

Parataxis and hypotaxis: formal and empirical perspectives

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The context

Comparative and diachronic work with a generative orientation has unquestionably led to a great many discoveries and insights.

However, it's also part of our duty as researchers to consider prominent claims made by scholars of very different theoretical persuasions – especially if those claims seem poorly evidenced, poorly motivated, or simply false.

Today's talk is part of a project to assess the following claim(s):

parataxis > hypotaxis

(where “>” is to be read as “precedes”)

parataxis > hypotaxis

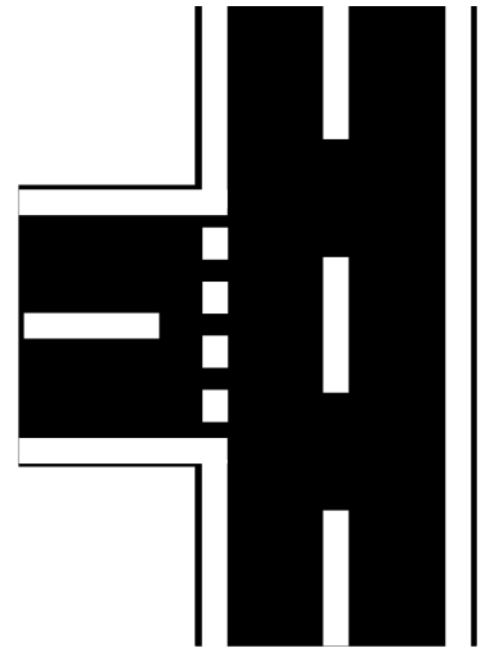
The Parataxis-Precedes-Hypotaxis Hypothesis (PPHH) has a long history:

- The term parataxis in its modern sense was introduced by Thiersch (1826) in the context of historical Greek (opposed to syntaxis there; hypotaxis only in later works)
- Very prevalent in historical linguistics before the advent of structuralism (e.g. Gildersleeve 1883; Delbrück 1900: 411; Small 1924: 125)
- Reiterated in more recent works with a functionalist orientation (e.g. Jucker 1991: 203; Deutscher 2001: ch. 11; Dąbrowska 2015: 230)

But almost never explicitly addressed in the generative literature:

- Its influence can be seen in O’Neil (1977) and Kiparsky (1995)
- Rejected summarily in Roberts (2007: 174–175)

Roadmap



Part 1: establish what the content of the PPHH is

- Spoiler alert: there are several different versions of the PPHH
- Only one in principle threatens standard Minimalist assumptions about the architecture of grammar
- That version is very obviously wrong (as far as we can tell)

Part 2: empirically evaluate a particular version of the PPHH

- Not one that is inherently problematic for generative linguistics if correct
- But one that is interesting nonetheless
- Precondition for this kind of research: parsed diachronic corpora of various languages

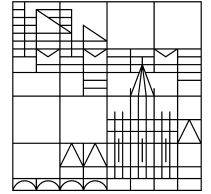
Content warning



Ideas don't arise in a vacuum. Some of the ways in which the PPHH is stated (and motivated) in earlier literature make for uncomfortable reading today.

- Mitchell (1985) approvingly quotes Small (1924: 125): “It may be laid down as a general principle that in the progress of language parataxis precedes hypotaxis.”
- Small's following sentence: “The former is associated with the uncultivated mind; the latter, with the cultivated mind of civilized peoples.”
- Andrew (1940: 87): early Old English was characterized by “simply a lack of grammatical subordination such as we find in the language of children and some primitive people”.

**This doesn't mean that (every version of) the PPHH is wrong, of course.
But claims (in science as elsewhere) may persist because of ideology rather than merit.**



**Flavours of
parataxis > hypotaxis**

Versions of the PPHH

Harris & Campbell (1995: 284): “in approaching the question of whether hypotaxis develops out of parataxis we encounter the problem that different linguists have in mind different ideas of parataxis, and that at least some of them are vague”

A non-exhaustive list:

1. Early human languages lacked Merge.
2. Early human languages lacked self-similar embedding.
3. Early human languages lacked (finite) subordinate clauses (specifically).
4. Diachronically, hypotactic structures develop out of paratactic structures.
5. Diachronically, embedded structures replace adjoined structures.
6. Diachronically, hypotactic structures become more common.
(possible causal factors: “complex” culture/society; Latin; literacy from orality)

**There may be entailment relations between these hypotheses.
But each needs to be considered separately.**

PPHH 1: Early human languages lacked Merge

- Merge: the operation hypothesized, in Minimalist syntactic theorizing since Chomsky (1995), to be fundamental to structure building.

“Given any two distinct syntactic objects A, B, $\text{Merge}(A,B) = \{A,B\}$.”
(Collins & Stabler 2016: 5)

PPHH 1 can quickly be put to rest:

- In a language without an operation such as category-neutral Merge (defined such that it is able to apply to its own output):
“No sentence ... could contain more than two words”
(Nevins, Pesetsky & Rodrigues 2009: 366)
- No human language has ever been argued to display this property.
- “The cognitive ability to handle finite complementation must have already been a feature of the human brain in the more distant past” (Deutscher 2001: 184–185)

PPHH 2: Early human languages lacked self-similar embedding

As an empirical claim, this ought to be taken more seriously than PPHH 1.

- “although Merge may IN PRINCIPLE combine any two lexical items or phrases an unbounded number of times, not every imaginable instance of Merge is acceptable in actual languages” (Nevins, Pesetsky & Rodrigues 2009: 366)
- “It is theoretically possible, though unlikely, that some language might be so impoverished in lexical and other resources that only a finite number of non-deviant sentences could be generated by its GP [generative procedure–GW]. If so, it would be a minor curiosity, with no bearing on UG, acquisition, or other significant issues, contrary to much media confusion.” (Chomsky 2013: 35)
- Cf. also Pullum & Scholz (2010): “recursion does not guarantee infinitude”.

No grammatical theory I know of predicts that self-similar embedding is a necessary property of human languages.

- In the Triggered Merge formalization of Collins & Stabler (2016: section 7), it’s easy to construct a lexicon where nothing triggers Merge of a constituent of the same type (or of a constituent that could contain a constituent of the same type).

Are there languages without self-similar embedding?

It depends who you believe.

- Futrell et al. (2016), for Pirahã, develop a regular grammar yielding a finite output.
 - But this stipulates that “up to 3 instances” of certain elements are allowed.
 - If instead unbounded repetition is allowed, then they “analyze Pirahã as an infinite regular language” (2016: 20).
- Kornai (2014): “time and again we come across languages where only a finite presentation seems to make sense”.
 - But his list includes Akkadian, for which the case has only been made that it lacks *finite complement clauses* (Deutscher 2001), and dubious cases such as Proto-Uralic (Ravila 1960).
- “Any finite corpus or set of examples can be given a description as a finite language in principle” (Futrell et al. 2016: 3) – hence, historically attested languages are not a good testing ground.
- Widmer et al. (2017): no language in their sample of 55 Indo-European languages (present or historically attested) lacks NP-within-NP embedding.

No truly compelling case has yet been uncovered.

PPHH 3: Early human languages lacked finite subordinate clauses (Givón 1979; Karlsson 2009; O’Neil 1977: 207, tentatively)

Assuming that all clauses are CPs, PPHH 2 entails PPHH 3.

Givón (1979: 306):

“certain types of languages—those which have only coordination (‘clause chaining’) but no subordination—are found only in preliterate ‘societies of intimates’”

- Givón’s claim is actually stronger: not restricted to finite clauses; uses word “only”.
 - Hard to view the Akkadian or Old Assyrian Empire as a non-literate society of intimates, but Akkadian is one of the languages where the case has been best made for lack of finite subordination (Deutscher 2001)
 - This claim needs to be assessed with reference to present-day languages; obviously, we have no historical records of non-literate societies pre-20th-century!
 - Coordination is a classic instance of self-similar embedding, of course; PPHH 3 could be true without PPHH 2 being true in general.

Working definition of (clausal) subordination:

a CP is subordinated if it is dominated by another CP.

PPHH 3: Early human languages lacked (finite) subordinate clauses (Givón 1979; Karlsson 2009; O’Neil 1977: 207, tentatively)

Are there languages without (finite) subordinate clauses?

- Roberts (2007: 174): “the claim that earlier stages of certain languages may have lacked subordination altogether violates the **uniformitarian hypothesis**, the idea that all languages at all times reflect the same basic UG, and so cannot be taken seriously in the approach adopted here.”
 - This of course depends on what we think UG contains.
 - “On the other hand, it is quite plausible that a language may lack **finite clausal subordination** of the familiar type” (2007: 174).
- Delbrück (1900) claims that Proto-Indo-European lacked finite subordination, on the grounds that finite subordinators are not reconstructable.
 - This is bad reasoning; cf. negation, basic vocabulary
 - Languages like Mandarin have subordination but no (overt) subordinator
 - Harris & Campbell (1995: 284): marker/structure fallacy

PPHH 3: some cautionary notes

For PPHH 3 to be correct, there has to be an asymmetry between early and more recently spoken languages in having/lacking (finite) subordination.

- King & Cookson (1890: 204): “We cannot ... suppose that hypotaxis is of recent origin in language; for as far as we can go back in the history of human speech, we find the degradation of sentences to a completely subordinate position fully established.”
- Gildersleeve (1893: xxv): “we have to be on our guard. Hypotaxis is older than our record, and we cannot argue safely as to prehistoric processes”
- Even Karlsson (2009): “Evidence from many language families indicates that **non-finite clausal subordination** and initial stages of **finite clausal subordination** existed already in **preliterate languages**.”

As a categorical claim, PPHH 3 is certainly false.

Does it hold statistically? I’m not aware of any studies addressing the question.

PPHH 4: Diachronically, hypotactic structures develop out of paratactic structures

This is a very different beast. Classic case: reanalysis fusing two independent clauses.

[I think that.] [John is here] > [I think [that John is here]]

Variant (PPHH 4a), actually very different: reanalysis of adjoined clause as embedded.
(Roberts & Roussou 2003: 116–121)

This kind of reanalysis necessarily involves violation of Whitman's (2000) "conservation of structure" constraint: c-command relations change.

Most famous case has been powerfully challenged (Axel-Tober 2017).

See Harris & Campbell (1995: 283–310) for sceptical discussion.

PPHH 4 is not the focus of this talk.

PPHH 5: Diachronically, embedded structures replace adjoined structures

Since adjunction is formally a case of self-similar embedding *par excellence*, and involves (Pair) Merge, PPHH 5 is orthogonal to PPHH 1 and 2.

Influential presentation: Kiparsky (1995) for Indo-European.

- Proto-Indo-European has only adjoined S; CP is innovated in the history of the subfamilies (e.g. Germanic).
- Wallenberg (2016) presents a supporting quantitative tendency (PPHH 5a): relative clause “extraposition” has been getting rarer for centuries in English, Icelandic, French and Portuguese. (Cf. also O’Neil 1977, Suárez-Gómez 2006)
- Whether Kiparsky’s version of PPHH 5 extends beyond Indo-European hasn’t ever really been addressed, to my knowledge.

Today’s results won’t bear directly on PPHH 5.

Interlude: adjunction in current theories of syntax

Standard mechanism for adjunction in Minimalism: Pair Merge (Chomsky 2001, 2013, Richards 2009, Nomura 2017).

Chomsky (2001: 18):

- “For structure building, we have so far assumed only the free symmetrical operation Merge, yielding syntactic operations that are sets, all binary: call them *simple*. ... But it is an empirical fact that there is also an asymmetric operation of adjunction, which takes two objects P and a and forms the ordered pair $\langle a, P \rangle$, a adjoined to p. Set-merge and pair-merge are descendants of substitution and adjunction in earlier theories.”

Pair Merge is *prima facie* a departure from the Strong Minimalist Thesis, and is motivated by the interface with the C-I system, where it can yield predicate composition.

In cartographic and Kaynean approaches (Kayne 1994), adjunction is not different from specifier formation, and hence PPHH 4 is not formulable.

“It is fair to say that what adjuncts are and how they function grammatically is not well understood.” (Hornstein & Nunes 2008)

PPHH 6: Diachronically, hypotactic structures become more common

This is possibly the most frequently-encountered version of PPHH in the literature. Usually interpreted with respect to (finite) clausal subordination in particular (PPHH 6a).

Dąbrowska (2015: 230):

- “Further telling evidence can be gleaned from historical data. The earliest written texts in a language are usually highly paratactic ... while later texts typically show more use of subordination. The historical increase in the frequency of subordination is gradual”

Karlsson (2009):

- “It is a well-known fact that, mainly due to Latin influences, German and English were syntactically most complex in the 17th century and Swedish in the 19th century”

PPHH 6 is a quantitative claim. It can only be assessed using quantitative data from historical corpora.

Causal factors

The causal argumentation for all versions of the PPHH has varying levels of quality.
Three broad groups of possible factors:

- **Latin influence** (e.g. Karlsson 2009)
 - Only really applicable to the Early Modern European written context
 - Non-finite clauses leading to an increase in finite subordination?
 - How likely is this to lead to a “real change” in principle?
- **Orality > literacy**
 - Chafe (1982) and Biber (1995) show that finite subordinate clauses are more common in written than in spoken texts
 - But very difficult to disentangle “real change” from genre effects; cf. present day
- **Cultural complexity & communicative needs** (e.g. Givón 1979; Deutscher 2001)
 - Difficult to find a robust proxy; different notions of “complexity”/“needs”
 - Important to avoid discredited notions of “primitiveness” and lower intelligence
 - Causal chain rarely made explicit (though see Deutscher 2001: 166–186)

Implications of PPHH 6

PPHH 6 has no bearing on questions of grammatical architecture. But it is interesting nonetheless for a variety of reasons.

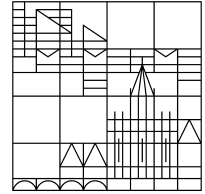
- If PPHH 6 is correct as far as the corpora are concerned, is it a “**real change**” in the sense of differences in knowledge of language between generations?
 - Could in principle be an artefact of the texts available to us from different periods (poetry, literacy)
 - Could in principle be a real, but non-linguistic, change
- If it’s a “real change”, and if the causal argument works (see next slide), it indicates that sociocultural factors have an impact on language change (cf. ethnosyntax, Enfield 2002)
- If it’s not a “real change”, it has important **implications for the variationist approach to syntactic change** (Kroch 1989, Yang 2002, Pintzuk 2003, etc.): how much change in corpus frequency involves change in the weightings of different grammatical options?

But let’s assess the hypothesis first before speculating further!

Overview of hypotheses

| | Categorical | Tendency | Structures |
|---------------------------------------|---------------|----------------|----------------|
| No Merge > Merge | <u>PPHH 1</u> | <u>?</u> | <u>?</u> |
| No self-embedding > self-embedding | <u>PPHH 2</u> | <u>PPHH 6</u> | <u>?</u> |
| No subordination > subordination | <u>PPHH 3</u> | <u>PPHH 6A</u> | <u>PPHH 4</u> |
| Clausal adjunction > embedding | <u>PPHH 5</u> | <u>PPHH 5A</u> | <u>PPHH 4A</u> |

In the rest of today's talk: PPHH 6a will be the focus.



**Does (finite) clausal
subordination become
more common over time?**

Methods: investigating PPHH 6a

Crucially relies on availability of parsed diachronic corpora.

“**Hypotaxis coefficient**”: proportion of clauses that are subordinate/embedded, including all non-finite clauses.

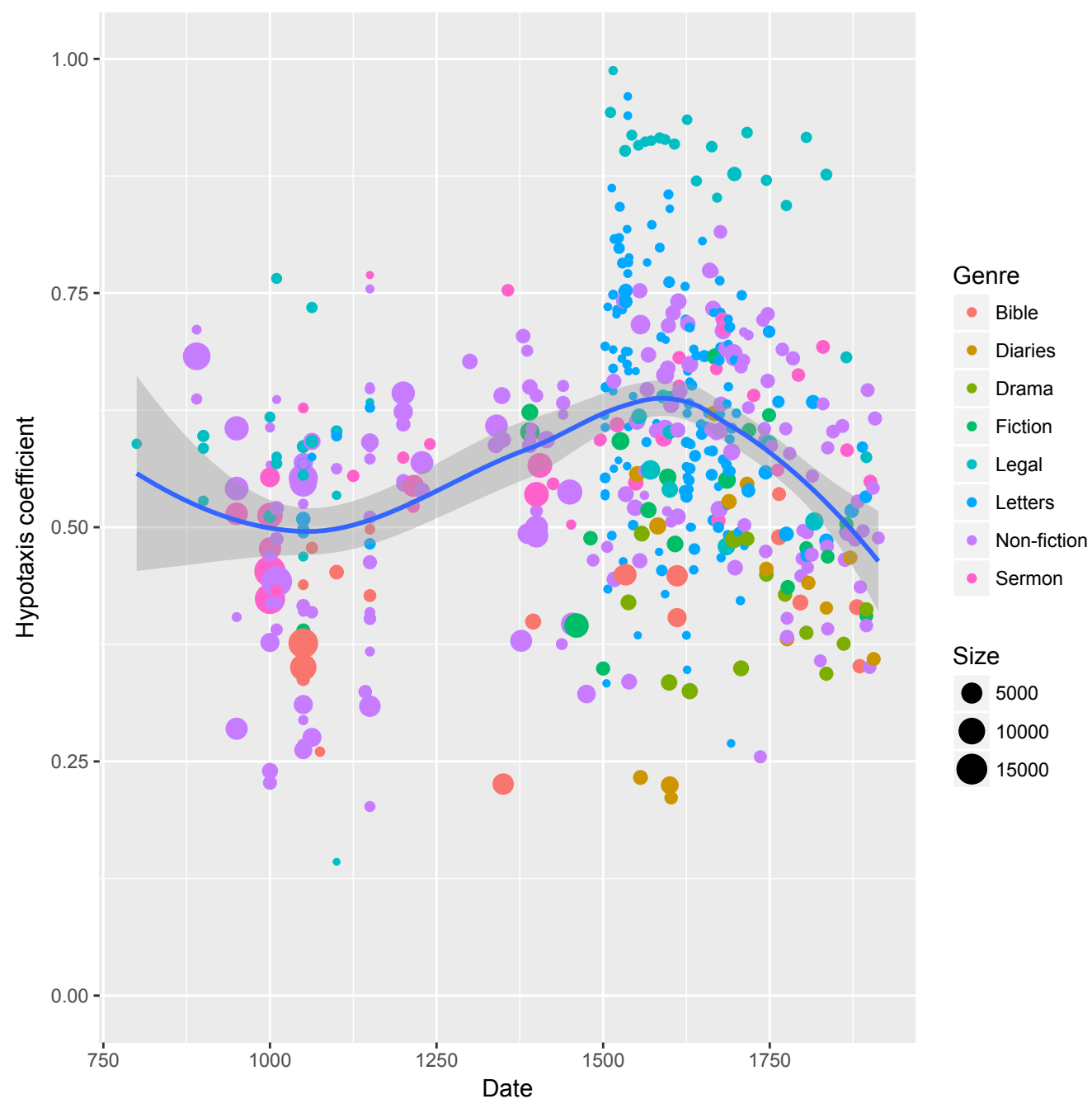
- Finite **unembedded** clauses: IP-MAT* in Penn-style parsed corpora (includes e.g. imperatives, exclamatives, coordinated clauses)
- Finite **subordinate**/embedded clauses: basically IP-SUB* (includes e.g. relatives, complement clauses, adverbial clauses)
 - Some variation in how interrogatives are treated – ask me if interested (shouldn't affect the overall results much)
- **Non-finite** clauses: IP-INF*

Languages investigated: English, Icelandic, French, Portuguese, Irish, Chinese

English

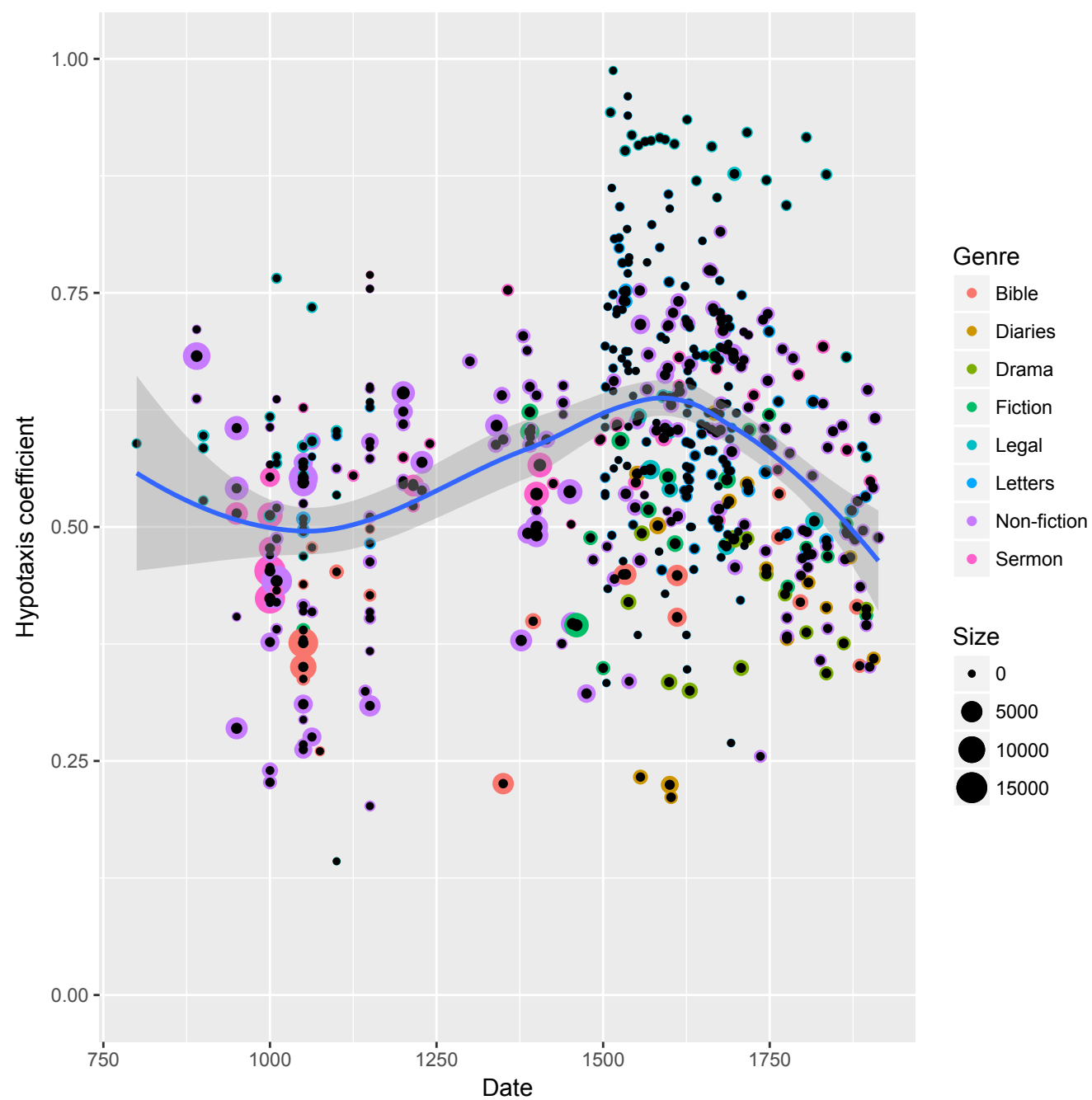
- YCOE
(Taylor et al. 2003)
- PPCME2
(Kroch & Taylor 2000)
- PPCEME
(Kroch et al. 2005)
- PPCMBE
(Kroch et al. 2010)

- “Non-fiction” (purple)
is something of a
dustbin category.
- Legal texts high;
diaries and bibles low



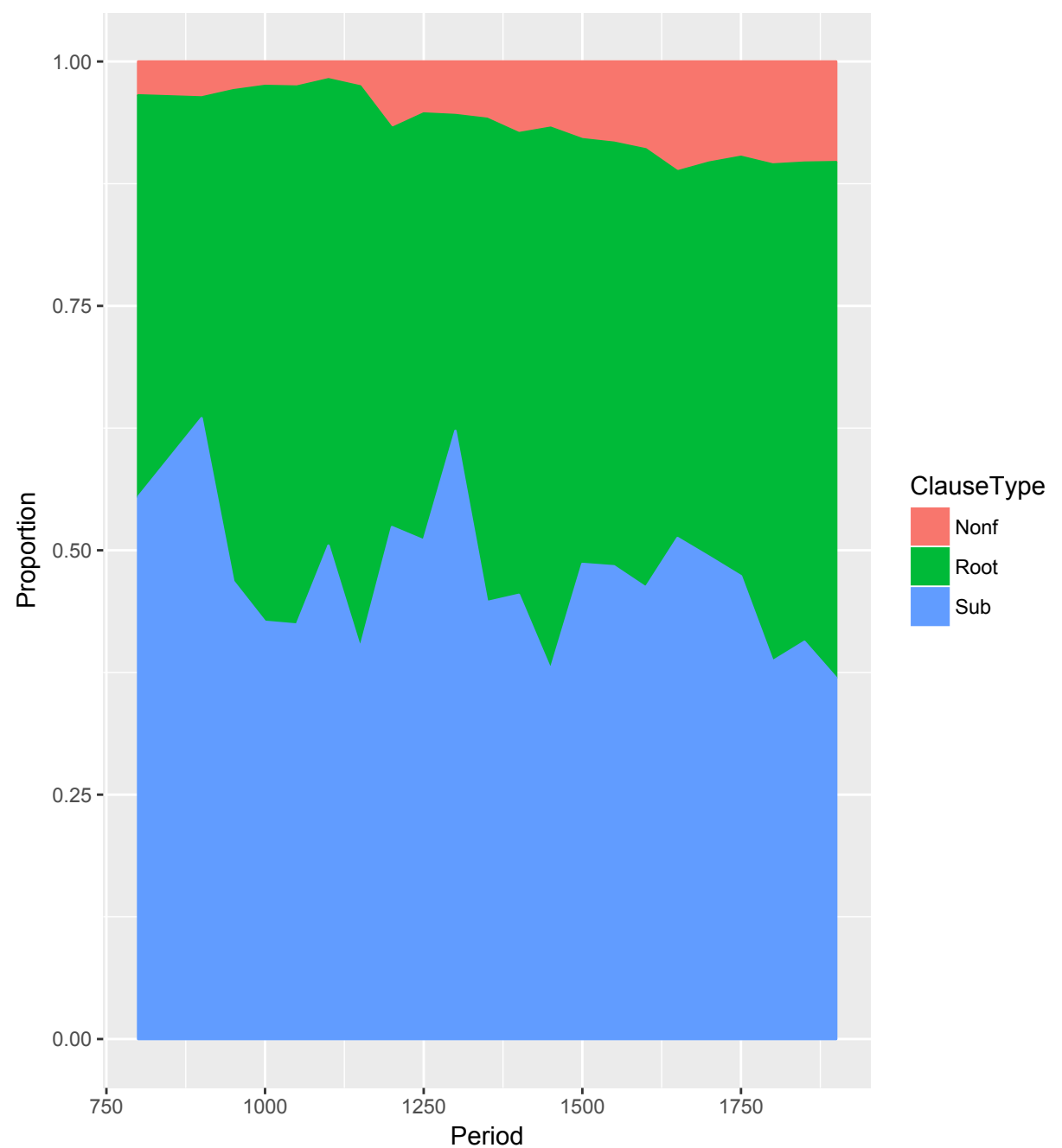
English with non-finite

- Non-finite clauses are the dark dots in the centre.



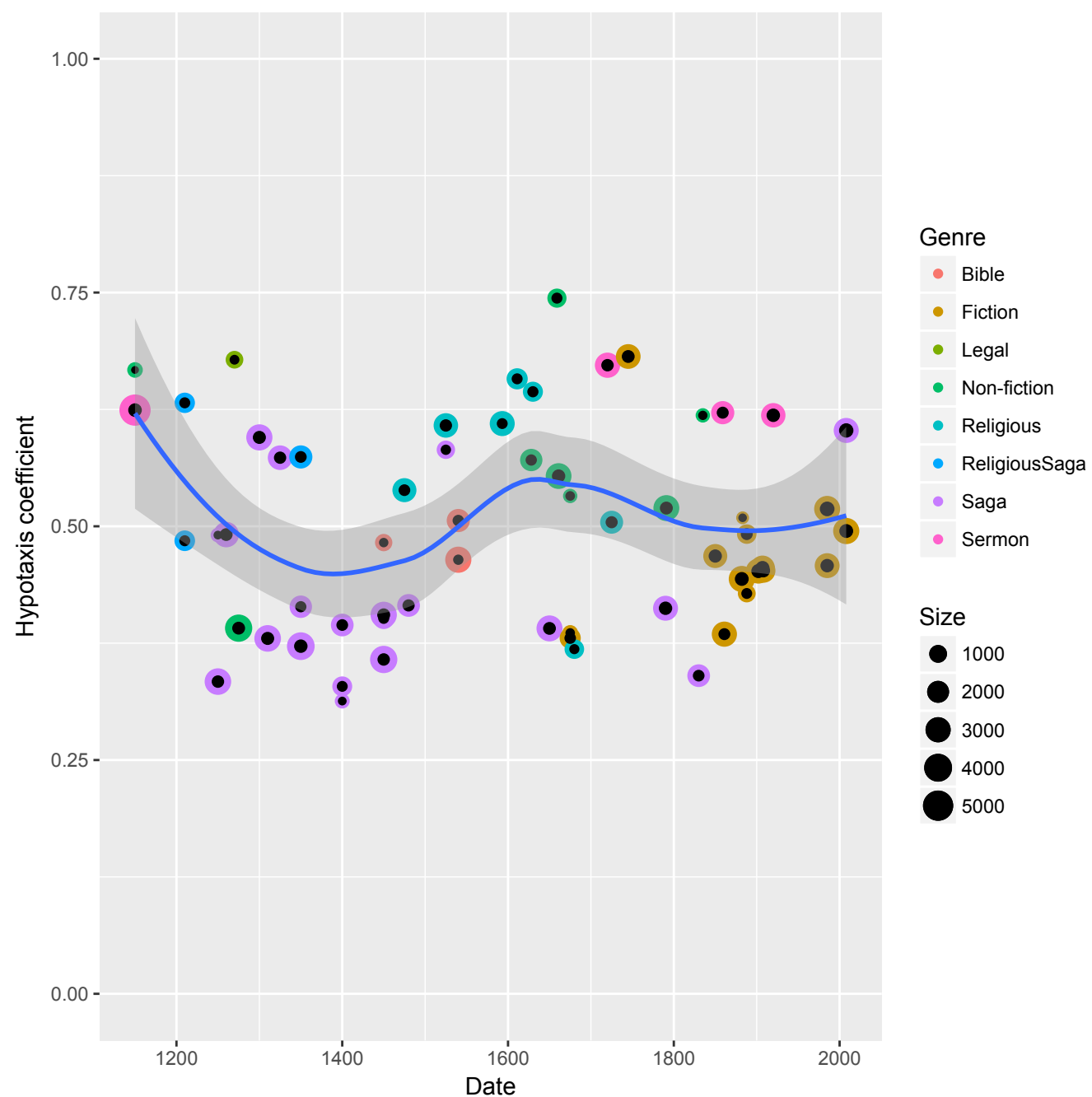
English: distribution

- Gentle increase in non-finite clauses between OE and Modern English.
- Window: 50 years



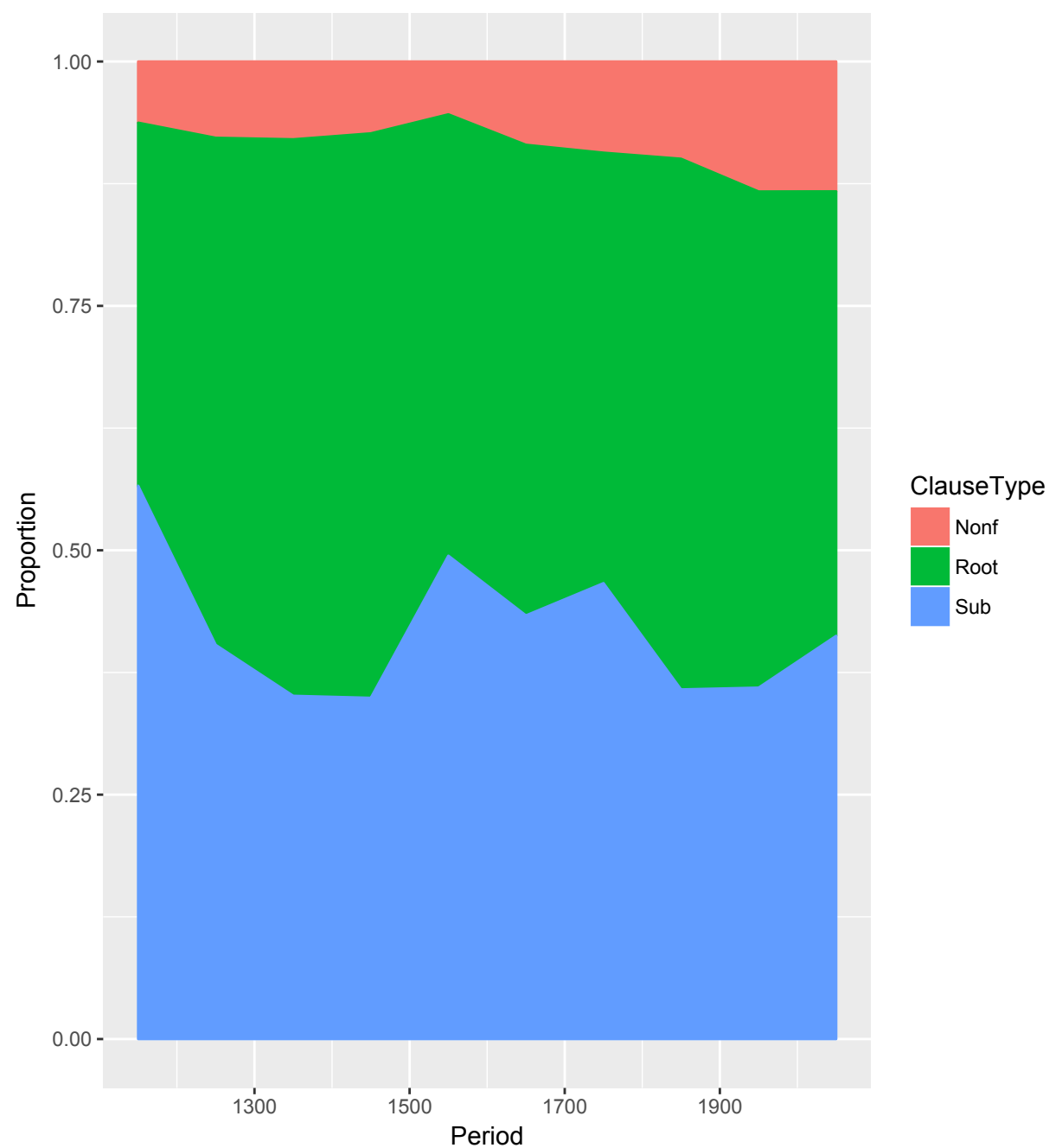
Icelandic

- IcePaHC (Wallenberg et al. 2011)
- Sagas typically have less than average hypotaxis



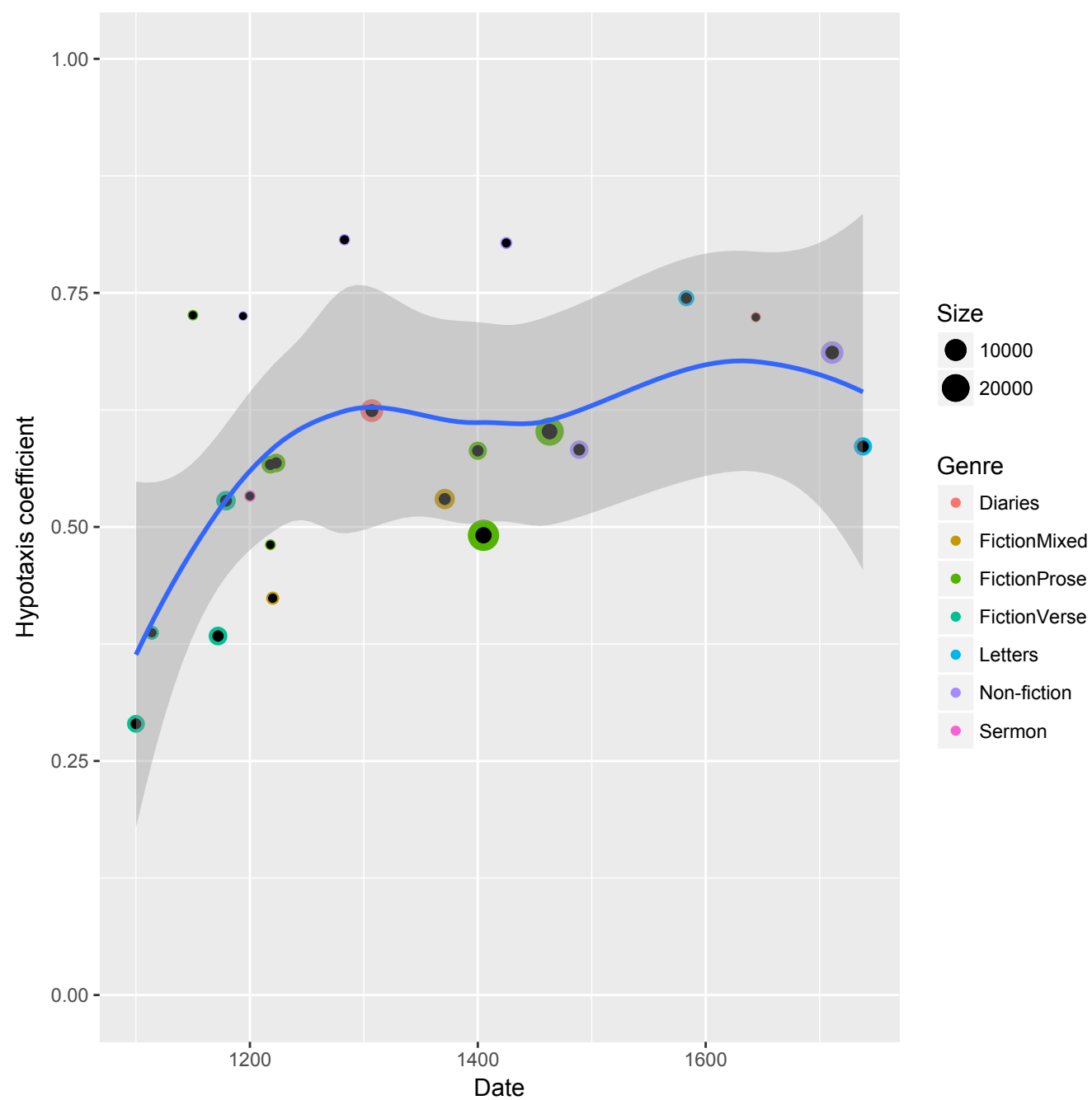
Icelandic: distribution

- Gentle increase in non-finite clauses between 1500 and 1900.
- Window: 100 years



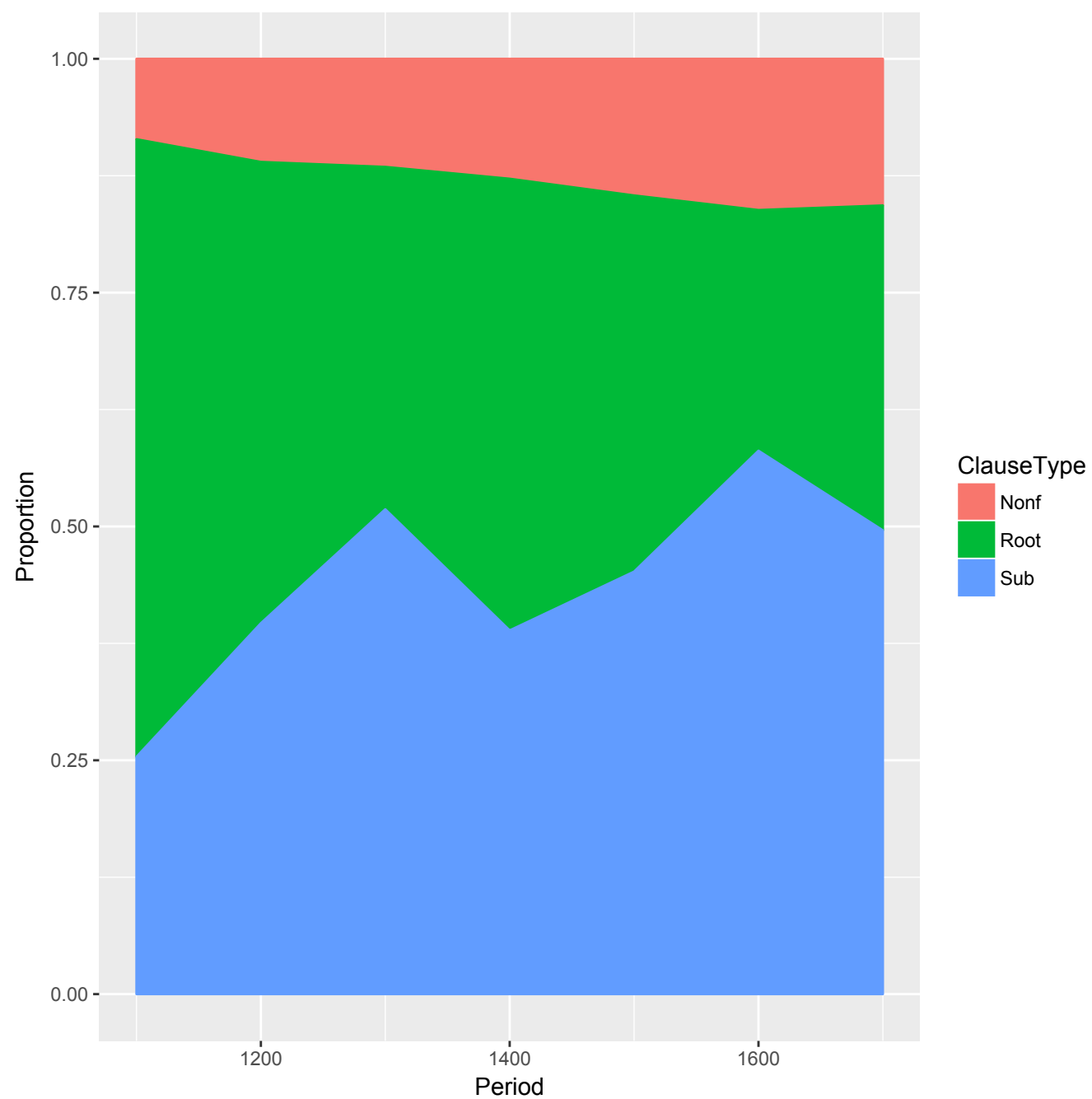
French

- MCVF (Martineau et al. 2010)
- Apparent early rise is exclusively due to dominance of **verse** texts in this period



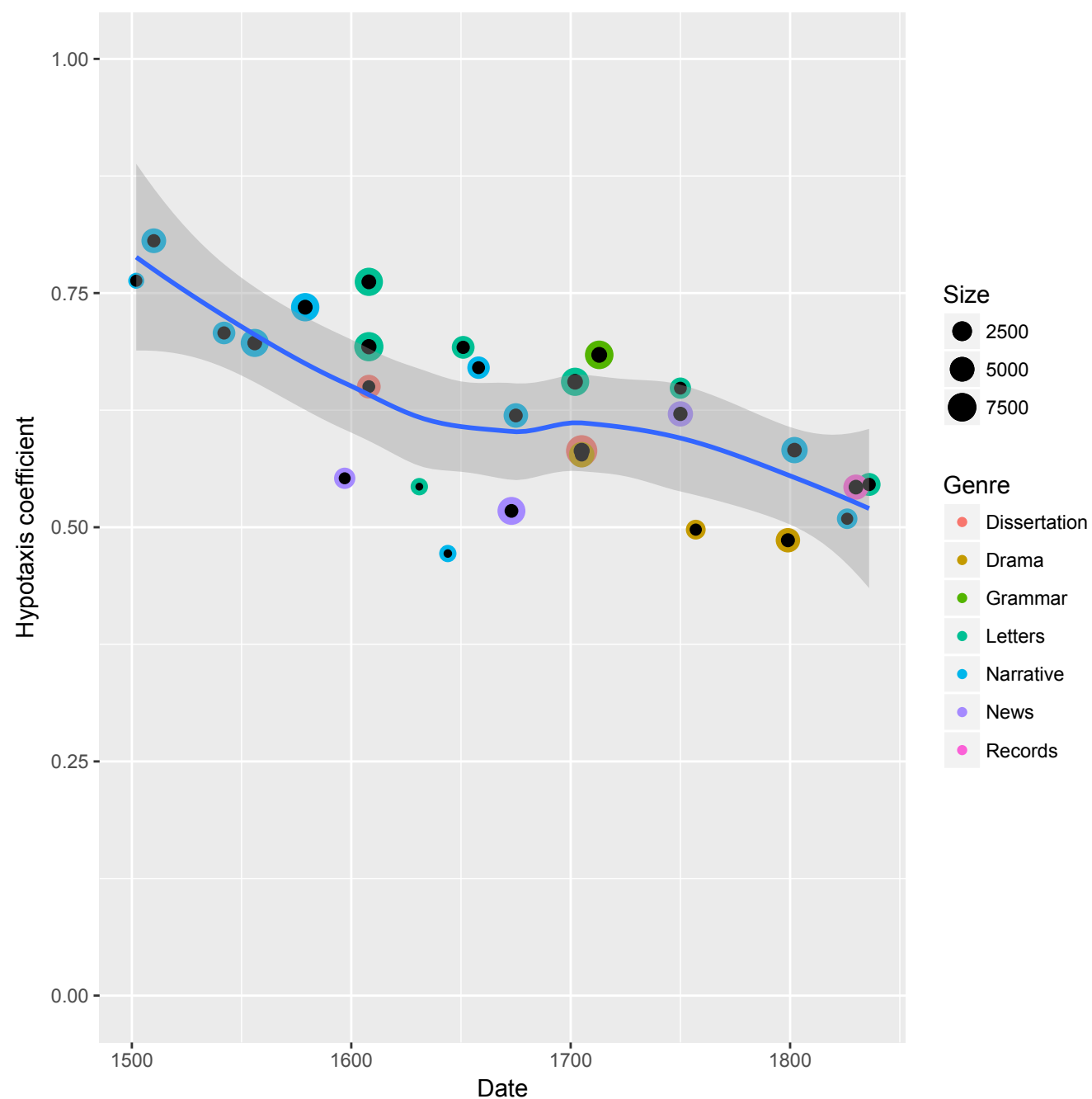
French: distribution

- Again, gentle rise of non-finite clauses
- Window: 100 years



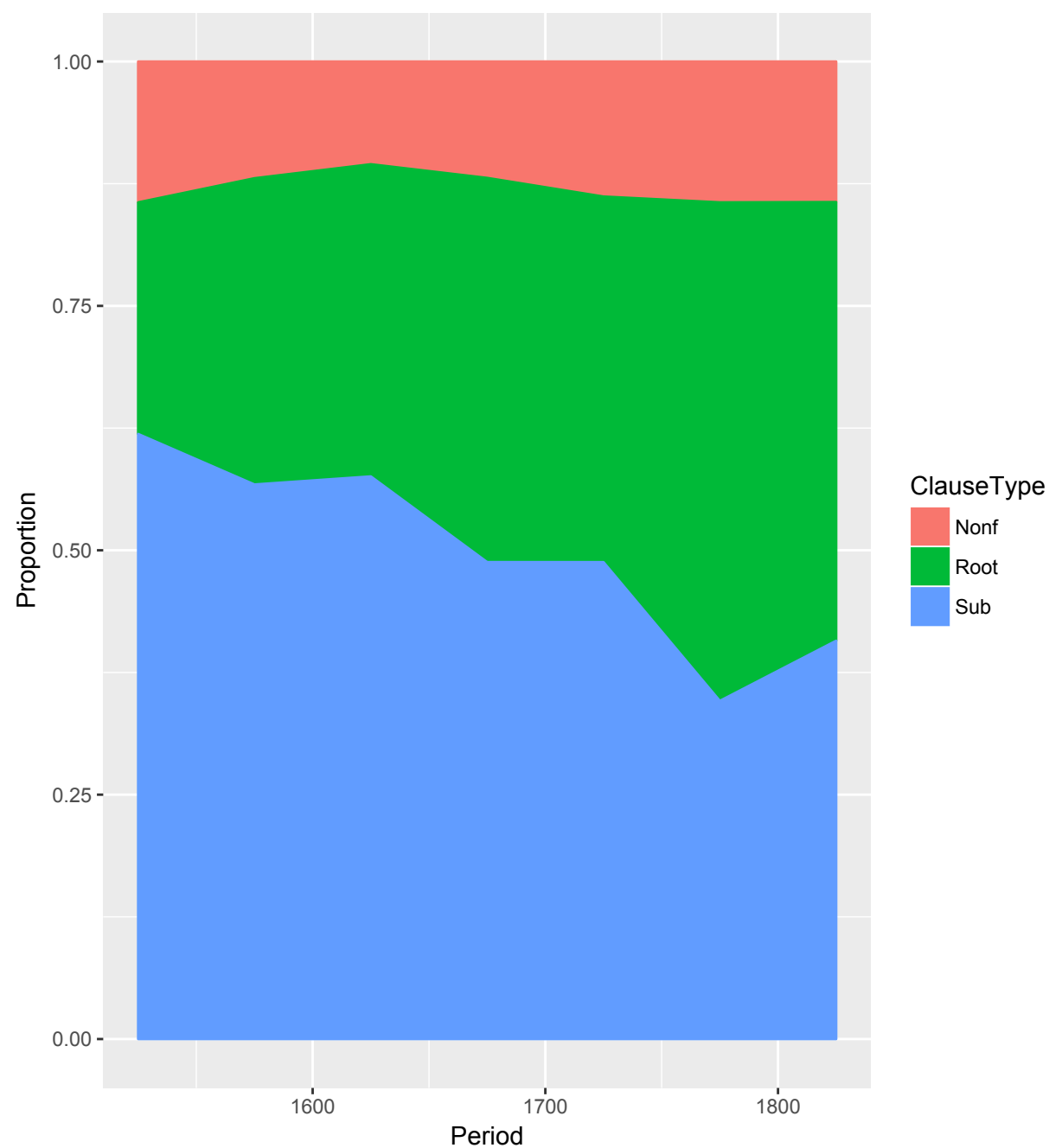
Portuguese

- Tycho Brahe Corpus (Galves, Andrade & Faria 2017)
- News texts & dramas typically low



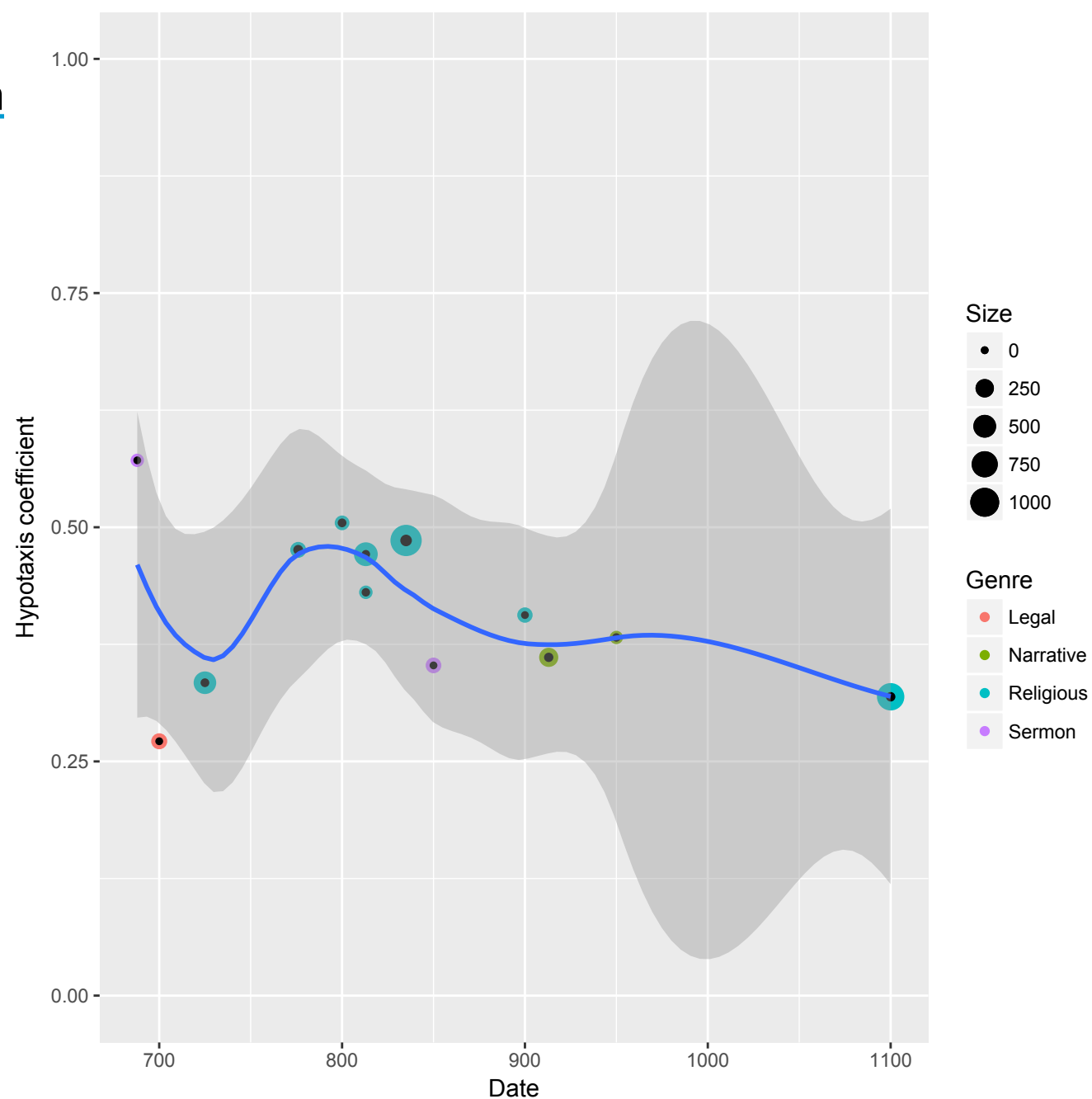
Portuguese: distribution

- Only clear trend is reduction in finite subordinate clauses
- Window: 50 years



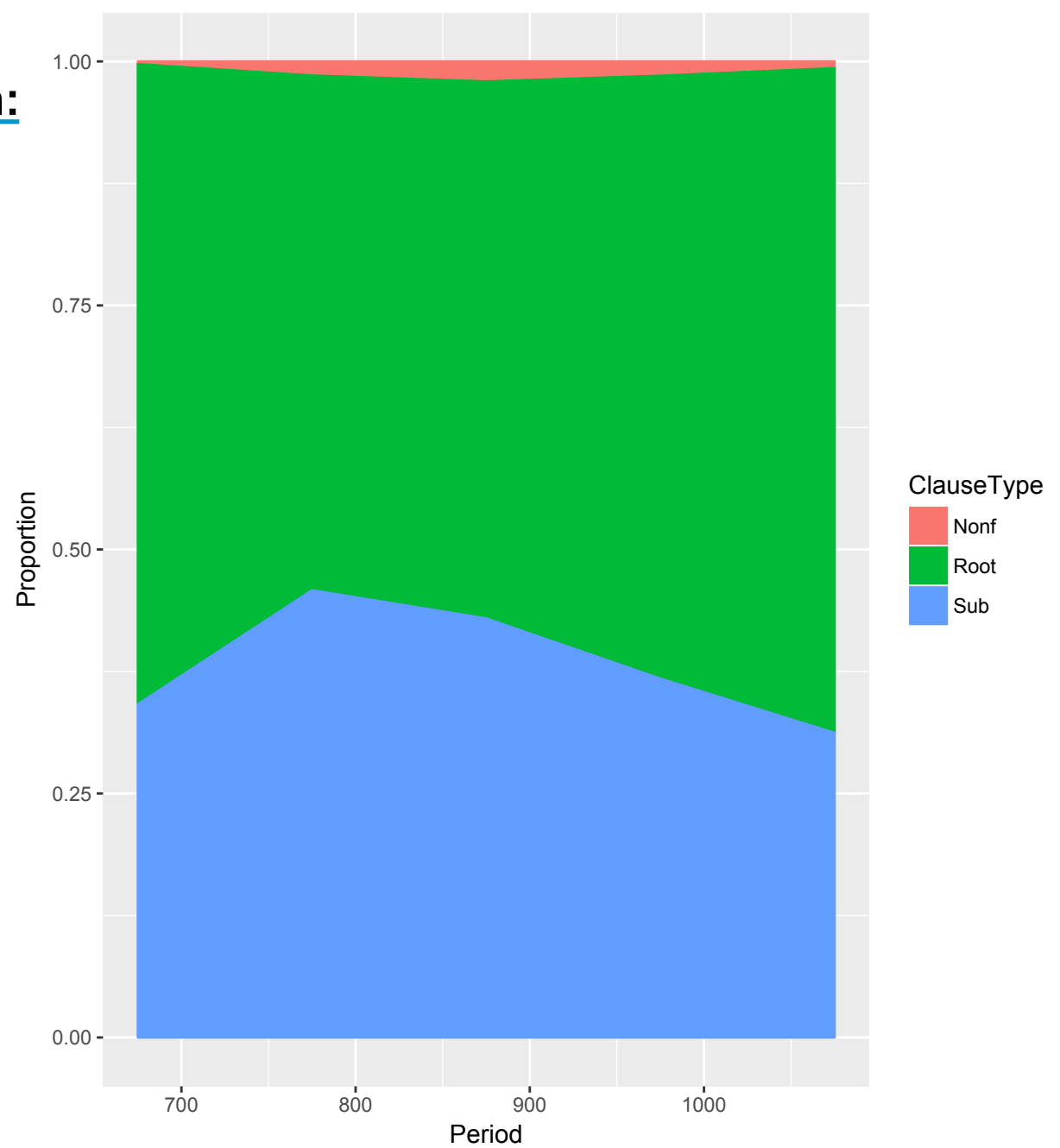
Old and Middle Irish

- Parsed Corpus of Old and Middle Irish (Lash 2014)
- Hard to generalize about genre



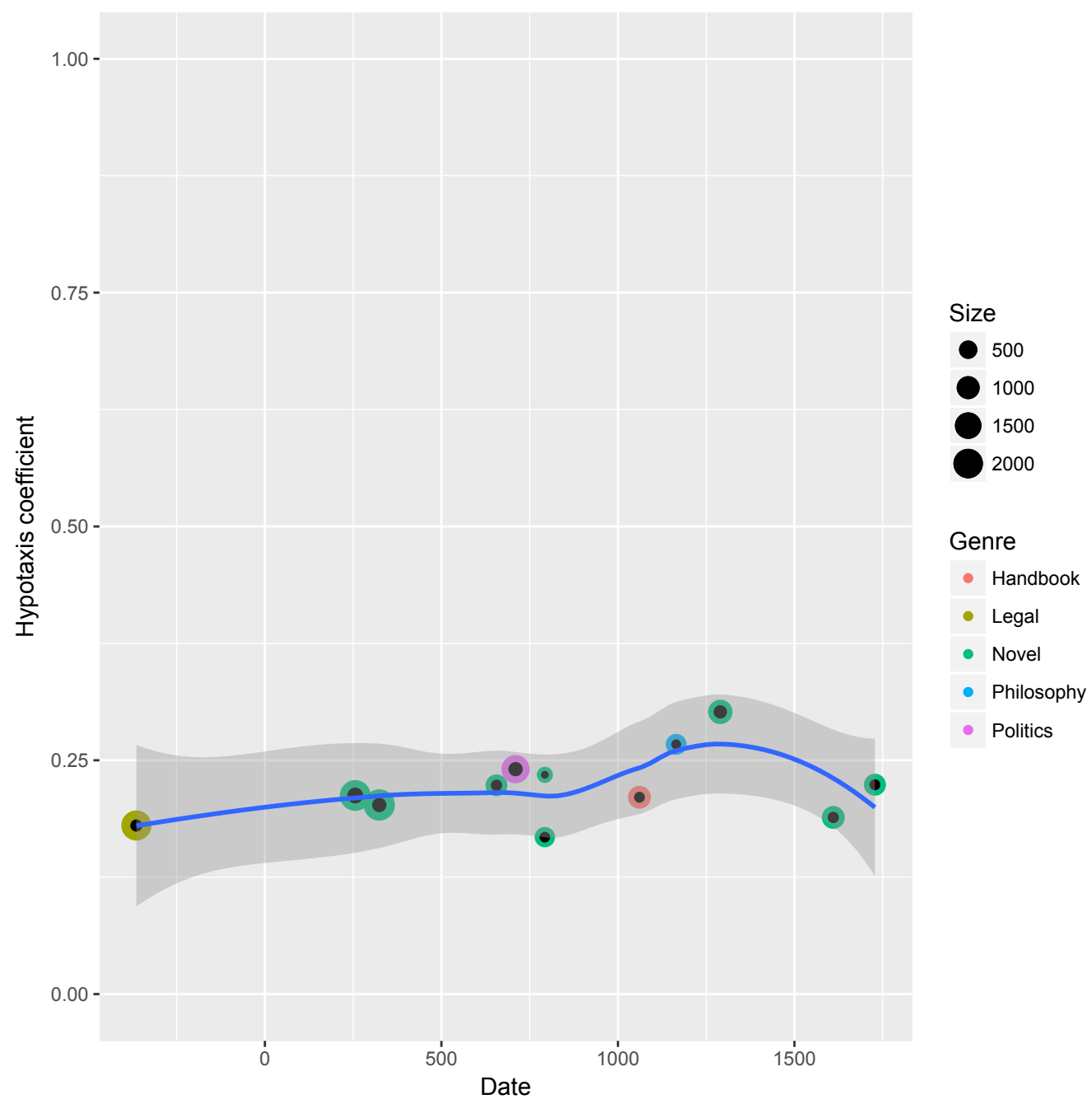
Old and Middle Irish: distribution

- No clear trends
- Window: 100 years



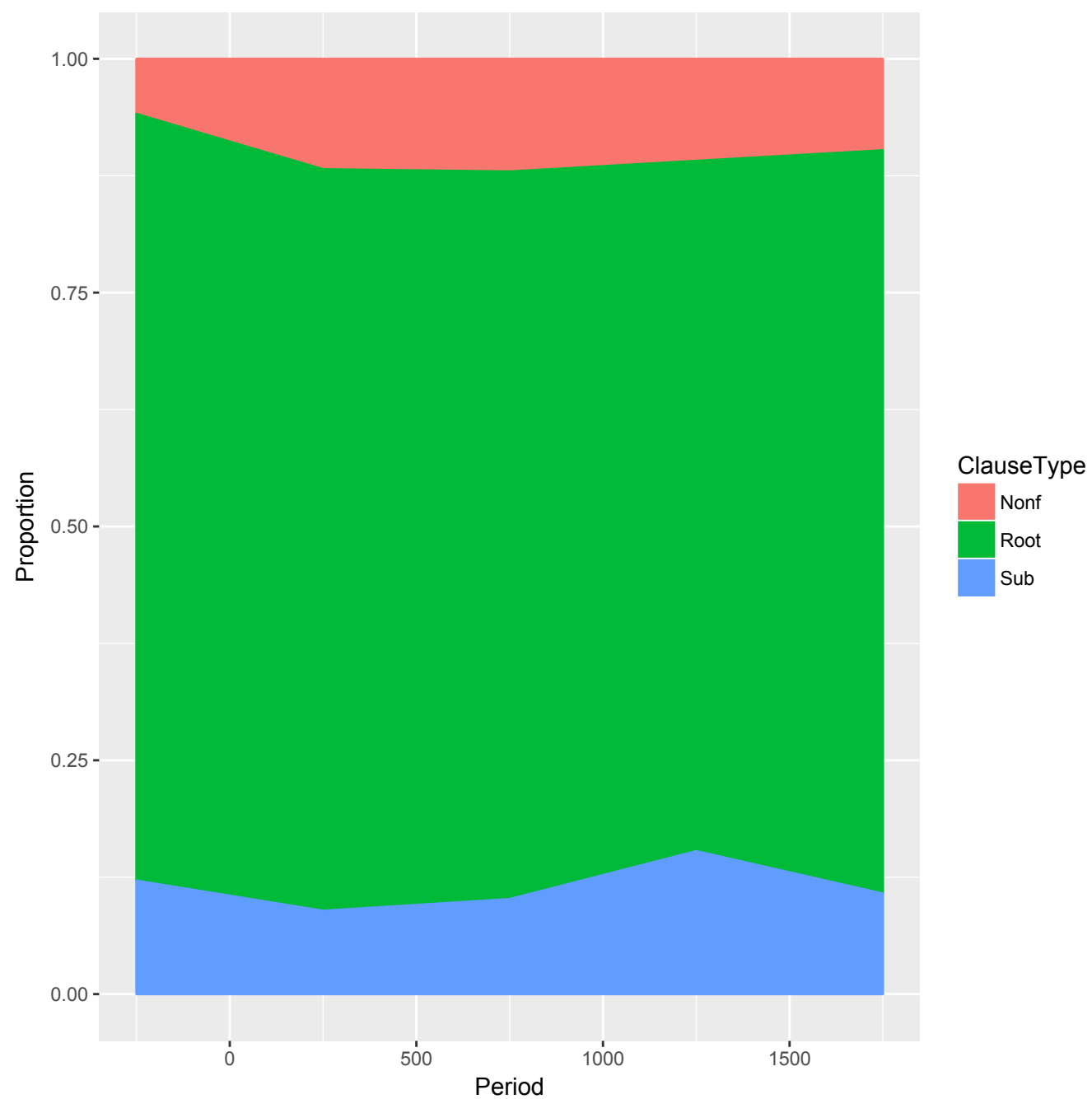
Chinese

- ChiParHC (Li 2017)
- Again, hard to generalize about genre



Chinese: distribution

- No clear trends
- Window: 500 years



Evaluation

Mixed-effects binomial logistic regression using R and lme4 package

- Dependent variable: unembedded vs. (finite **or** non-finite) subordinate clauses
- Fixed effect: date
- Random intercept: text

Linear effect of time should at least be detectable if the hypothesis is correct!

Nagelkerke R^2 , a measure of goodness of fit, calculated using Nakagawa & Schielzeth (2013) method and MuMIn R package. Gives percentage of variance explained by the model.

- Marginal R^2 : only fixed effects (date)
- Conditional R^2 : fixed and random effects (date and text)

| | English | Icelandic | French | Portuguese | Irish | Chinese |
|-------------------|----------|-----------|----------|------------|---------|----------|
| Log odds | -0.00045 | -0.00003 | -0.00144 | 0.00294 | 0.00092 | -0.00013 |
| Marginal R^2 | 0.5% | 0.0% | 1.6% | 2.0% | 0.4% | 0.2% |
| Conditional R^2 | 11.7% | 5.5% | 9.0% | 4.5% | 2.6% | 1.1% |

Evaluation (with genre)

| | English | Icelandic | French | Portuguese | Irish | Chinese |
|-------------------|----------|-----------|----------|------------|---------|----------|
| Log odds | -0.00045 | -0.00003 | -0.00144 | 0.00294 | 0.00092 | -0.00013 |
| Marginal R^2 | 0.5% | 0.0% | 1.6% | 2.0% | 0.4% | 0.2% |
| Conditional R^2 | 11.7% | 5.5% | 9.0% | 4.5% | 2.6% | 1.1% |

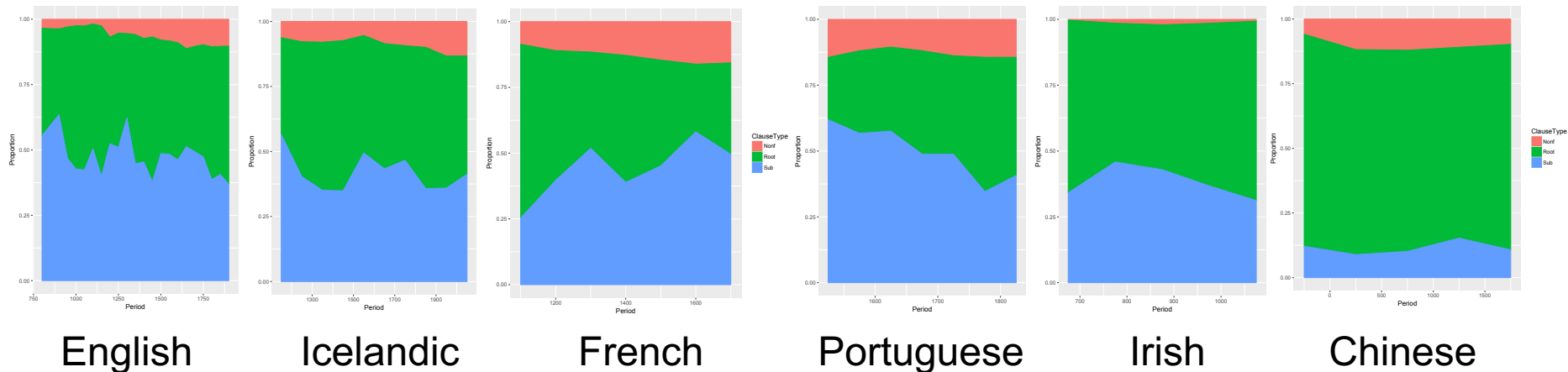
As above, but including genre as a fixed effect, below:

- Marginal R^2 : only fixed effects (date, genre)
- Conditional R^2 : fixed and random effects (date, genre, text)

Even genre allows us to explain only a relatively small proportion of the variation.

| | English | Icelandic | French | Portuguese | Irish | Chinese |
|-------------------|---------|-----------|--------|------------|-------|---------|
| Marginal R^2 | 3.6% | 2.4% | 4.8% | 2.8% | 1.5% | 0.4% |
| Conditional R^2 | 11.1% | 5.5% | 7.7% | 4.6% | 2.7% | 1.1% |

Overview



No robust support for any version of the PPHH.

- English, Icelandic, Irish, Chinese: no consistent direction of change.
- French: increase in hypotaxis 1100–1200, but early texts are in verse.
- Portuguese: gentle but steady *decrease* in hypotaxis over the timespan of the corpus.
- Gentle upward trend for non-finite clauses in English, Icelandic and French.

Does genre play a role? Yes, but irrelevant to the hypothesis as far as we can tell.

- The most hypotactic texts in English are legal texts.
- A consistent role for genre is exactly what we'd predict given Chafe's (1982) and Biber's (1995) results, if performance effects are constant.
- So unless the corpora are unbalanced and genre effects are *counteracting* a real diachronic trend, the result basically stands.

Conclusion

- **It's widely agreed that parataxis > hypotaxis.**
Much less widely agreed what this actually means.
- **Focusing on the idea that (finite) clausal subordination becomes more prevalent over time, I have found no support for this in parsed diachronic corpora of English, Icelandic, French, Portuguese, Irish, or Chinese.**
 - Maybe the corpus annotation is wrong.
 - Maybe the choice of languages is wrong.
 - But insofar as parataxis > hypotaxis is an empirical question, the burden of proof should be shifting at least somewhat.
- **Much future work suggests itself:**
 - More languages.
 - More consideration of genre.
 - Suggestions welcomed!

**Thank you
for your attention!**

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Bonus languages: Latin, Slavic/Russian, Georgian

These corpora don't have constituency parsing.

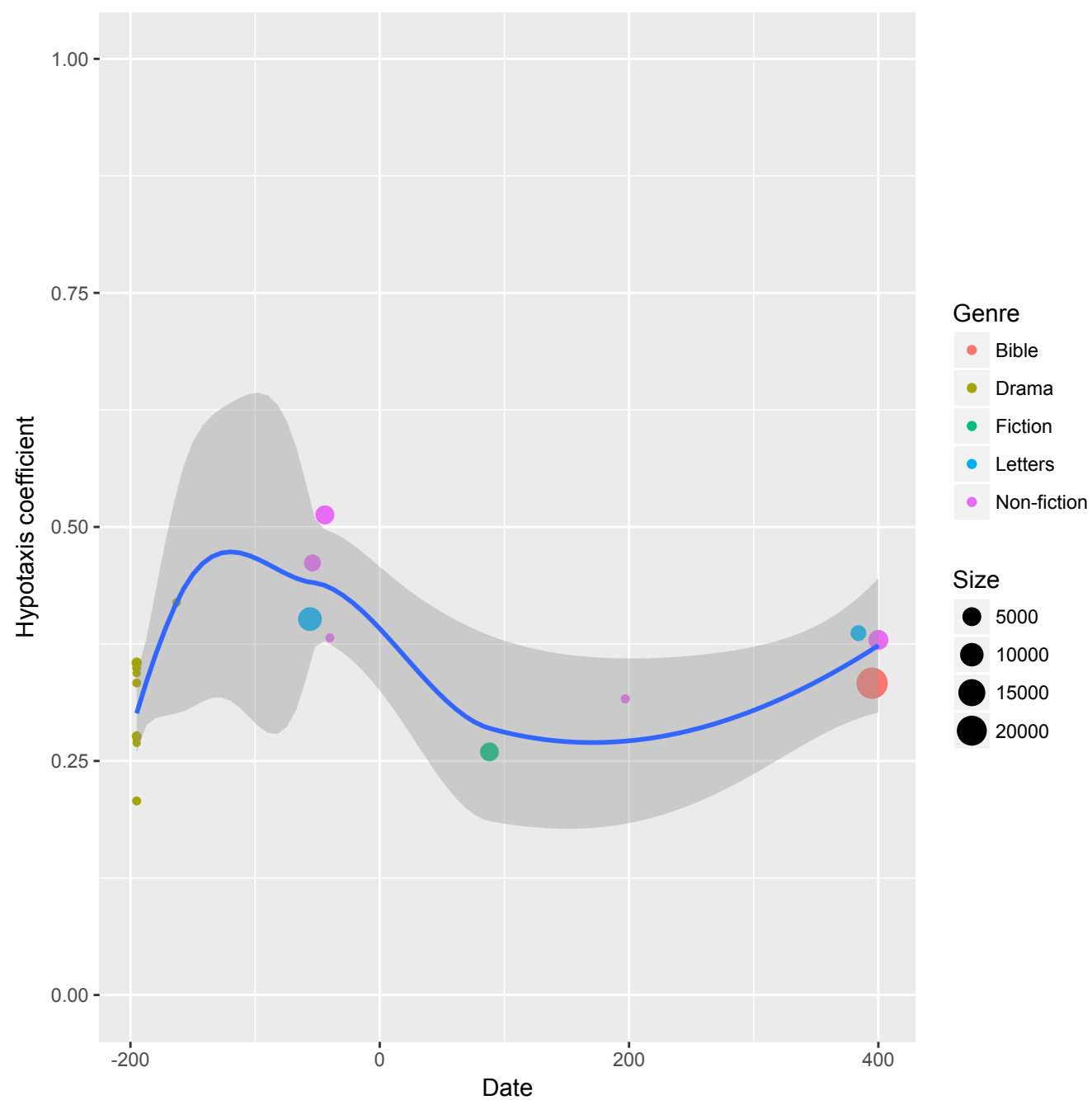
- Latin: PROIEL
- Slavic/Russian: PROIEL
- Georgian: Georgian National Corpus

Approximation to the hypotaxis coefficient: number of overt subordinators divided by the number of finite verbs.

This seems to work reasonably well (more testing needed). Only finite clauses.

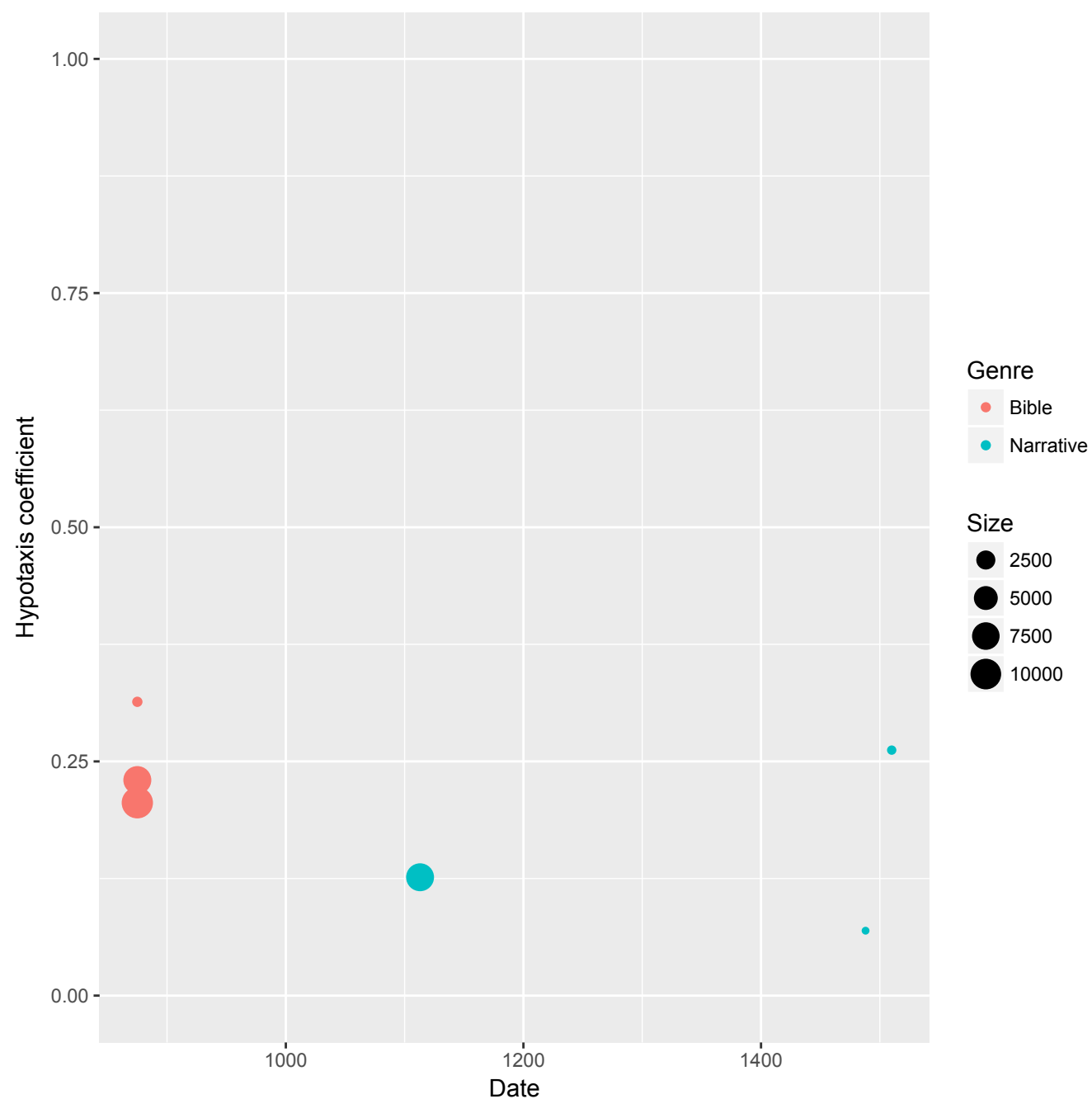
Latin

- PROIEL (Haug & Jøhndal 2008)
- Again, hard to generalize about genre



Slavic/Russian

- PROIEL (Haug & Jøhndal 2008)
- Bible texts are Old Church Slavonic; narrative texts are Russian
- Too little here to say anything meaningful at all



Georgian

- Georgian National Corpus (Gippert & Tandashvili 2015)
- Philosophical and legal texts most hypotactic

