

Daniel Wiechmann — RWTH Aachen University
Arne Lohmann — Leibniz Universität Hannover

INTRODUCTION

Language users have a choice concerning the relative ordering of prepositional phrases.

- i. *The astronomer gazed [into the sky] [through his telescope].*
- ii. *The astronomer gazed [through his telescope] [into the sky].*

Efficiency-based accounts (Hawkins 1994, 2000, 2004, also Gibson 1998, 2000), assume that speakers prefer arrangements that have optimal processing properties. The principle of domain minimization (Hawkins 2004) predicts that more efficient variants are preferred in proportion to the minimization difference between the competing sequences.

SYNTACTIC & SEMANTIC DOMAIN MINIMIZATION

Syntactic domain minimization principle:

Minimize Phrasal Combination Domains (PCD)

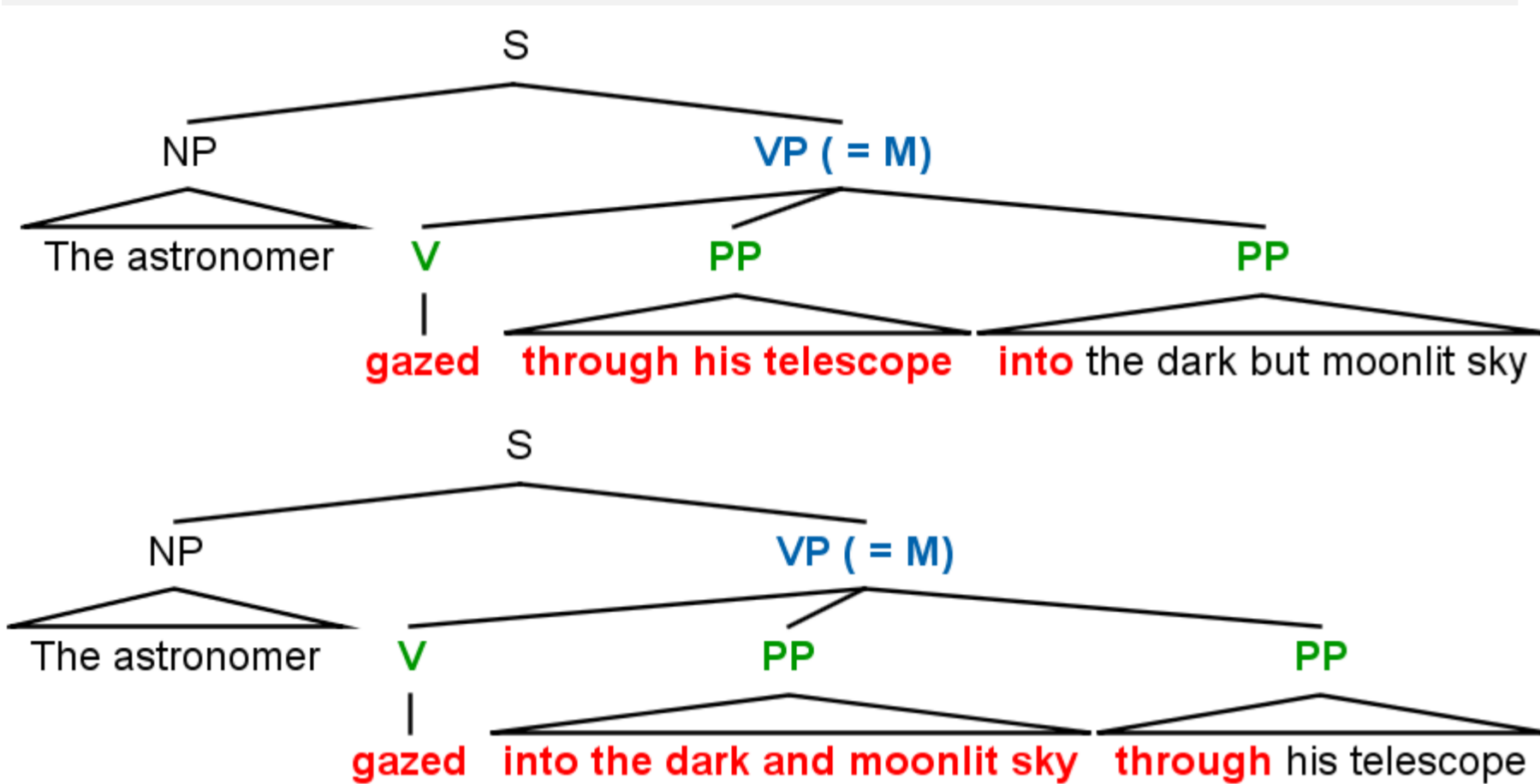


Figure 1: PCD length difference resulting from different orders

Semantic domain minimization principle:

Minimize lexical dependency domains (LDD)

- iii. *John counted [on your support] [in his old age.]*
SUBJ V_{dep} PP_{dep} PP_{indep}
- iv. *John counted [in his old age] [on your support.]*
SUBJ V_{dep} PP_{indep} PP_{dep}

Verb entailment test

Does [X V PP] entail [X V]? If so, then assign V_{indep}.
If not, then assign V_{dep} & PP_{dep}.

- v. *John accounted [for this fact] [in his book]*
SUBJ V_{indep} PP_{dep} PP_{indep}
- vi. *John accounted [in his book] [for this fact]*
SUBJ V_{indep} PP_{indep} PP_{dep}

Pro-verb entailment test

Does [X V PP] entail [X Pro-V PP]*, then assign P_{indep}.
If not, assign PP_{dep}.

*Pro-V sentences: *X did something PP; X was PP; something happened PP; something was done (by X) PP.*

Research Question:

What are the relative strengths of syntactic (PCD) & semantic (LDD) domain minimization?

"The most general and the strongest is Early Immediate Constituents (~PCD), which defines a preference for minimal domains of phrase structure recognition (and production). A second factor is lexical dependency, [...]"
(Hawkins 2000:257)

DATA

CORPUS SAMPLE:

- o Extraction of all "V PP PP"-sequences from ICE-GB
- o → manual weeding out of false hits
- o → N_{FINAL DATA SET} = 1,256

CODING:

- o Annotation of each example with respect to syntactic and semantic properties:
 - o **Syntax:** Assess length of actual PCD & alternative PCD
 - o **Semantics:** Is there a semantic dependency?
 - o If so, assess length of actual & alternative LDD

METHODS & RESULTS

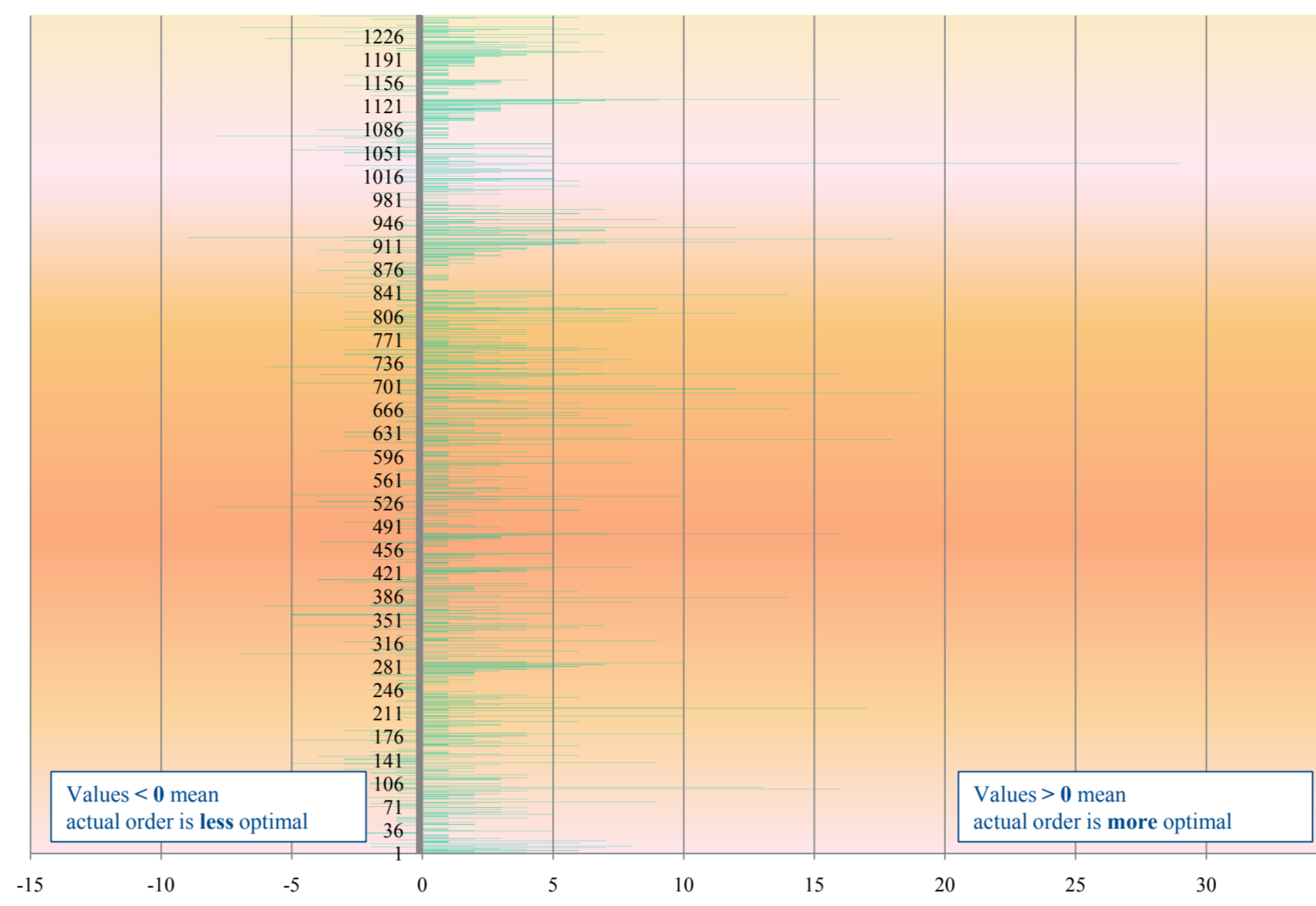


Figure 2: Observed PCD length differentials (in words)

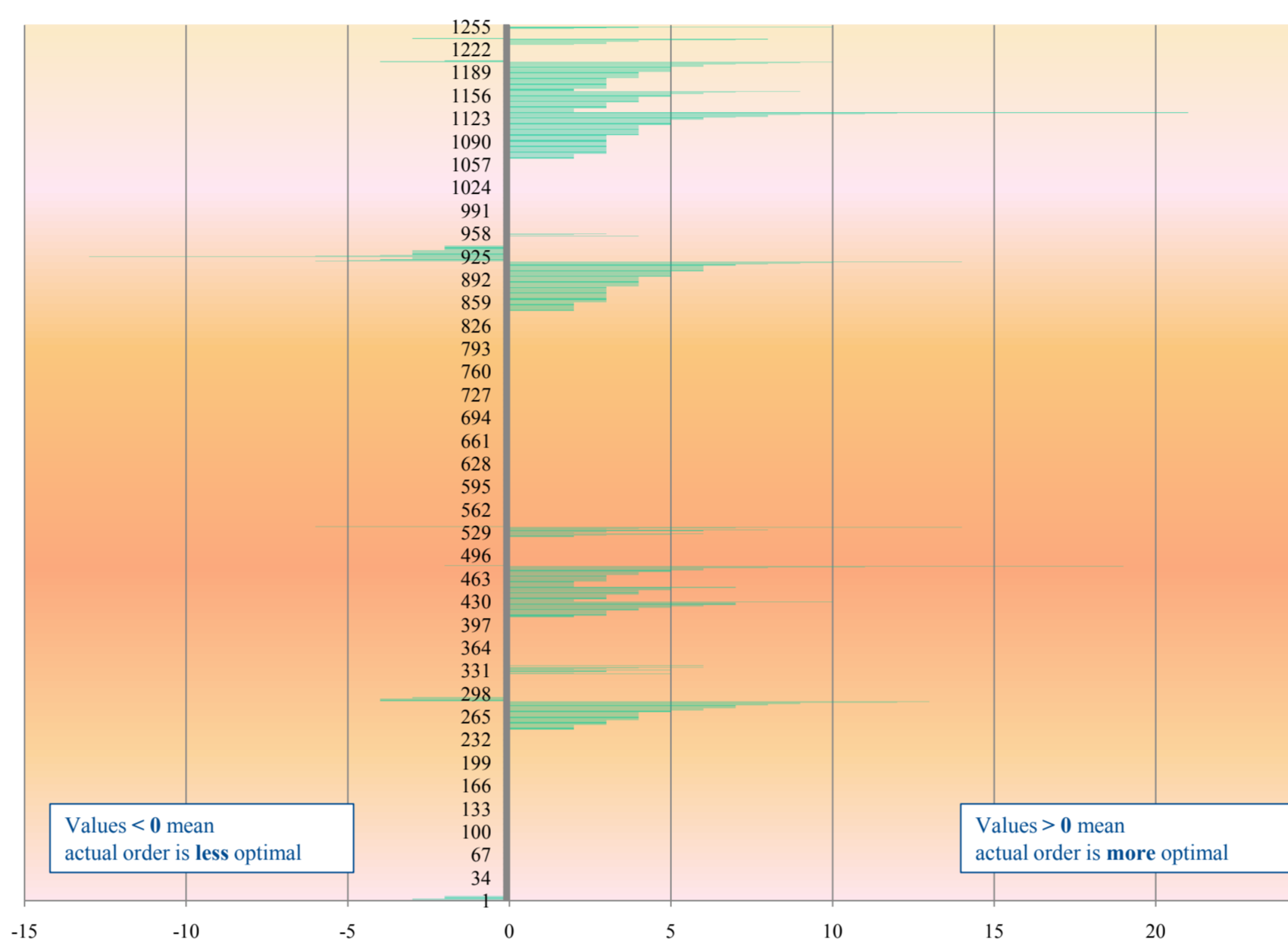


Figure 3: Observed LDD length differentials (in words)

STATISTICAL ANALYSIS:

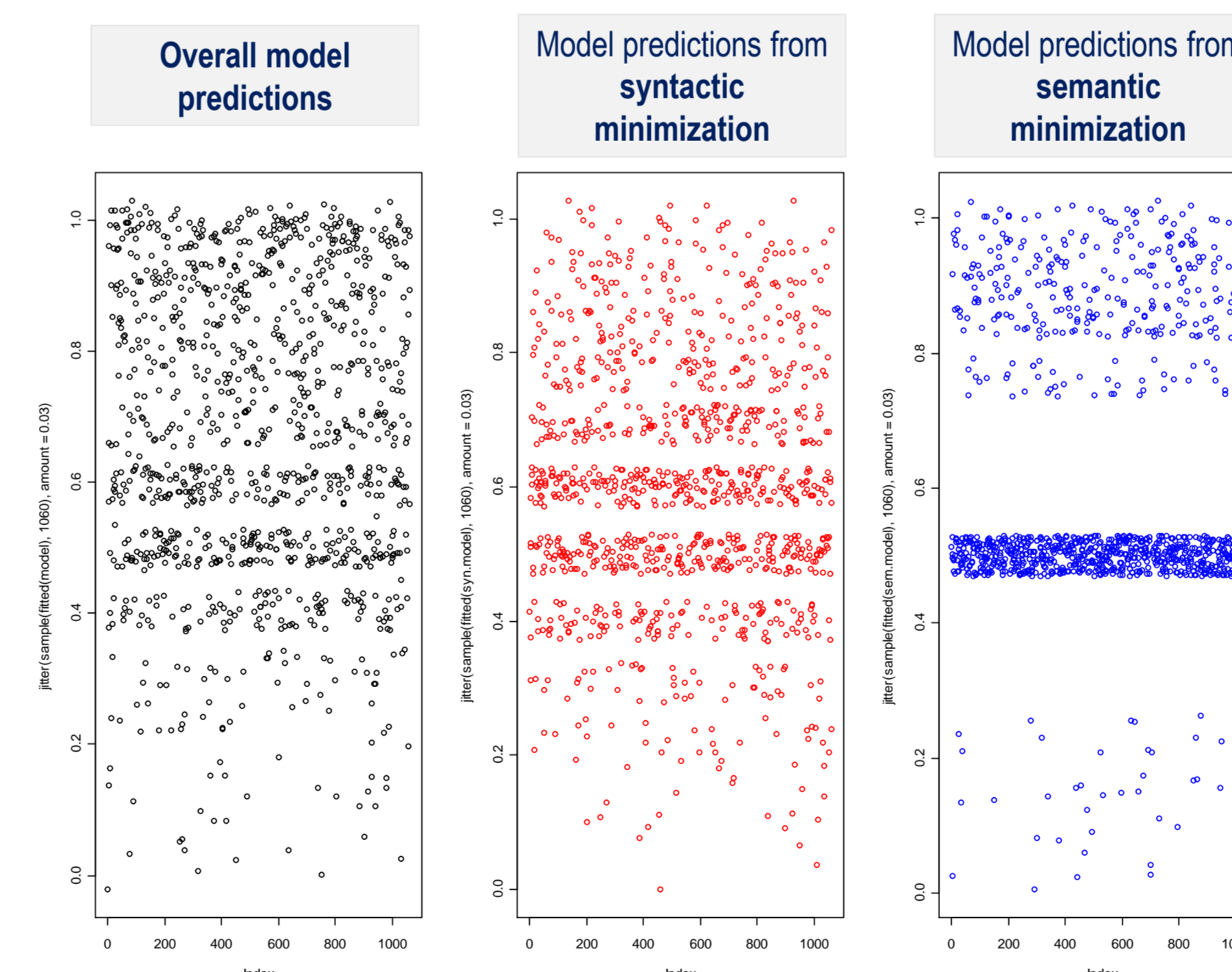
Binomial logistic regression w/o intercept (Levy, in progress)

- o model evaluates distributional information
- o & tries to predict the ACTUAL PP-order as a function of syntactic and semantic domain minimization

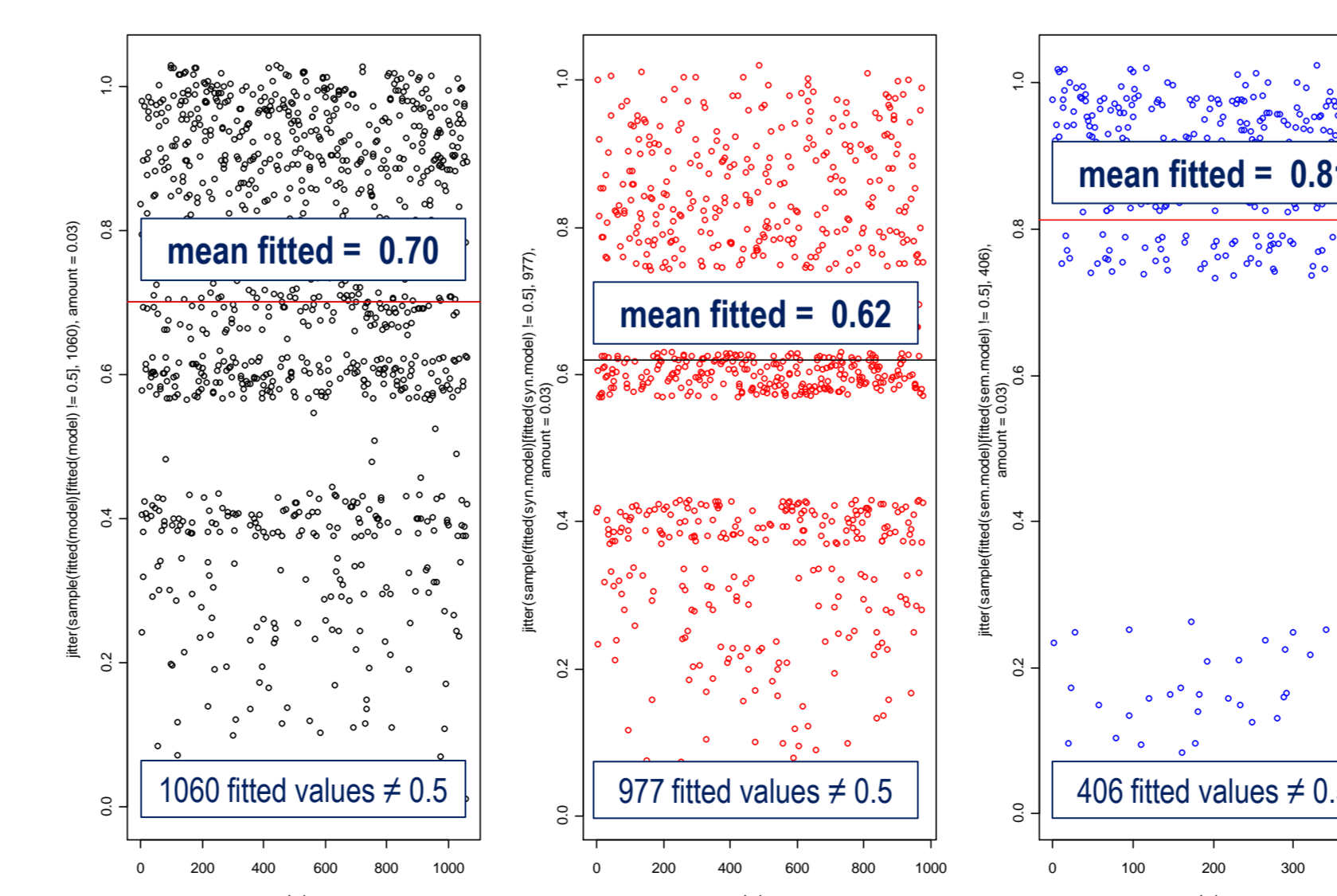
Regression Coefficients:

	Estimate	Std. Error	z-value	Pr(> z)
semantic minimization	0.65	0.06	11.32	<2e-16 ***
syntactic minimization	0.39	0.03	11.39	<2e-16 ***

Model predictions (fitted values)



Removing all cases where no predictions are being made



CONCLUSIONS & OUTLOOK

The results show that both syntactic (PCD) and semantic (LDD) domain minimization significantly influence the order of prepositional phrases.

Our comparison of the relative strengths of the two principles suggests that Hawkins' (2000) claim of a generally higher importance of PCD (see above) should be revised:

- o It is true that **PCD minimization** is the most general principle, which is reflected in a much **greater coverage** (78% of the data versus 30% coverage of semantic constraint)
- o Yet it is the **LDD minimization** which is the strongest principle, as it has a much **greater effect size** (Regression coefficient_{SEM} = 0.67 versus regression coefficient_{SYN} = 0.39)

The stronger effect size of LDD shows that speakers are more reluctant to separate semantically dependent combinations of verb+preposition, than to produce long syntactic dependencies.

We are currently exploring if this predominance of semantic minimization is a general one, in extending the present study to other order alternations which are influenced by both principles, e.g. *particle placement*.

FURTHER ISSUES

Verb specific behavior

(Do effects vary across different verbs?)

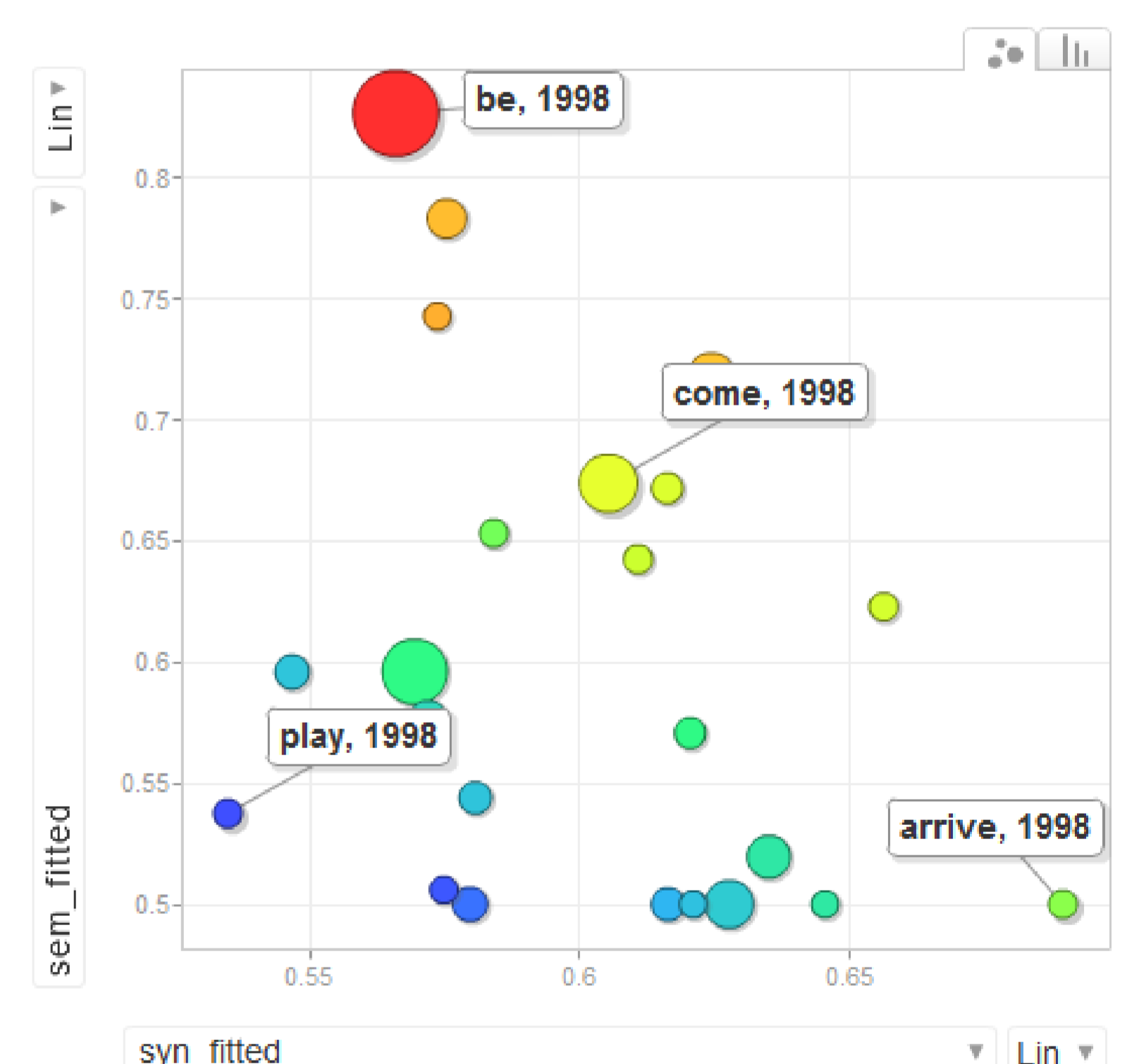


Figure 3: Mean fitted values for all verbs w/ N ≥ 10

Individual verbs are effected differently:

- o Some words (e.g. *be*) are strongly affected by the semantic constraint but not by the syntactic one.
- o Others (e.g. *arrive*) show a reverse image of that behavior: these are strongly affected by the syntactic constraint but not by the semantic one.
- o Still others (e.g. *come*) are equally affected by both constraints.

WORKS CITED

Hawkins, John. 1994. *A performance theory of order and constituency*. Cambridge: CUP.
 -- 2000. The relative order of prepositional phrases in English: Going beyond manner-place-time. *Language Variation and Change* 11: 231-266.
 -- 2004. *Efficiency and Complexity in Grammars*. Oxford: OUP.
 Gibson, Edward. 1998. Linguistic complexity: Locality and syntactic dependencies. *Cognition* 68:1-76.
 -- 2000. The dependency locality theory: a distance-based theory of linguistic complexity. In A. Marantz, Y. Miyashita, & W. O'Neil (Eds.), *Image, language, brain* (pp. 95-126). Cambridge, MA: MIT Press.
 Levy, Roger. in progress. *Probabilistic Models in the Study of Language*. Cambridge, MA: MIT Press.