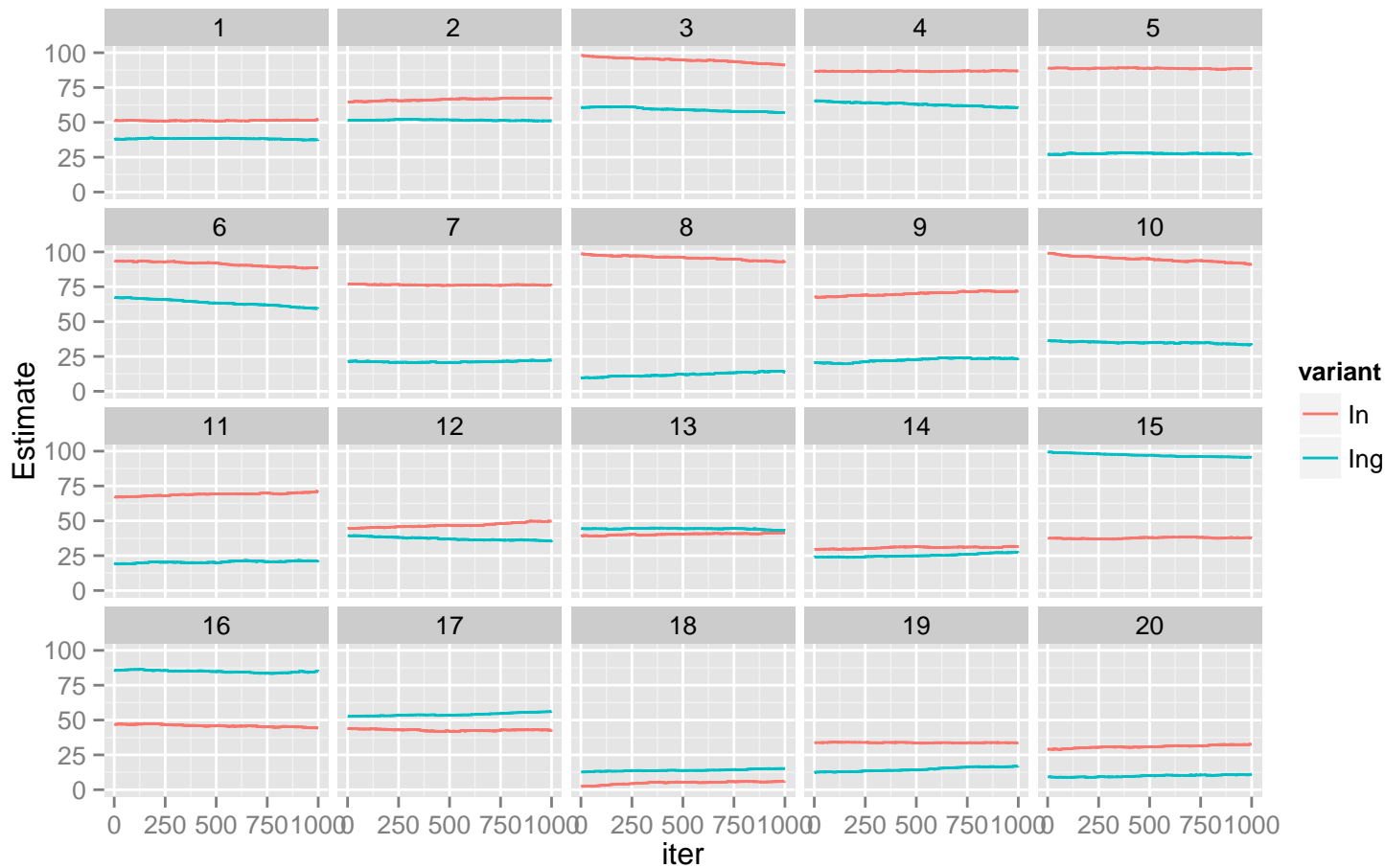
- If neither variant has a selectional advantage (or more than a negligible one), then specialization should occur (modulo **drift**).
- But if there is an advantage, then we have a race; who wins?
- First, the learner must identify some **salient domain of specialization**.
- If specialization is driven by the Principle of Contrast, then it is a stable fact about child cognition (i.e. should be as stable as the human brain).
  - This might not be true, but it's probably the most restrictive hypothesis...

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## When Specialization vs. Replacement?

- If so, then specialization should occur at the same rate per token of the linguistic variable that the child encounters.
  - **Factor 1:** the size of selectional advantage for one variant vs. another, compared with the fixed rate of specialization.
  - **Factor 2:** the frequency, in speech, of the context for the linguistic variable in question.
  - Even if Factor 1 is small compared with rate of specialization, replacement could still occur if Factor 2 is small enough.
- The specialization stabilizes at 20000 tokens, but with 1000 tokens it never does – implies that the frequency of the variant could be a determining factor.



# Case Study: Relative Clause Extraposition

(Wallenberg *Under Review*)

## French

- (20) mais l'heure vient que je ne parleray plus a  
but the time comes that I NEG speak-FUT more to  
vous en proverbes  
you in proverbs

“The time approaches when I will no longer speak to  
you in parables”

(MCVF, 1523-NEW-TESTAMENT-P, A5V.2491)

## English

- (21) none lives that more loves you

(PCEEC, TIXALL, 53.019.369, date: 1619)

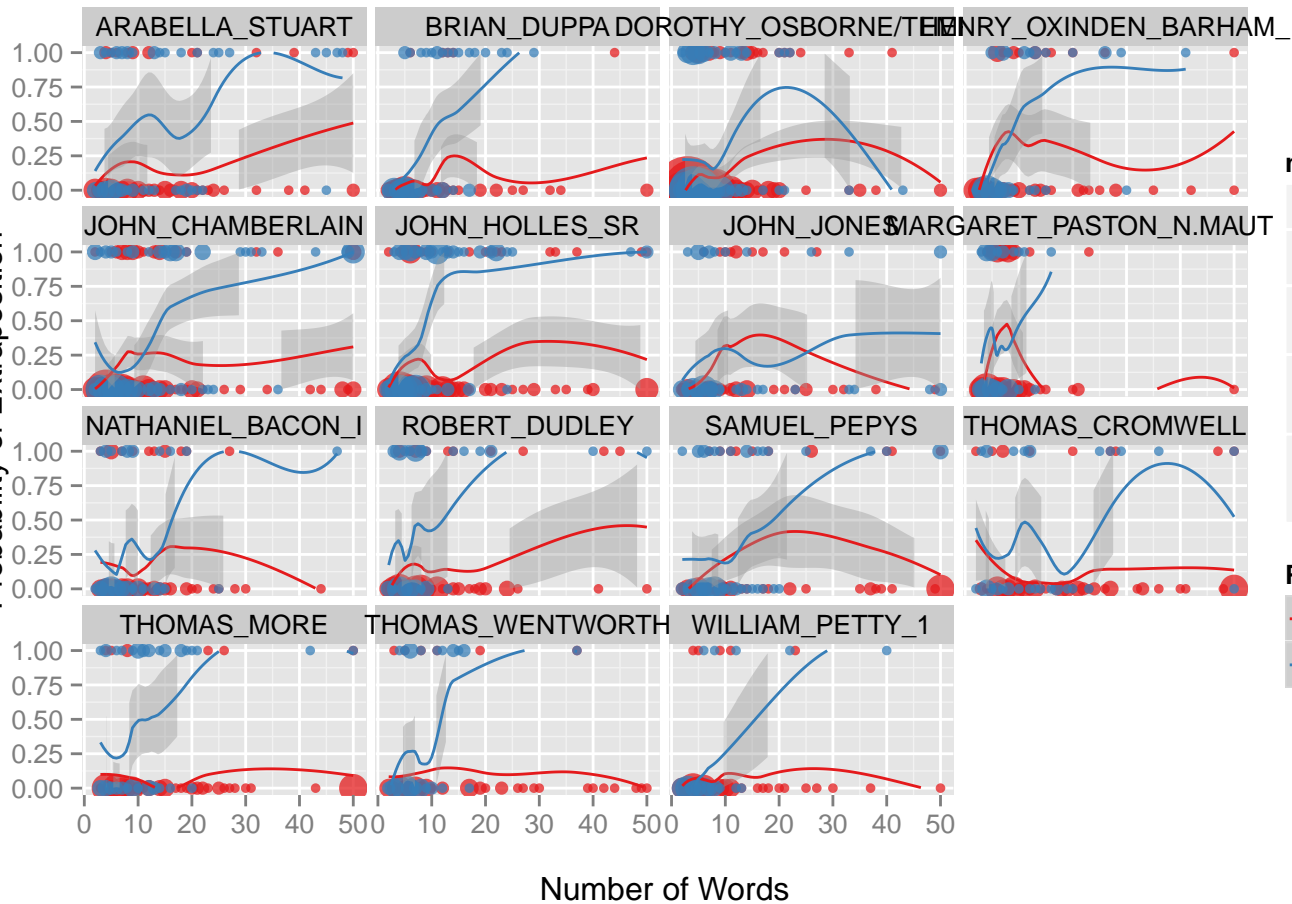


## Within Speakers, and Diachronically

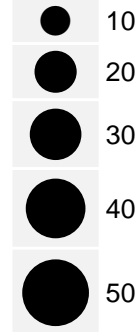
- Relative clause extraposition in the Parsed Corpus of Early English Correspondence (PCEEC; Taylor et al. 2006).
- Allows us to look at reasonable samples from individual speakers (letter-writers), as well as an historical sample from 1400–1700.
- Coded for prosodic weight of the relative clause, in number of words, from 0–50.
- Also coded for extraposition from Subject vs. Object.

**Hypothesis:** individual speakers treat weight as a continuous variable, with extraposition specialized imperfectly along it, in roughly the way the acquisition model predicts (following on Ingason and MacKenzie, 2011).

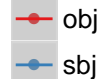
Probability of Extrapolation



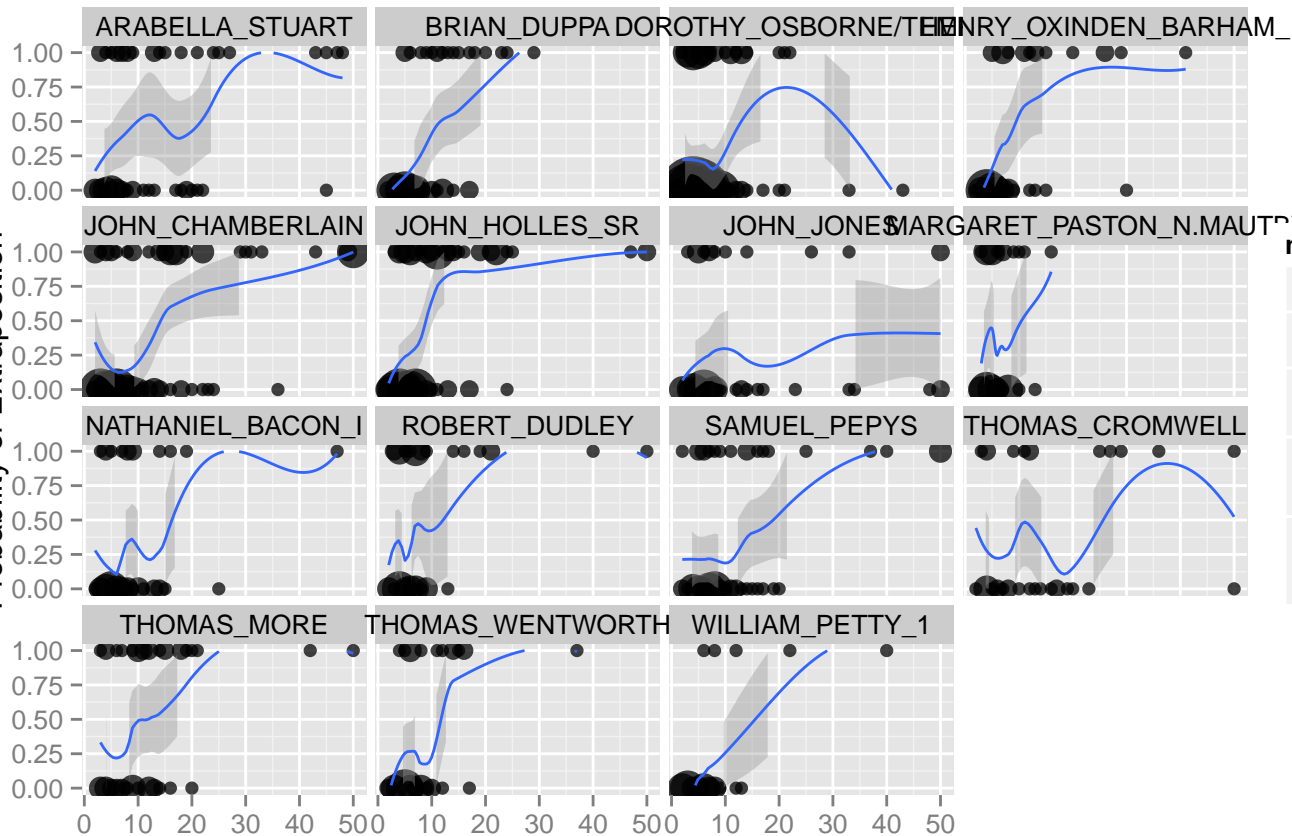
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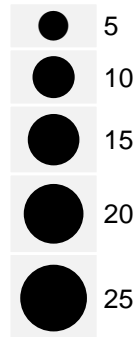
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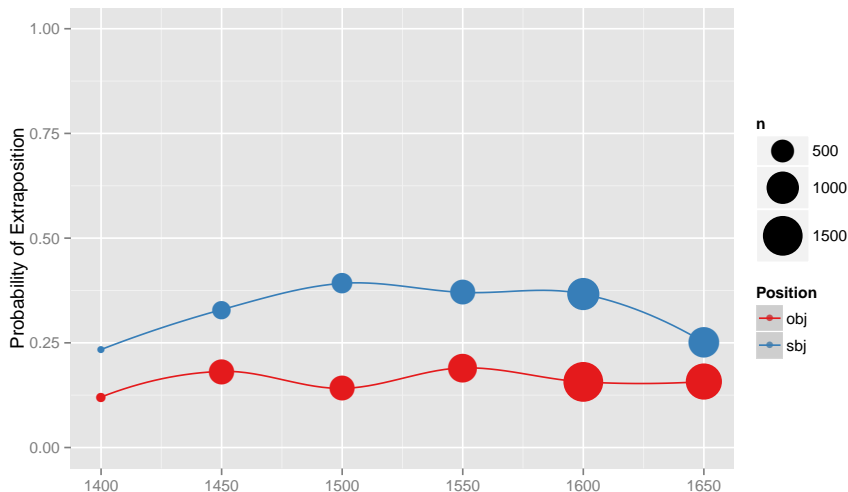


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Number of Words

# All PCEEC, over time (N = 8073 clauses)



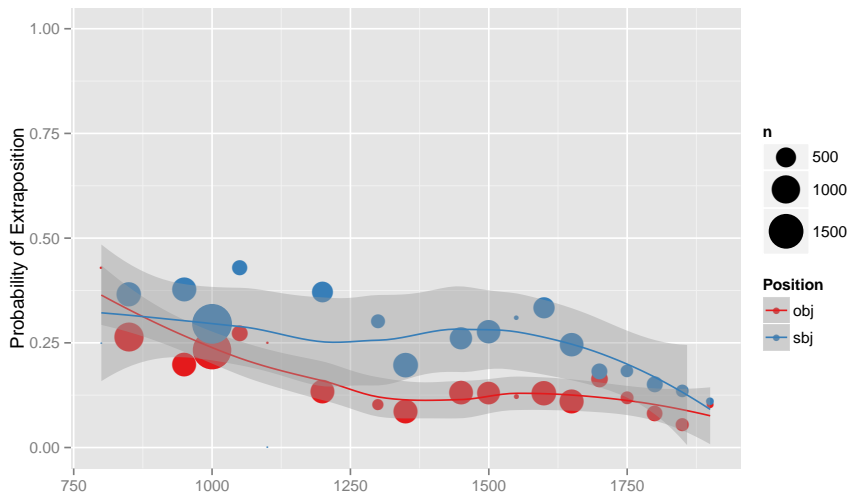
## Diachronically, Crosslinguistically

- **English:** YCOE (Taylor et al., 2003), PPCME2 (Kroch and Taylor, 2000), PPCEME (Kroch et al., 2005), PPCMBE (Kroch et al., 2010).
- **Icelandic:** IcePaHC (Wallenberg et al., 2011).
- **Old/Middle French:** MCVF Corpus (Martineau et al., 2010).
- **Historical Portuguese:** Tycho Brahe Corpus of Historical Portuguese (Galves and Britto, 2002/2013).

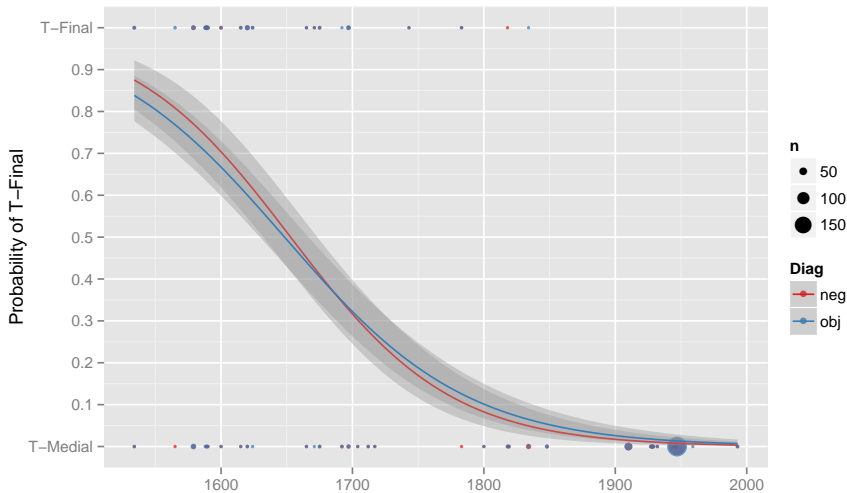
**Hypothesis 1:** the specialization for weight has stabilized, so the effect of weight will be constant over time. **(Confirmed!)**

**Hypothesis 2:** the overall rate of relative extraposition will be stable over time. **(Rejected!)**

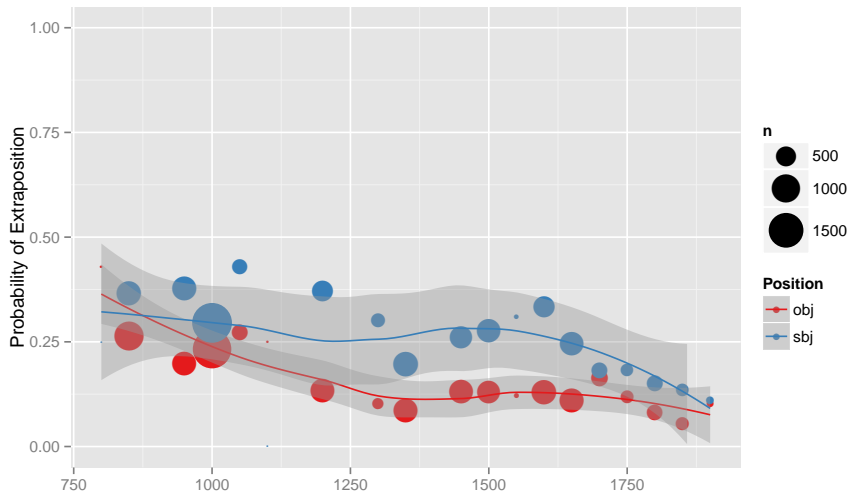
## English, over time (N = 18530 clauses)



Not usual...cf. Wallenberg (2013),  $N = 1030$  clauses



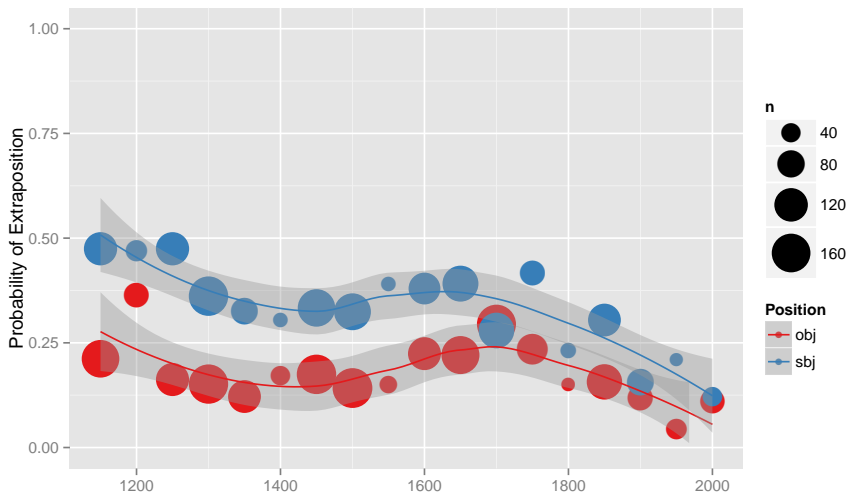
# English, over time (N = 18530 clauses)



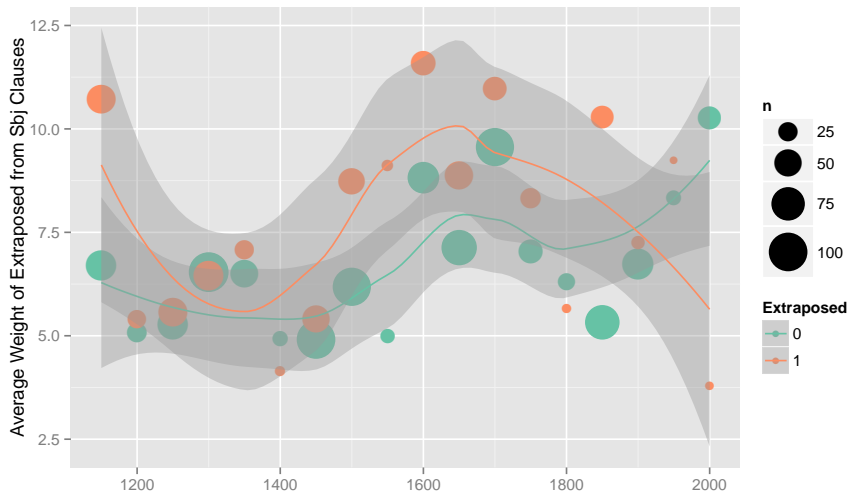


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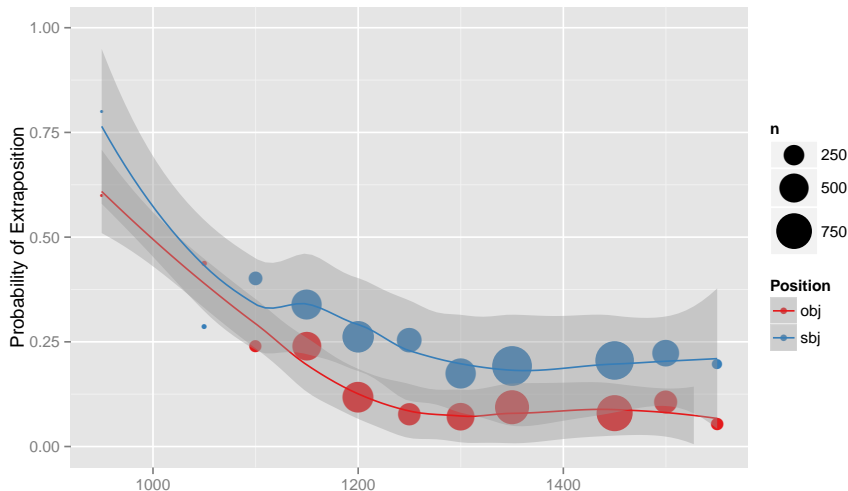
## Icelandic, over time (N = 3486)



# Icelandic, average weight over time (N = 3486)



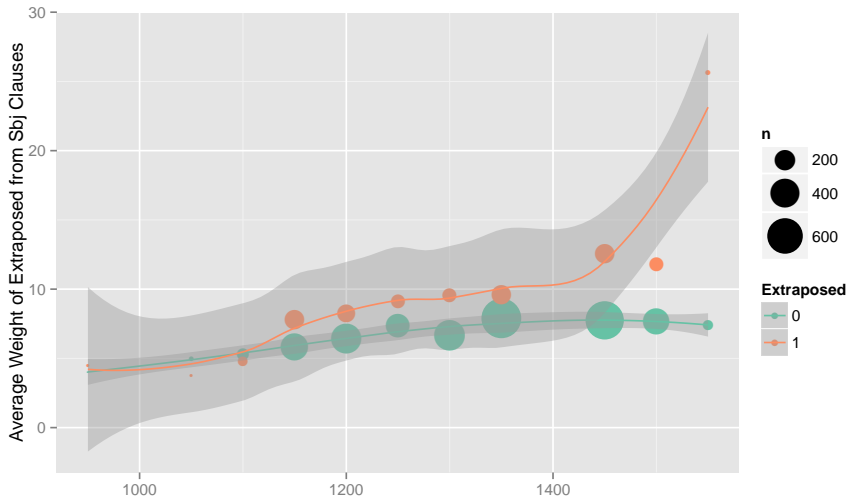
# Old/Middle French, over time (N = 8207)



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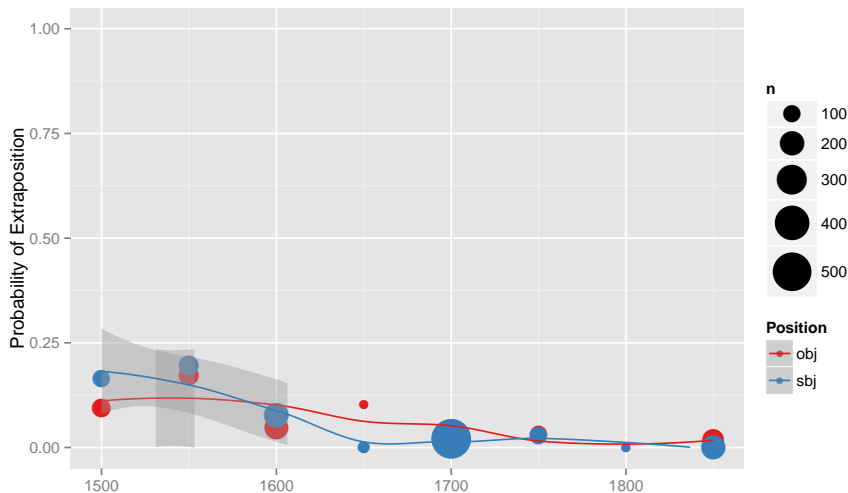
## French, average weight over time (N = 8207)



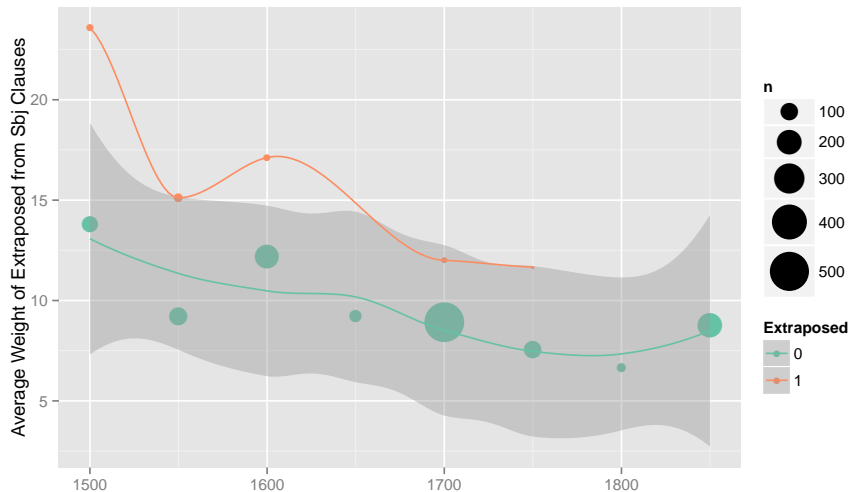
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## Portuguese, over time (N = 2398)



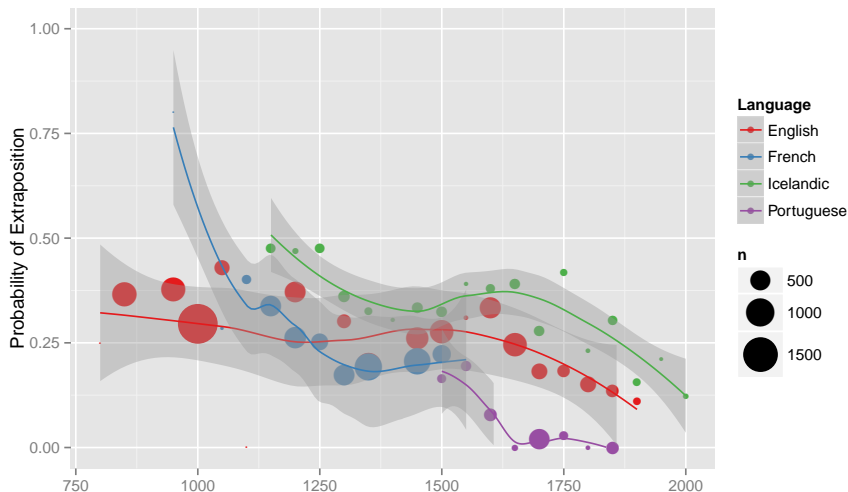
# Portuguese, average weight over time (N = 2398)



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# Subject Relatives, Four Languages





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## Change in Relative Clauses

- Why the change? **There is still some overlap in use.**
- Relative clause extraposition is restricted in modern Portuguese (Cardoso, 2011, 2012); cause and effect?
- Perhaps: a small selectional advantage asserted itself when the doublet began, but it was small, and specialization took place simultaneously. The advantage is still acting in the usage-overlap, but the overlap is very limited (Wallenberg, *Under Review*, building on Kiparsky 1995).
- Drift? The population (of utterances) can fixate on the majority variant over time through random death (Moran 1958; see Nowak 2006 and refs).
- **Note:** topicalization in English has slowly declined from 1750 through the 20th c. (A. Kroch, p.c.).

# Conclusions

## Conclusions

- Within syntax, only one formal account of optionality is available, the same one that accounts for language change: Competing Grammars (i.e. decision points in the selection of grammatical formatives).
- All categorical variation/optionality/change = Blocking Effect, Competing Grammars
- Blocking Effect = selection, P. of Contrast (and a domain of specialization)
- Thus, all categorical variation/optionality/change is reduced to interactions of Competing Grammars, selection, Principle of Contrast, and inherent mathematical properties of possible domains of specialization.

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## Conclusions

### Conclusions

- Competing Grammars results in replacement, specialization, or “stable variation”.
- The latter is the result of mapping categorical variation onto a continuous dimension of specialization, and it’s **actually only very slow change**.
- An acquisition simulation shows how stable variation can emerge under a minimal assumptions about the Principle of Contrast.
- It is possible to extend this formal account to other domains of variation, like morphology and phonology.

## Conclusions

### Further Research

- There's really no reason to think either **replacement** or **specialization** are stable..
  - Can both processes continue without ever stabilizing, bleeding each other (cf. weight effect in French)?
  - The actual outcome of the change depends on the relative speeds of replacement and specialization.
  - **Hypothesis:** the rate of specialization is fixed, given the frequency of the variable.
- The relative clause result needs to be checked, esp. for restrictive relative clauses.
- The topicalization change needs investigated further (ongoing research with A. Kroch).
- Check drift hypothesis mathematically for slow change.

## Conclusions

### Further Research

- We have a hypothesis about which factors influence specialization vs replacement, as they may not **appear** be deterministic; find ways to test it!
- How, in detail, does a domain of specialization get imposed on a variable?
- Can we experimentally show that the Principle of Contrast applies outside of morphemes?
- Look into other “stability” data sets (for instability and specialization).
- Appropriately parameterize phonological variation.
- Extend specialization account to the interaction of phonological and phonetic change (e.g. allophonic split).

## Acknowledgements

Thank you first to Josef Fruehwald for working out many of these ideas with me, and to Anthony Kroch and Betsy Sneller for much discussion of these issues. Thanks to Anton Karl Ingason for use of his CS queries. Also Aaron Ecay, Ricardo Bermúdez-Otero, Caitlin Light, Laurel Mackenzie, Ian Roberts, Uri Shlonsky, Meredith Tamminga, Danielle Turton, Wim van der Wurff, and audiences for earlier versions of this work. Also my SEL8116 class.

Simulation:

[github.com/joelcw/tyneside/blob/master/articles/sim\\_Gauss.F](https://github.com/joelcw/tyneside/blob/master/articles/sim_Gauss.F)

Extrapolation Study:

[github.com/joelcw/tyneside/tree/master/extrapolation](https://github.com/joelcw/tyneside/tree/master/extrapolation)

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