The Historical Development of Periphrastic *do*

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do Support

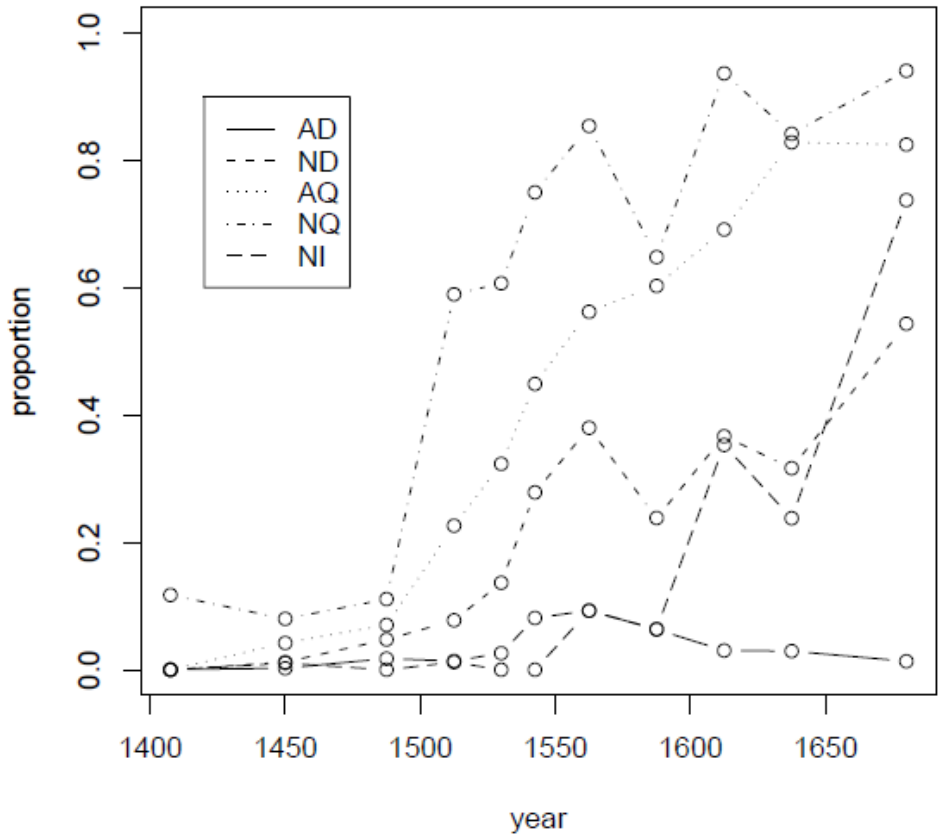
- Started in the 15th century
- Some Middle-English examples in four types of sentences:

1. Dolores mortis **not touched** hym or pynched hym (ND)
2. … for I **know not** myne owne religion (ND)
3. Whereupon **he did not make** the wife upon the same clay… (ND)

Examples Continued

4. … whereof **he made** man … (AD)
5. For, lyke as winter rasure **dothe allway arace** and deface grene summer… (AD)
6. **Toke ye** hym in the quenys chamber? (AQ)
7. … **why dyde thou refrayne** from Ire… (AQ)
8. … **why shewed thou not** vengeaunce …? (NQ)
9. **Why do we not spede** vs…? (NQ)

Ellegård's (1953) data



Data Continued: % of *do*

Period		Contact ADs (*do* V)		Affirmative V-Questions	NDs
		All Periphr. *do*	Emphatic *do*		
I	1400-1500	1.09	0.00485	7.59	2.48
II	1500-1525	1.37	0.0186	25.5	7.77
III	1525-1550	4.69	0.0952	47.3	21.2
IV	1550-1600	6.17	0.0620	75.8	28.6
V	1600-1700	1.48	0.0925	87.3	37.6

Linguistic Explanation

- Affixes were blocked from being transferred directly to the main verb whenever there was an element (like *not*) between the inflection node and the main verb
- This required a lexical support, realized in the form of *do*
- ADs – an exception

Two Mathematical Models

I. Piotrovski-Altmann Law (Vulanovic & Baayen, 2007)
II. Grammar-efficiency model (Vulanovic, 2005)

Model I.

- Generalized logistic differential equation

$$\frac{dp(t)}{dt} = k(t)\,p(t)[m - p(t)]$$

t = time

p = proportion of new form (*do* constr.)

m = maximum, $0 < m \leq 1$

k = coefficient of proportionality

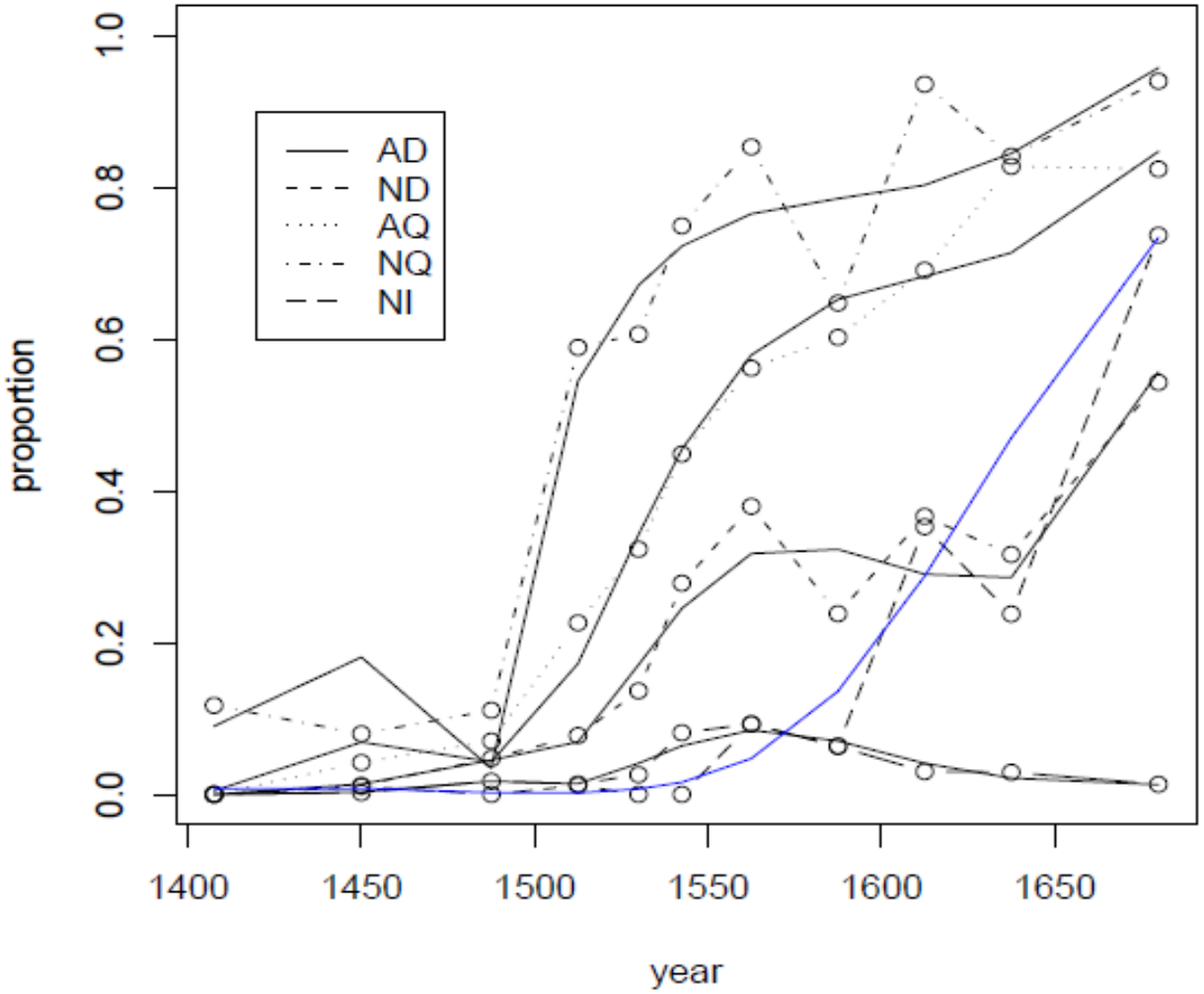
- *k* is constant in standard models, but here:

$$k(t) = At^2 + Bt + C$$

- Solution:

$$p(t) = \frac{m}{1 + \exp[-m\int k(t)dt]}$$

- 5 constants to be fitted to the data


AD
ND
AQ
NQ
NI
proportion
0.0
0.2
0.4
0.6
0.8
1.0
1400
1450
1500
1550
1600
1650
year

Model II.

- Use a grammar-efficiency model to show that emphatic *do* was a factor in the change affecting ADs.
- An example without *do*

  N(oun) → S(ubject)

  V(erb) → P(redicate)
- *k* = 2 grammatical conveyors of *n* = 2 syntactic functions

Grammar efficiency

US = number of unambiguous sentences

US = 1 (NV)

AS = all permutations of all sentences

AS = 2 (NV, VN)

$$GE = \frac{US}{AS} \cdot \frac{n}{k} = \frac{1}{2} \cdot \frac{2}{2} = \frac{1}{2}$$

An example with *do*

- N(oun) → S(ubject)
  V(erb) → P(redicate)
  doV → P
- *k* = 3 grammatical conveyors of *n* = 2 syntactic functions

Grammar efficiency

$$GE = \frac{US}{AS} \cdot \frac{n}{k} = \frac{2}{4} \cdot \frac{2}{3} = \frac{1}{3}$$

US = 2 (NV, N doV)

AS = 4 (NV, VN, N doV, doV N)

Here, NV and N doV are equally likely.

Proportion of sentences taken into account

p = proportion of N doV

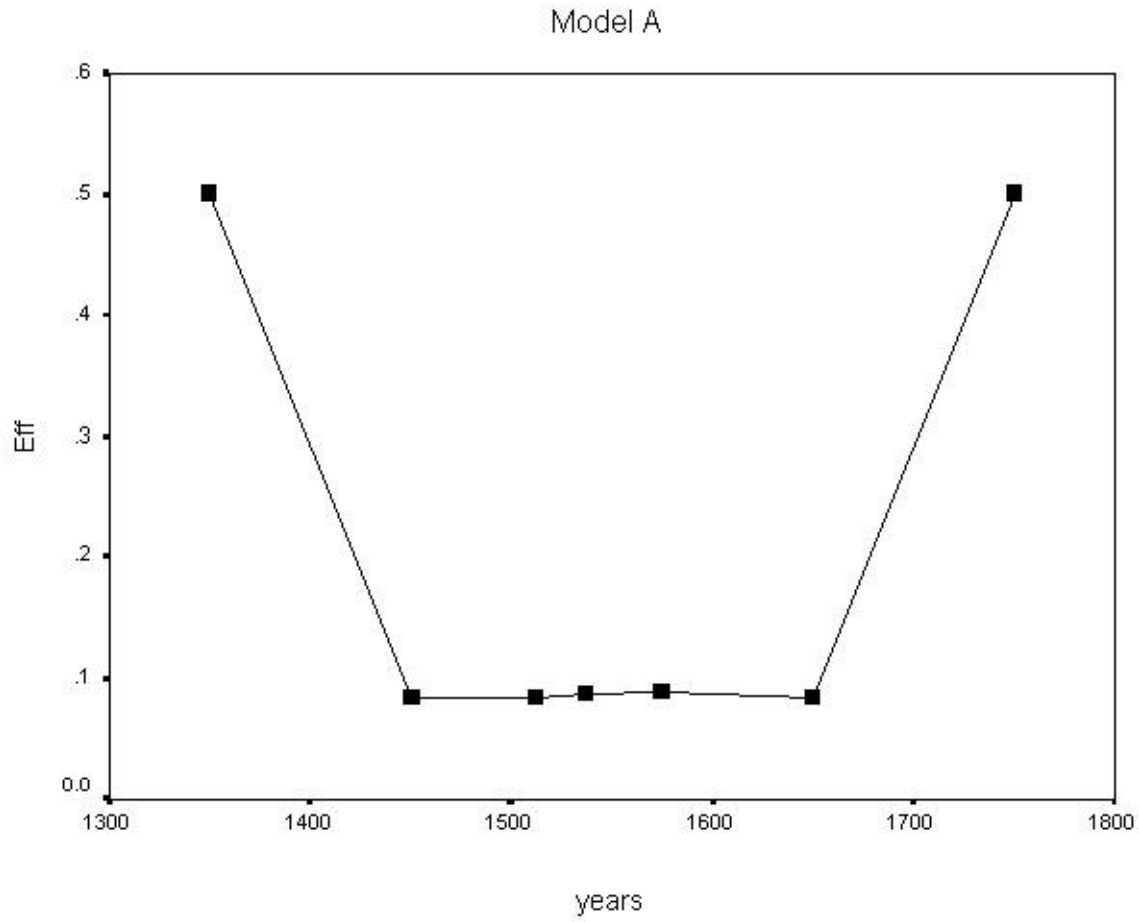
$1 - p$ = proportion of NV

$US = 1 + p/(1 - p) = 1/(1 - p)$

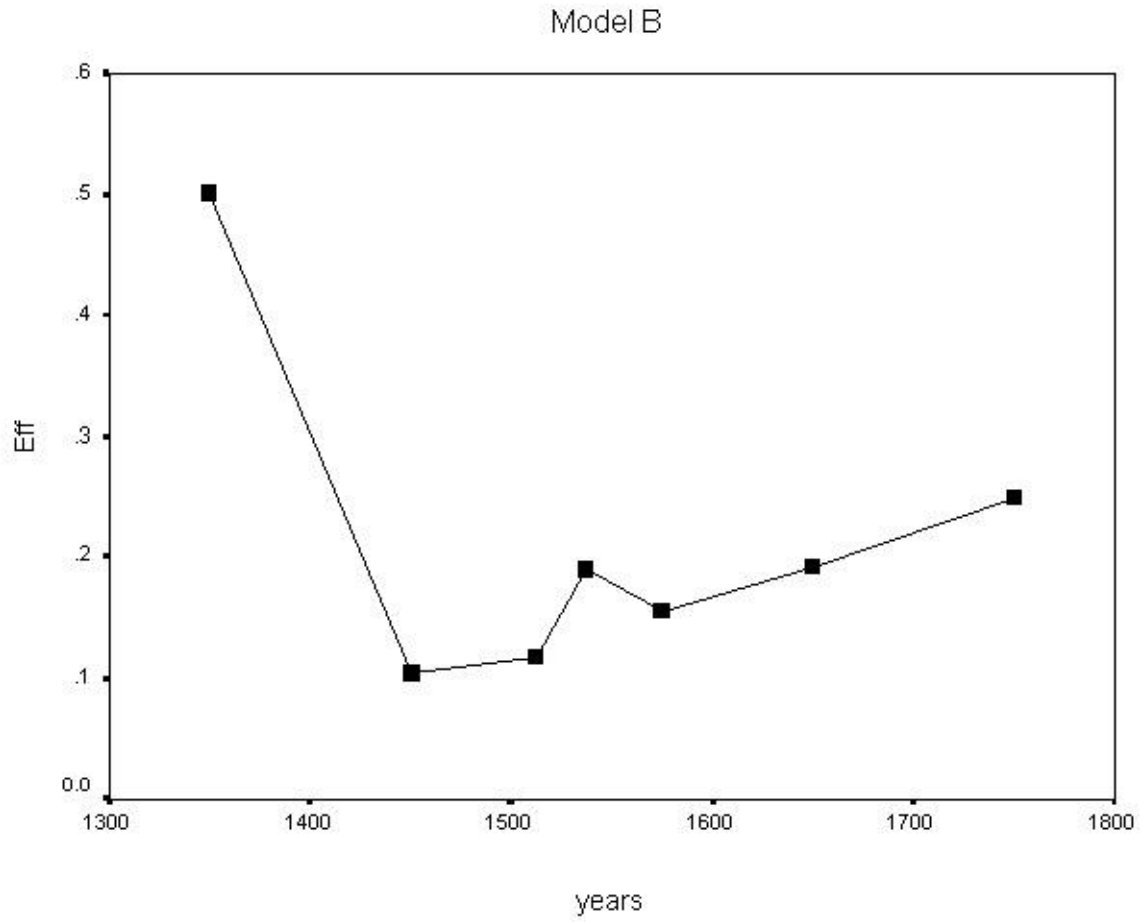
[if $p = ½$, then $US = 2$]

$$GE = \frac{1}{4(1-p)} \cdot \frac{2}{3} = \frac{1}{6(1-p)}$$

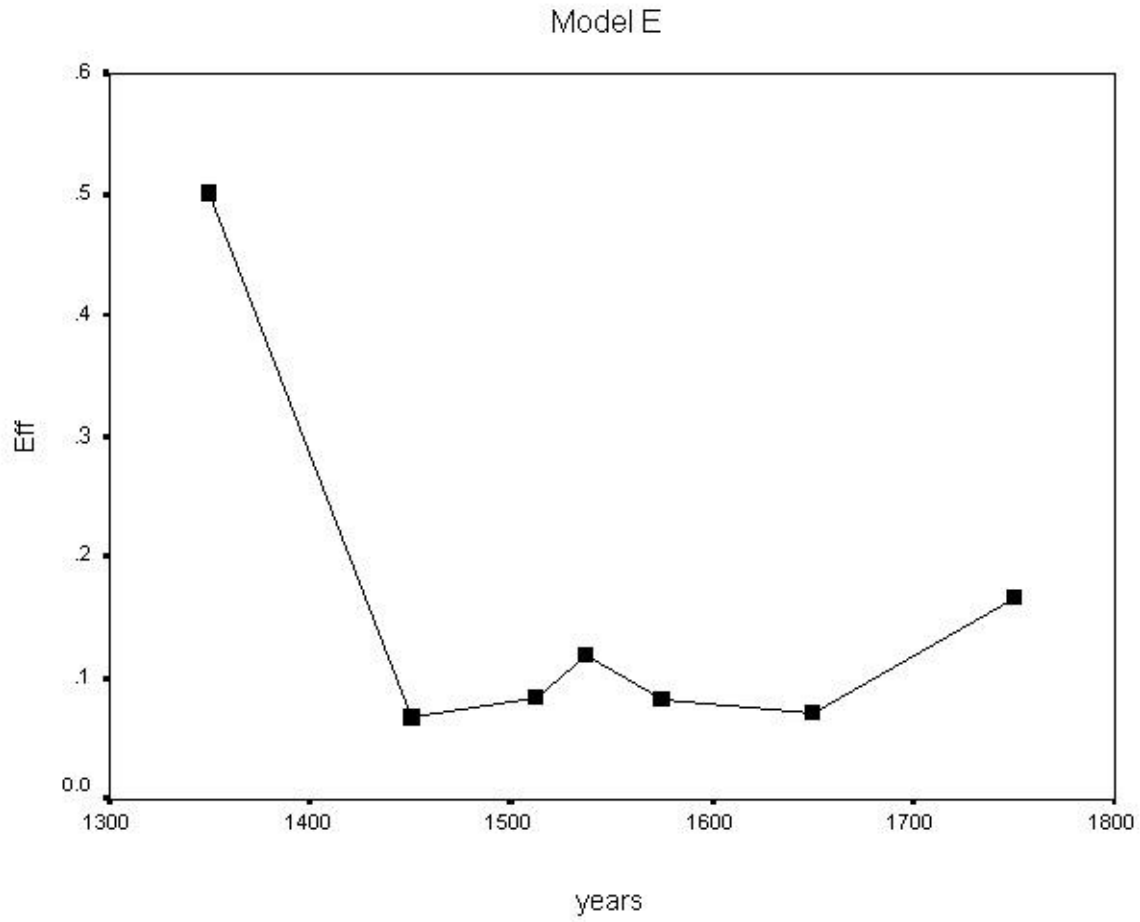
ADs: Model A – actual change without emphatic *do*



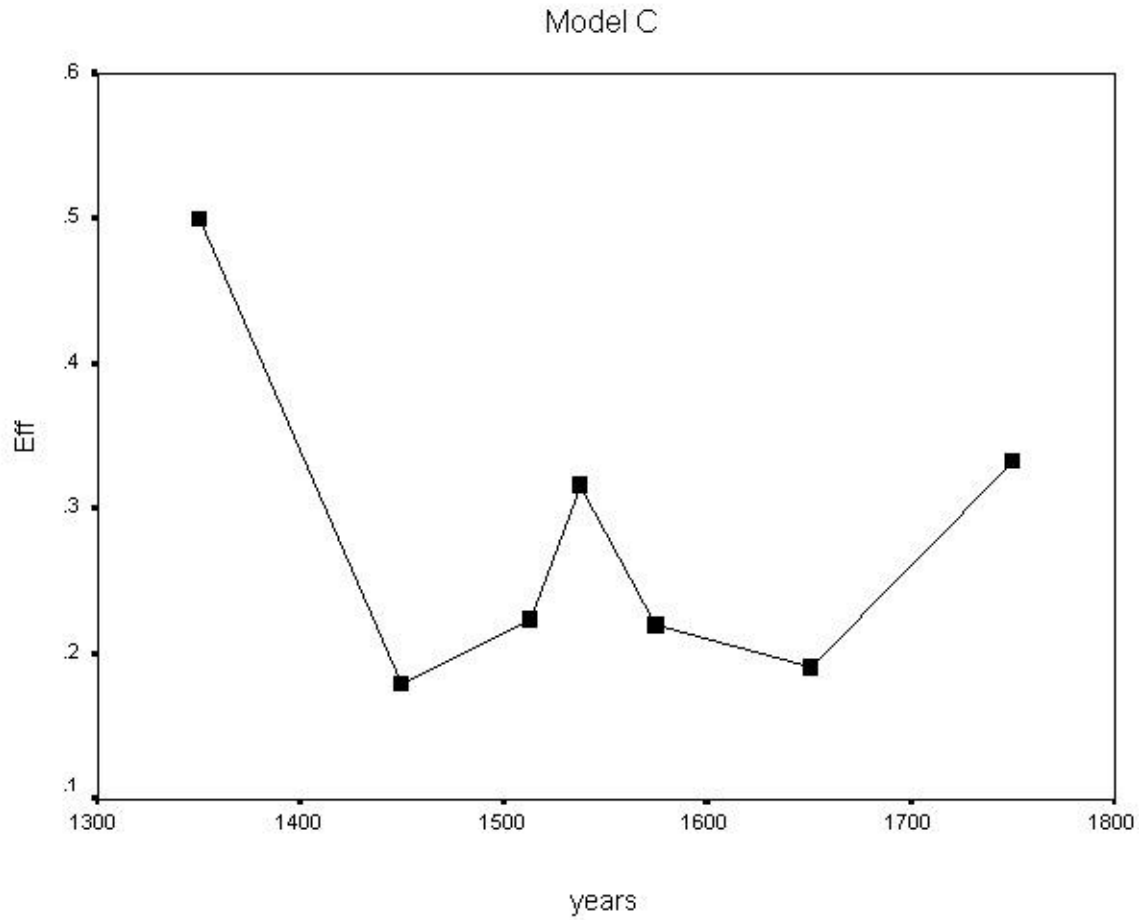
ADs: Model B – actual change with emphatic *do*



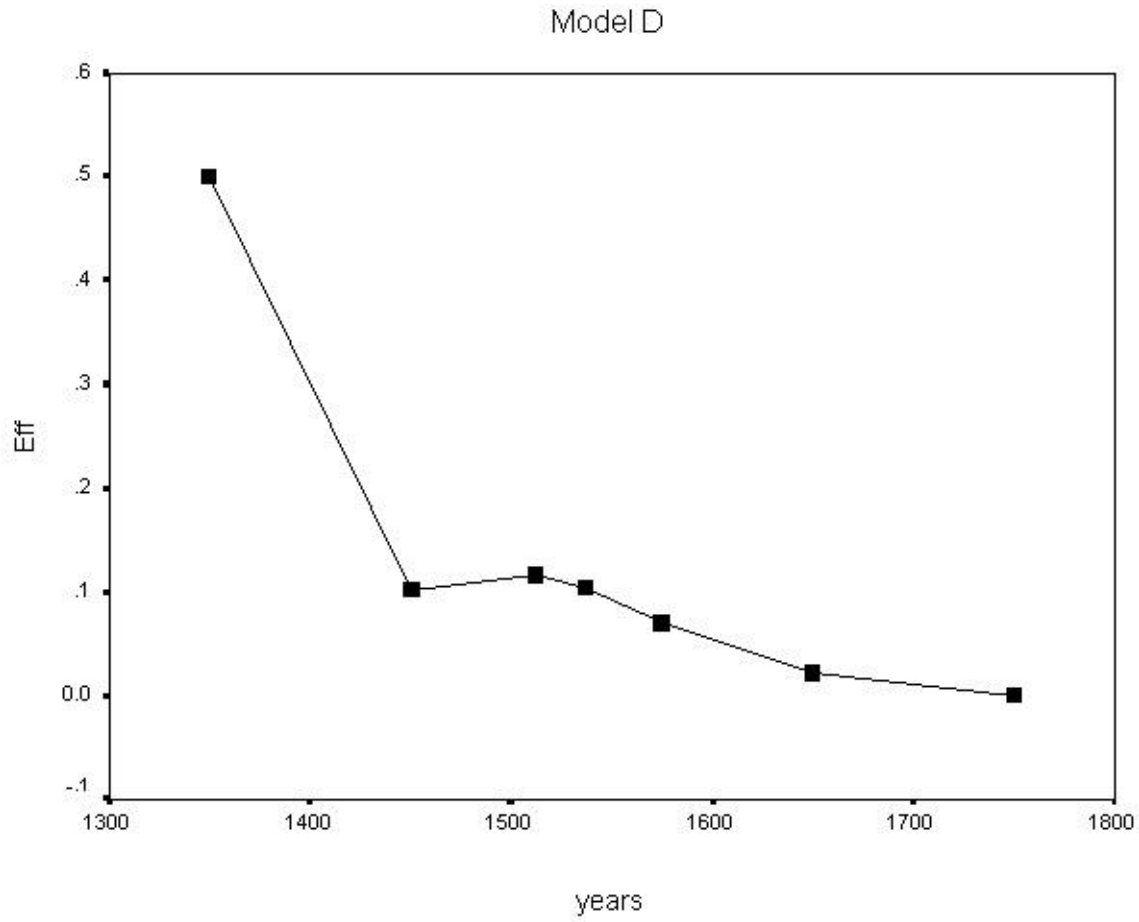
B is more similar to the change in other sentence types, like AQs



ADs: Hypothetical rise of *do* when not used for emphasis



ADs: Hypothetical rise of *do* when also used for emphasis



Conclusion

- In the last model *GE* = 0 at the final stage b/c all sentences are ambiguous:

  Is *do* in N doV used for emphasis or not?

- Emphatic *do* has to be taken into account!

Discussion

Q1: Please say more about the word “periphrastic" and what it means in relation to your work.

A1: In linguistics, a periphrastic construction is a longer construction which conveys the same information as an existing simpler construction.

A1 continued

Consider, for instance,

Do not laugh! and *Laugh not!*

The second construction is simpler and is still in use in most Germanic languages.

The first construction is periphrastic. It is standard in English, where this usage of *do* is called periphrastic *do*.

Q2

To what extent were cultural and social forces responsible for changes in the use of *do* over time?

A2: I have not researched this because this would not be part of my model anyway. In general, social factors are important in any linguistic change. They often trigger the change, but the subsequent developments are governed by linguistic laws and this is what I model.

Q3

In light of Q2, modern technology seems to be changing the ways we use language (e.g., texting styles and abbreviations, the use of “like”, etc.). Is it within the scope of either model you presented to predict future trends in language usage?

A3: What I presented concerns a completed syntactic change. If we would like to model a change that is currently underway, the starting stages of the change, linguistic laws, and mathematical/statistical models could be used to predict the remaining stages of the change.

A3 continued

It is also known and well-documented that many syntactic changes are cyclical. So, when one cycle gets completed, it can be expected that a new, similar cycle will start after a certain period of time. My models can cover this too.

Q4

Is your research and model applicable to languages other than English?

A4: Yes. I have not modeled any other changes involving periphrastic constructions, but I have modeled other syntactic changes in various languages, like:

- the historical development of word order in Romance languages
- the historical development of the French negation
- the passive-to-ergative reanalysis in Polynesian languages

Q5

What prompted you, as a mathematician, to study linguistics? What questions were you seeking to answer? What did you hope would emerge from your intensive investigations?

A5: My Ph.D. is in numerical analysis, another branch of mathematics, in which I have published more papers than in math linguistics. However, I've always been interested in languages. I have studied many languages to various degrees of competency - a full list can be found at http://www.personal.kent.edu/~rvulanov/oint.htm

A5 continued

I got the idea to consider grammar a machine which converts linguistic inputs into linguistic information (I discussed this in my talk) and I published my first paper on this in 1989. This is how it all started. I am currently more active in math linguistics than in numerical analysis. The ultimate goal of any research is to discover universal laws. My biggest contribution in this direction is the multidimensional generalization of the law I mentioned in my talk – the Piotrovski-Altmann Law.

Q6

To what extent have you been able to use or apply your research in your teaching?

A6: Unfortunately, there are no appropriate classes where I could use this research. Also, students would have to be very good in both math and linguistics. I have had one math graduate student. She defended her MS thesis last year and we were able to publish one paper based on her work.

A6 continued

I would like to add that I feel that any kind of research is at least indirectly beneficial for one's teaching. It makes you a better thinker, problem-solver, energizes you, and I believe this shows when you communicate with students.