Nominalizations with the suffixes -*ee* and -*ation* A distributional semantic analysis

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InSemantiC22

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Introduction: eventuality-related nominalizations

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- Many nominalizing suffixes also attach to non-verbal bases (e.g., Plag 1999, 2004; Bauer et al. 2013, Schneider 2023)

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- Word vector: computed by list of words in context of target word

- Distance between vectors = semantic similarity
  - High distance → unsimilar
  - Low distance → similar

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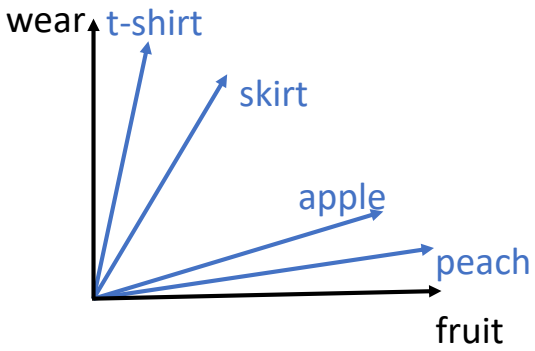
- Usually more dimensions: for example 300 dimensions

Introduction: Distributional Semantics



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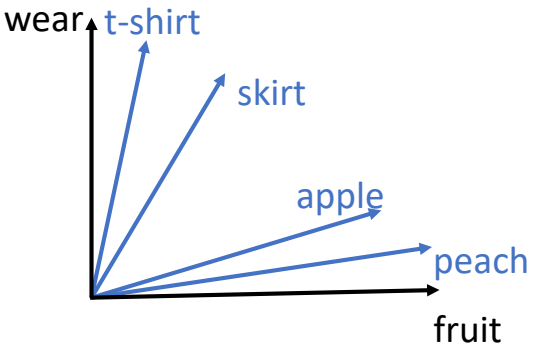

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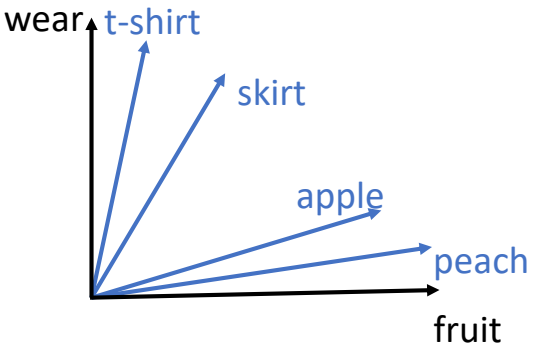

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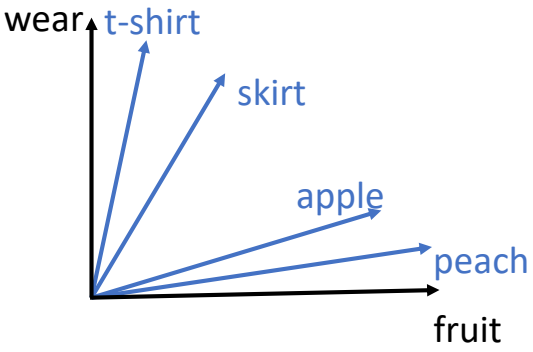

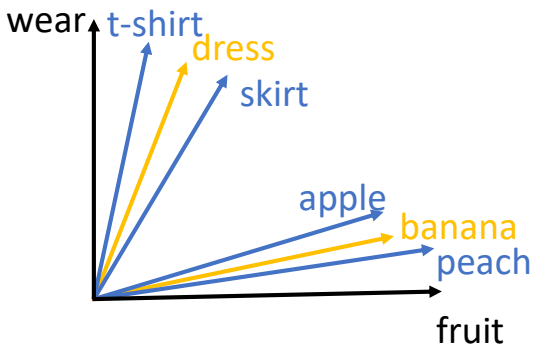

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- Focus on -*ee* and -*ation*

Research questions

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- Which factors influence the similarity between base and derivative?

- Do we find differences regarding different suffixes, -*ee* and -*ation*?

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- Base and derivative similar
  - Eventive elements for word formation process already in base
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- Verbal bases more similar to their derivatives than nominal bases to their derivatives
  - Verbs clearly eventive (e.g., Van Valin & LaPolla 1997; Haspelmath 2001; Szabó 2015)
  - Word formation process more straightforward
  - Eventive elements more easily identifiable for word formation process

Method

- FastText *Common Crawl* subword model (Bojanowski et al. 2016, Mikolov et al. 2018)
  - 2 million pre-trained word vectors
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- Compare cosine similarities of denominal/deverbal derivatives and their nominal/verbal bases

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  - Dependent variable: cosine similarity between base and derivative, range of [0,1]

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Variables of interest	Expectation
Relative frequency of base/derivative	Higher relative frequency leads to higher segmentability (e.g., Hay & Baayen 2003) → more transparent → higher cosine similarity
Word class of base	Verbal bases more similar to derivatives due to clearer eventuality
Polysemy of base	Higher polysemy of base leads to decrease of cosine similarity

biographee

debtee

The suffix -*ee*

46 denominal 312 deverbal

mentee

covenantee

tutee

Data from COCA (Davies 2008) and BNC (Davies 2004)

Similarity of nominal and verbal bases and derivatives for -*ee*

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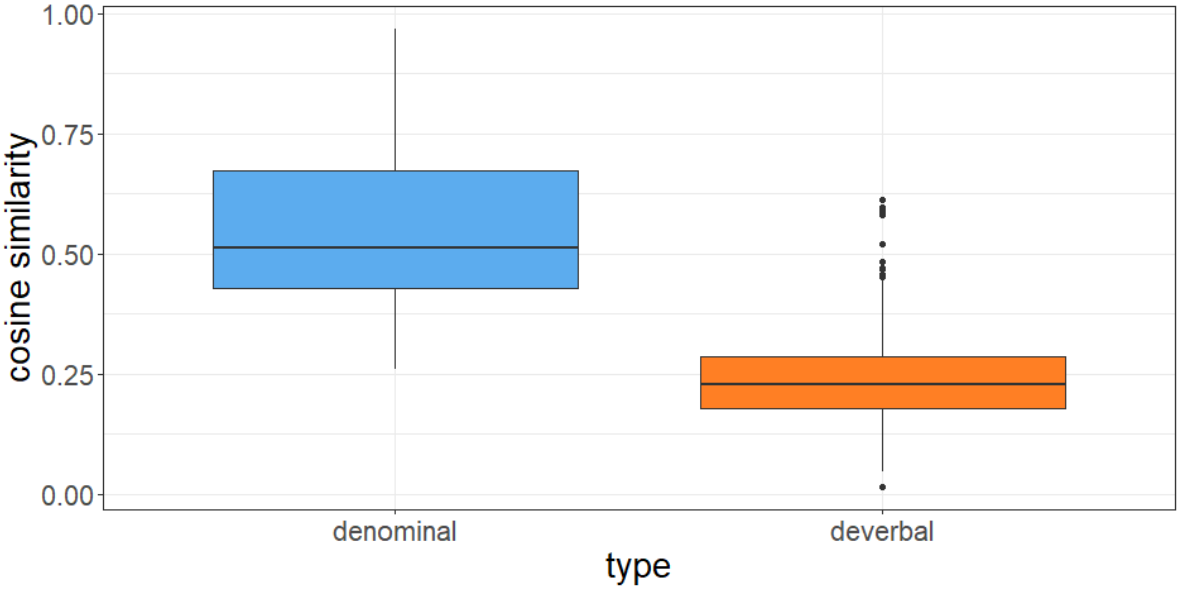
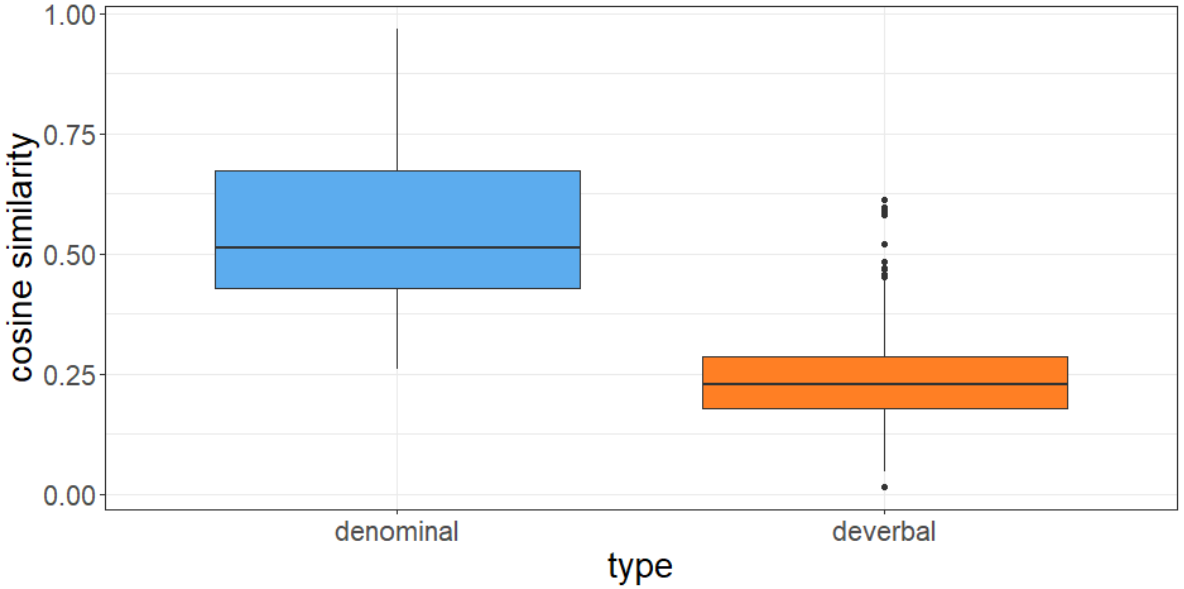


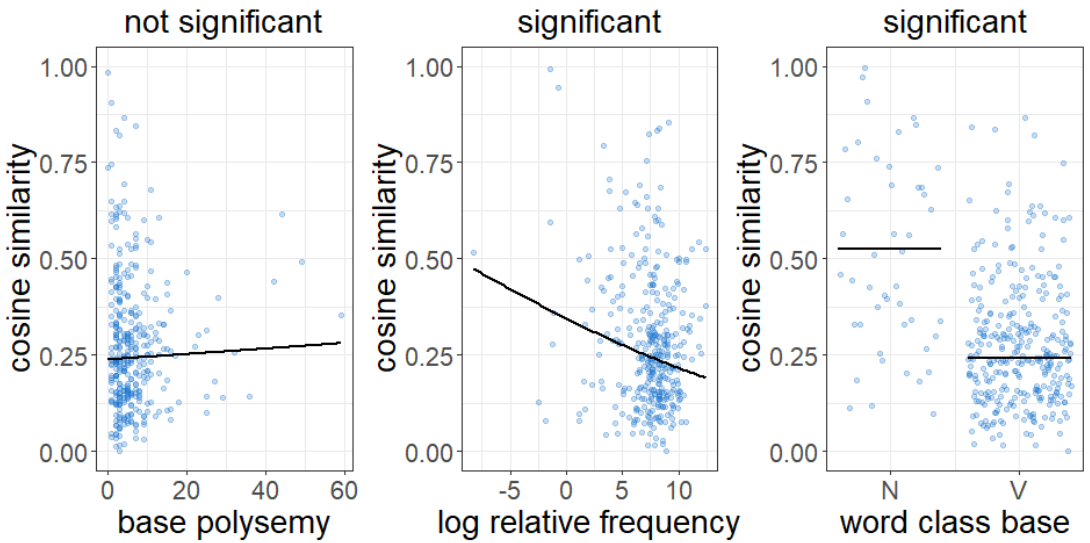
Similarity of nominal and verbal bases and derivatives for -*ee*

•Cosine similarity of denominal derivatives and nominal bases higher than that of deverbal derivatives and verbal bases
•Contra expectation that deverbal derivatives more similar to verbal bases



Beta regression model -*ee*

- Dependent variable cosine similarity



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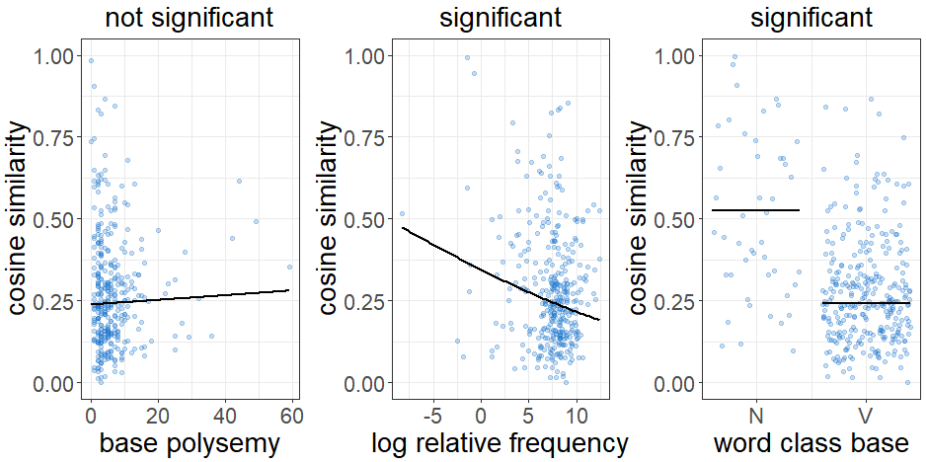

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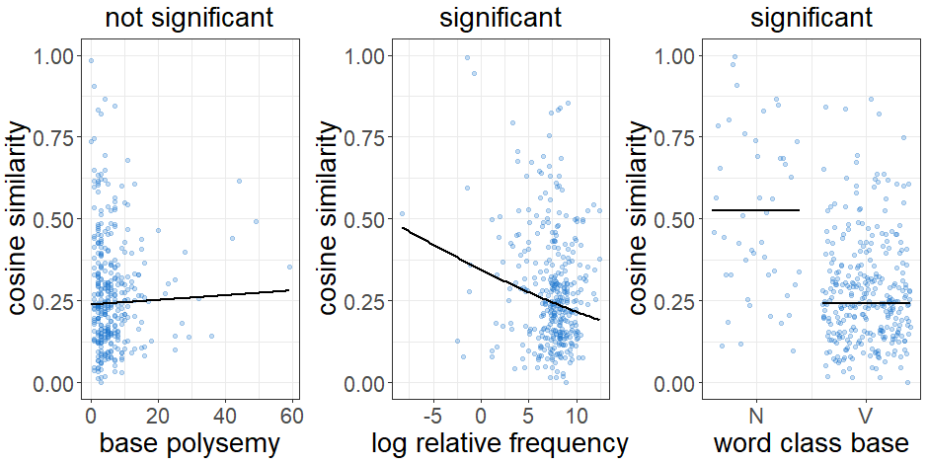

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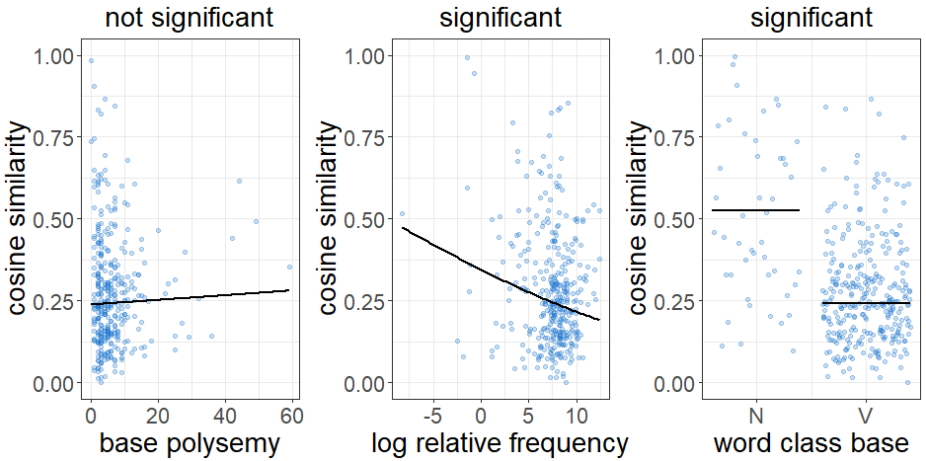

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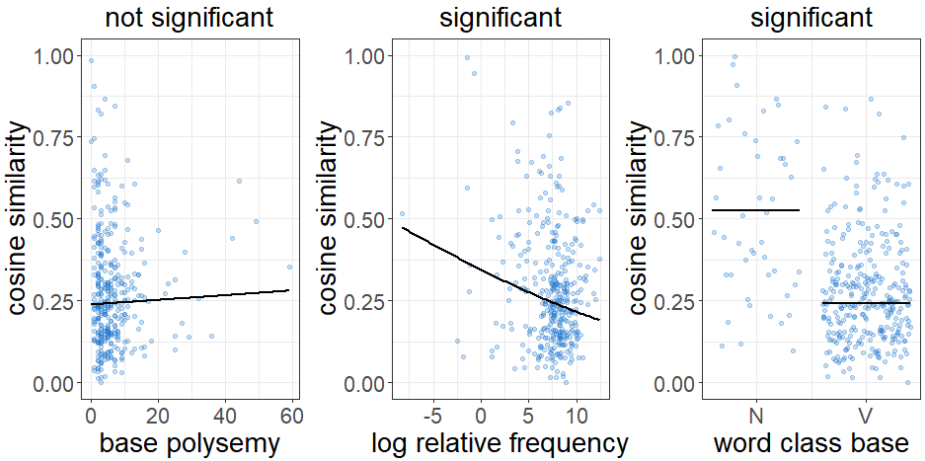


- Word class base
  - Significant
  - Cosine similarity decreases if base is a verb
  - Not expected

concertation

pixelation

The suffix *-ation*

67 denominal 72 deverbal

instrumentation

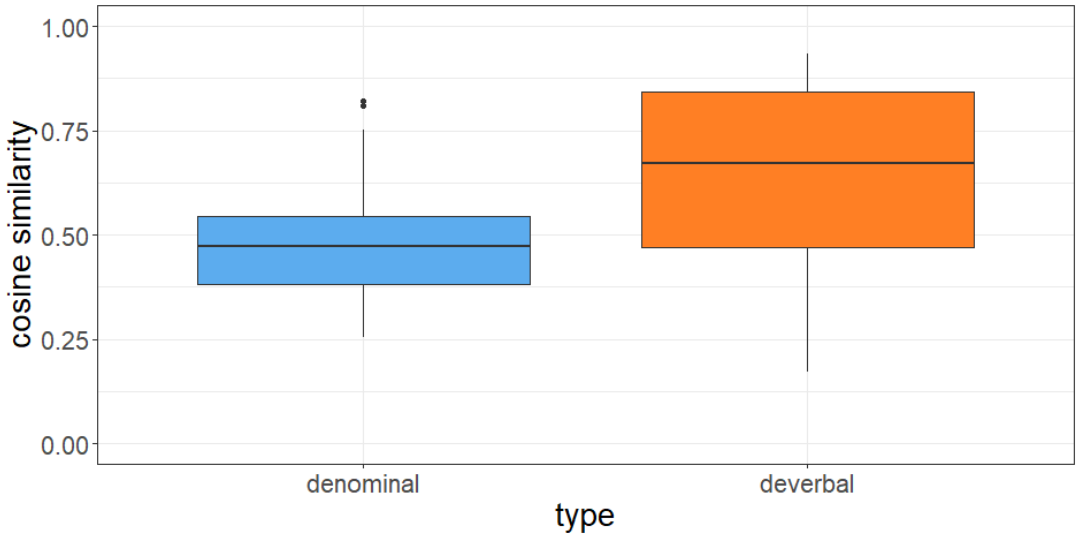
ozonation

impactation

Data from COCA (Davies 2008) and BNC (Davies 2004)

Similarity of nominal and verbal bases and derivatives for -*ation*

- Denominal derivatives and nominal bases show lower cosine similarity than deverbal pairs → opposite picture than for -*ee*



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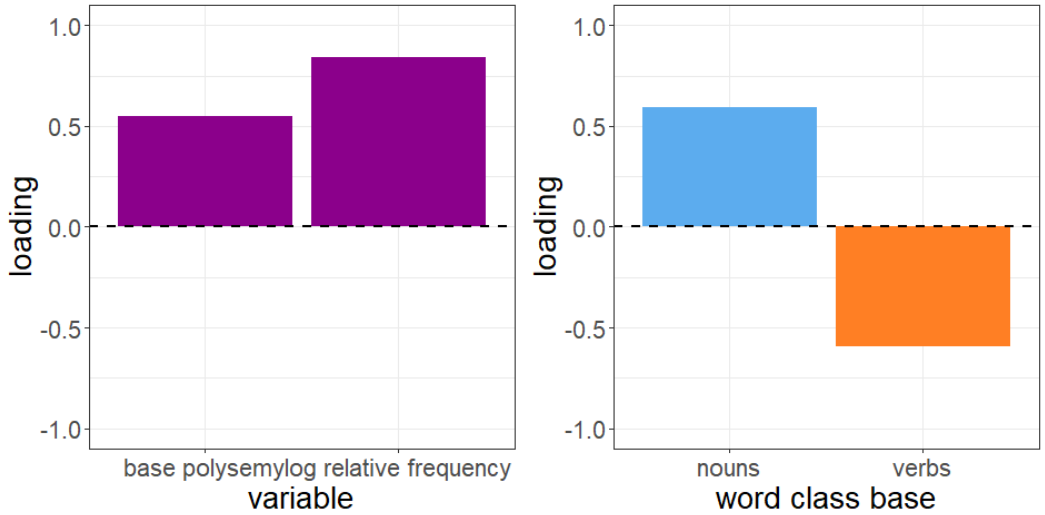
- First principal component is retained for analysis as fulfills common criteria (e.g., O'Rourke et al. 2005; Baayen 2008; Schmitz et al. 2021, Schmitz 2022)

Beta regression with PC for -*ation*



Beta regression with PC for -*ation*

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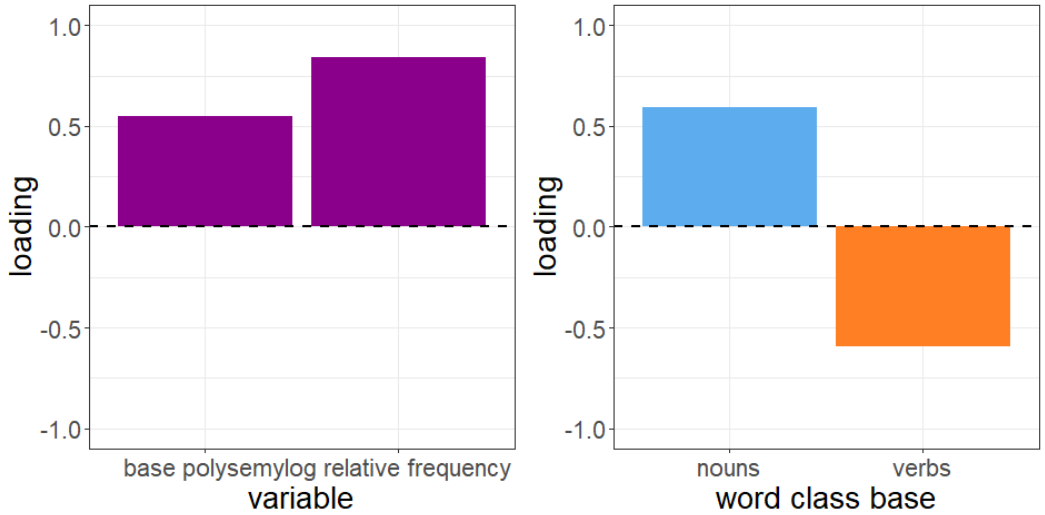

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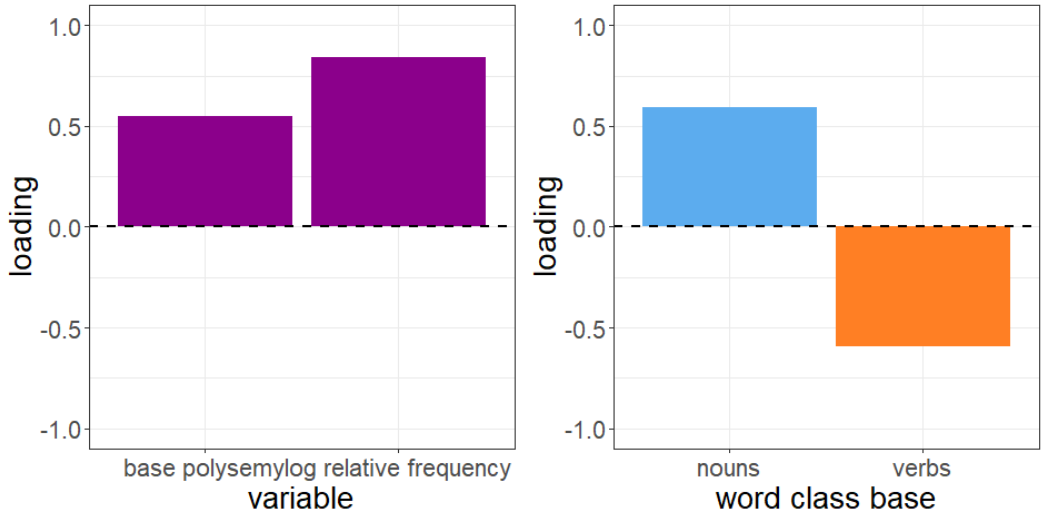

Beta regression with PC for -*ation*

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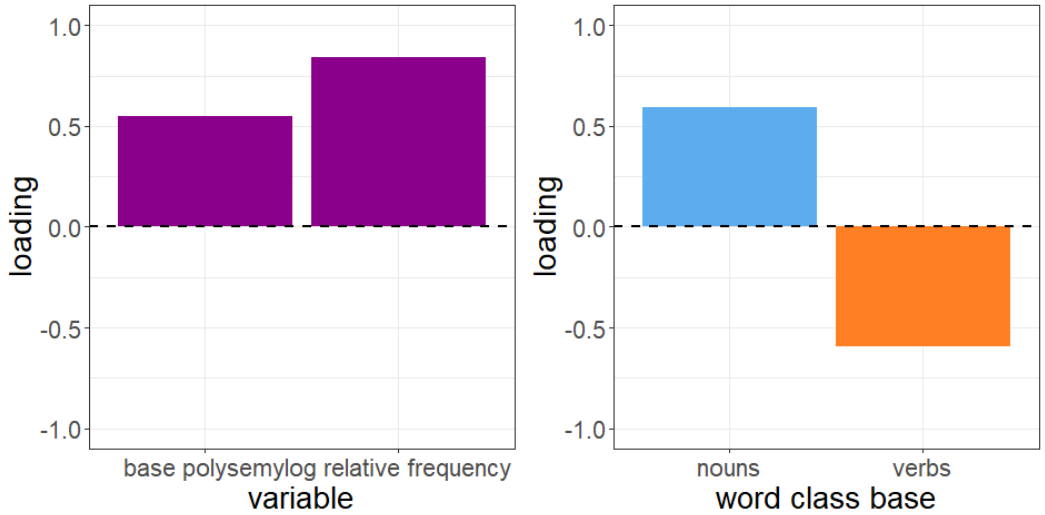
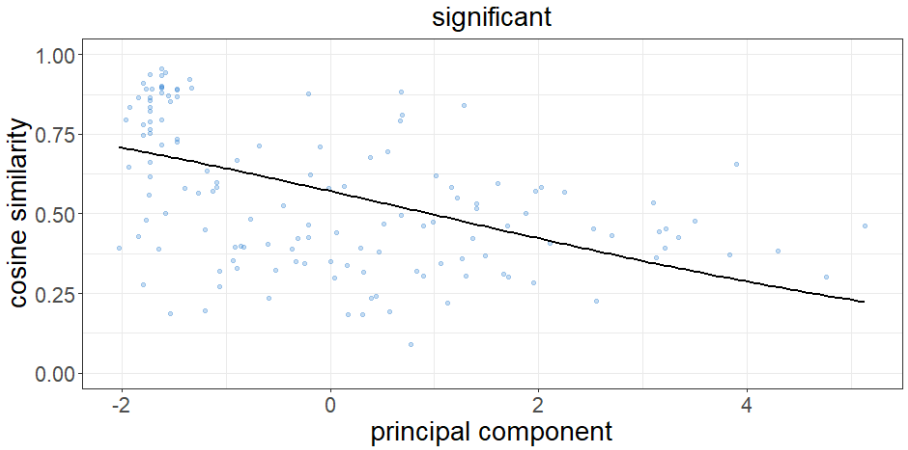
  - Word classes point to different directions



Beta regression with PC for -*ation*

- Effect of retained PC
  - Higher polysemy of base word decreases cosine similarity (expected)
  - Higher relative frequency decreases cosine similarity (unexpected)
  - Word class of base influences cosine similarity (verbs higher cosine similarity, expected)



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Cosine similarity

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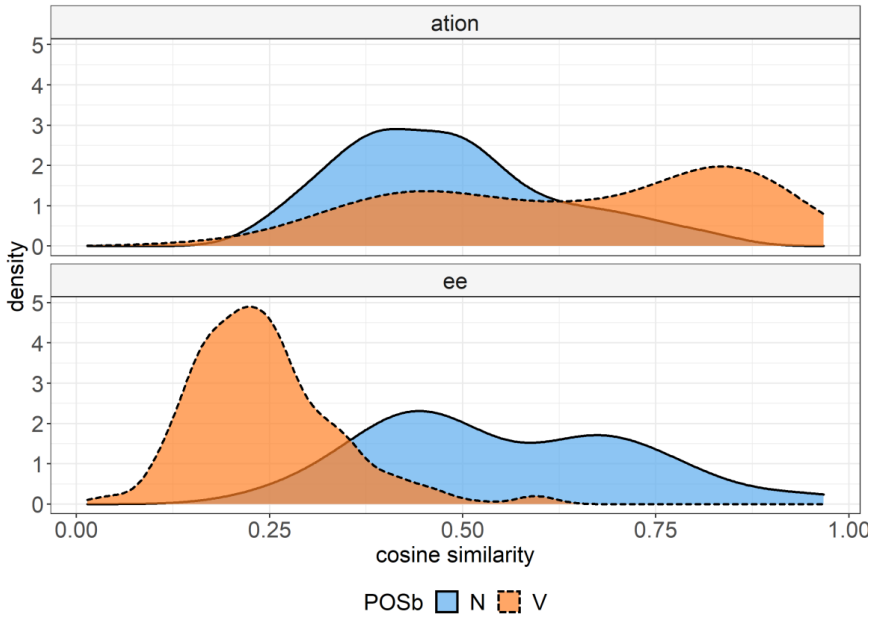

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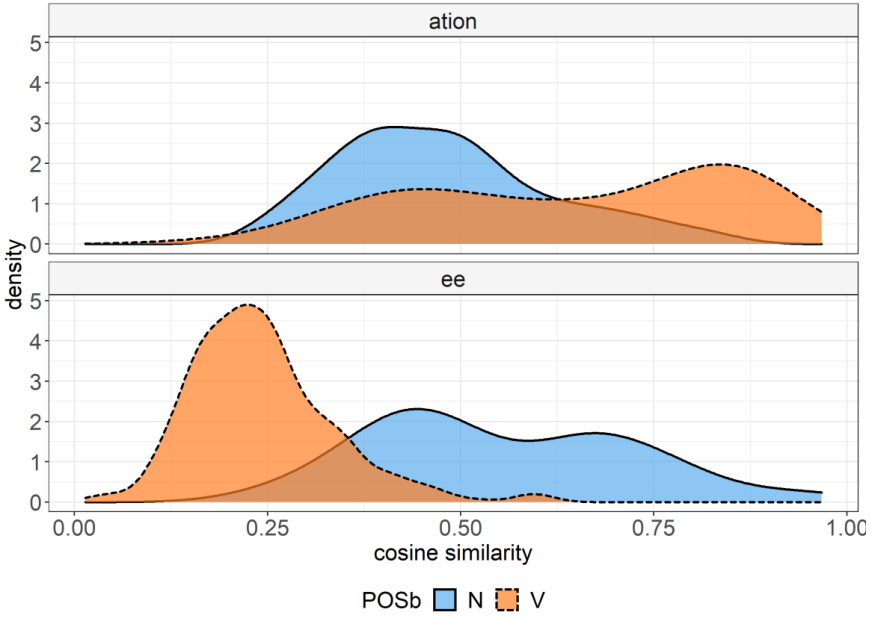
- **Deverbal** -*ation* derivatives more similar to verbal bases than **denominal** derivatives to nominal bases



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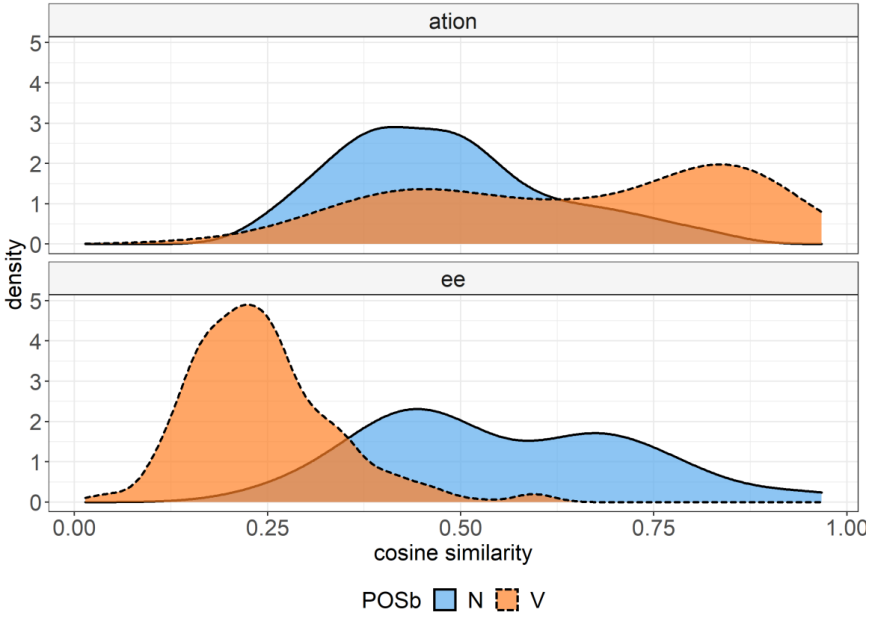

Differences denominal and deverbal

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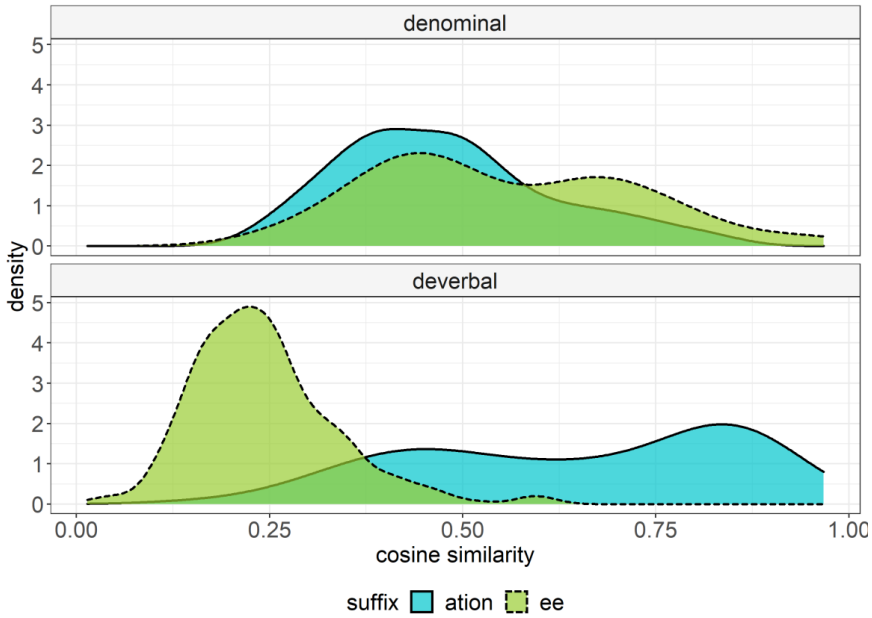
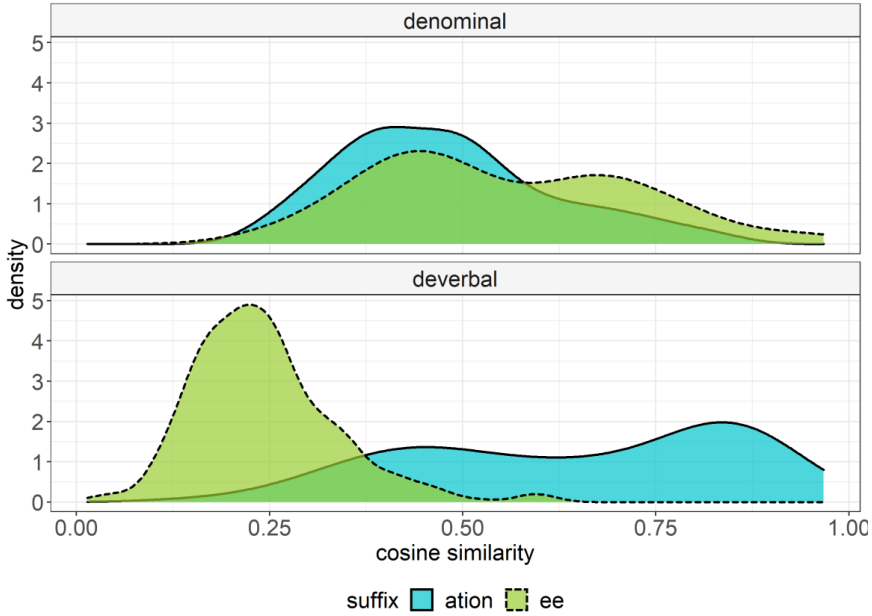


Differences denominal and deverbal

Denominal -*ation*
derivatives



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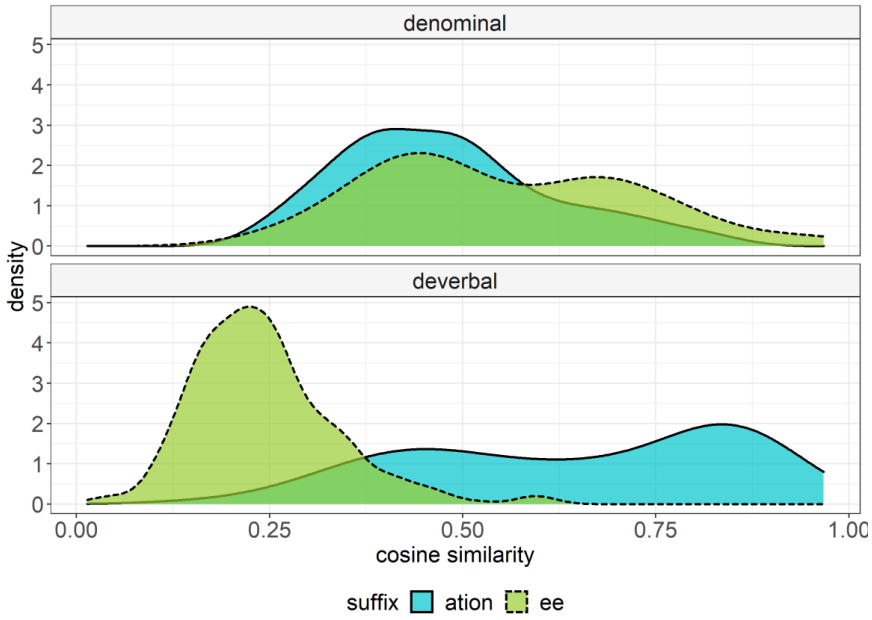
Denominal -*ation* derivatives

- are more uniform in their similarity than -*ee* derivatives



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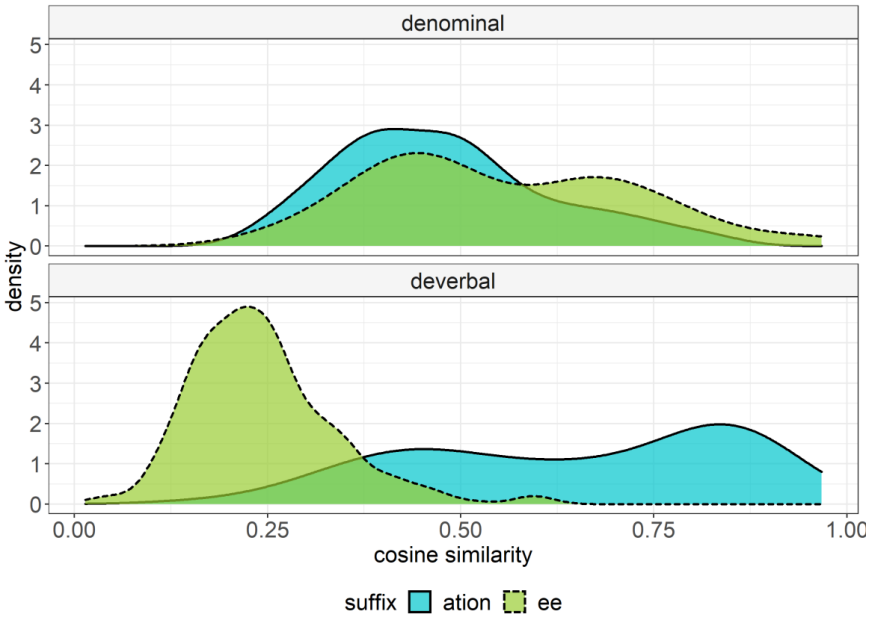

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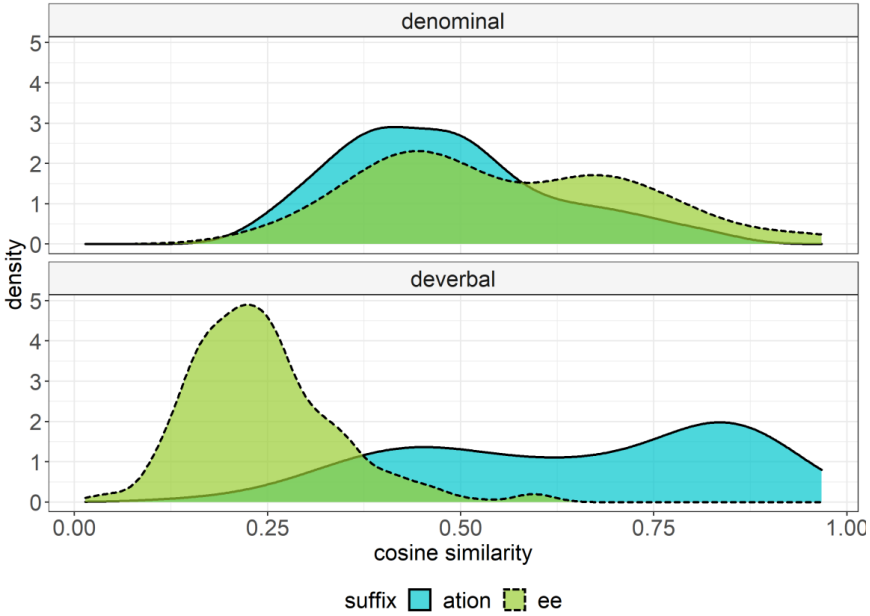
Deverbal -*ee* derivatives



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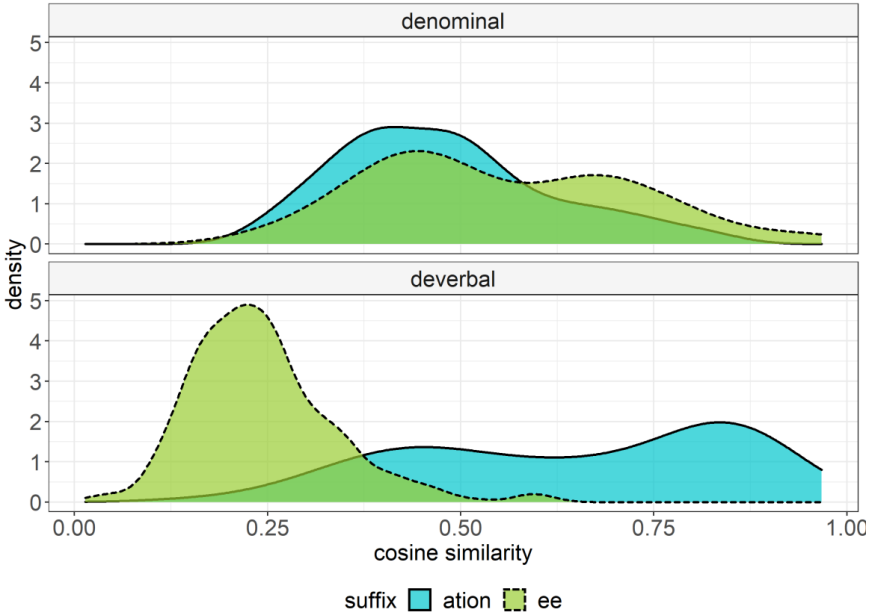

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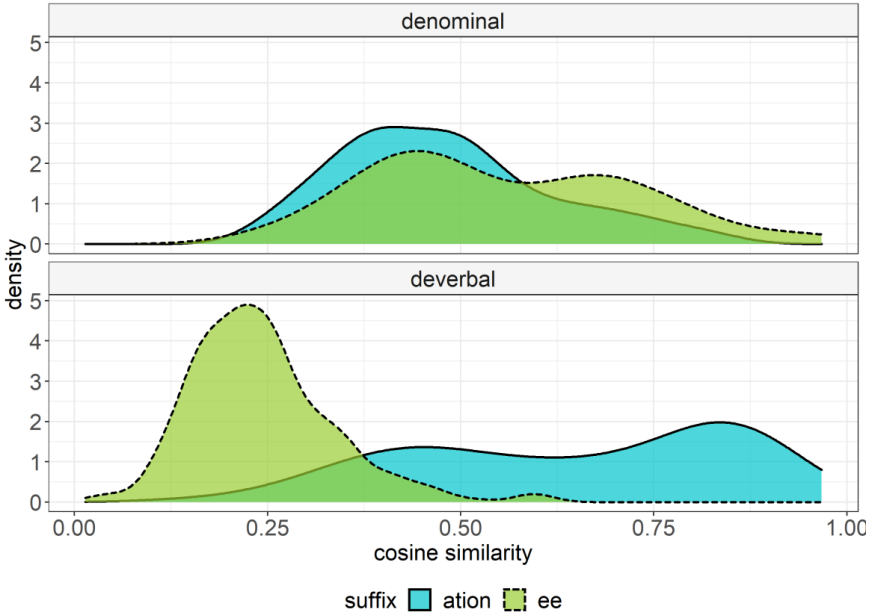
Deverbal -*ee* derivatives

- are more uniform in their similarity than –*ation* derivatives
- overall much less similar to their bases than –*ation* derivatives



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  (e.g., Van Valin & LaPolla 1997; Haspelmath 2001; Szabó 2015)
  - -*ee* creates participant readings → participants usually denoted by nouns
  - -*ation* refers to eventualities → eventualities usually denoted by verbs

Open questions & future directions

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- Do we find similar results with a different methodology, e.g., Linear Discriminative Learning (LDL)?
  - Error-driven learning → different vectors
  - Different measures → explanation for findings?

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Thank you!

Method: Data

- Corpus search on BNC (Davies 2004) and COCA (Davies 2008) for nominalizations with suffixes –*ee* and -*ation*

- Identification of bases manually
  - *biography* → *biographee*
  - *ozone* → *ozonation*

- Determination of word class of base on basis of a frequency criterion
  - As soon as the verbal base represents over 30% of all tokens of the base forms → base deverbal

charge	Tokens	Percentage
V	8265	31
N	26469	69

Beta regression with principal component for -*ation*

Beta regression with principal component for *-ation*

- Common criteria PCA

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Beta regression with principal component for *-ation*

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  - PC has to make sense in their loadings
    - Here it decreases cosine similarity