Towards a Dynamic Combinatorial Dictionary: A Proposal for Introducing Interactions between Collocations in an Electronic Dictionary of English Word Combinations

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INTRODUCTION

- Potentialities of electronic format in combinatorial lexicography:
  - Increase amount and range (variety) of contextual data
  - Facilitate interactive management of information
- This potential is underexploited. Design informed by printed dictionaries. Different medium (material format) but similar design.
- Our project: to record dependencies between collocations, not just between words (possible in electronic format, not in printed format).

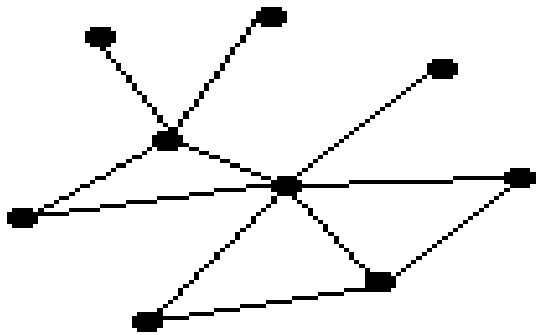
LEXICAL CONSTELLATIONS

- The node does not exert an unlimited influence on its environment (Cantos & Sánchez, 2001).
- Limitations of the concept of *lexical gravity* (Mason, 2000) = "the restriction a word imposes on the variability of its context". Restrictions on the context of the node are not an exclusive function of the node.
- Problems of ***lexical gravity interference*** (or ***lexical gravity overlaps***).

(more about lexical constellations in Sánchez, Cantos & Almela, 2007; Almela, 2011; Almela, Cantos & Sánchez, 2011)

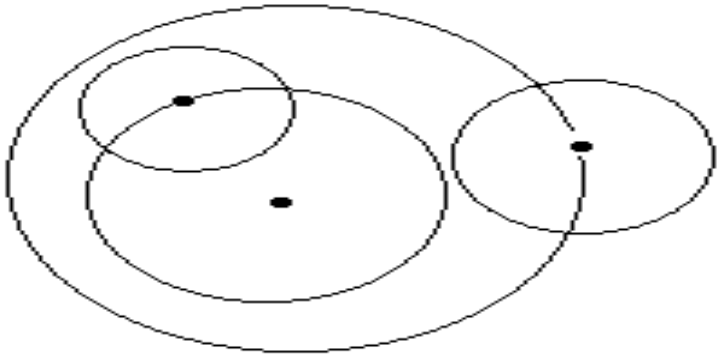
LEXICAL CONSTELLATIONS

- The received models of collocation = linear (no division into domains of lexical attraction).
  - Collocation = statistically significant co-occurrence.
  - Structure of a plain collocational network: **shared** collocation as a sufficient condition (two or more collocational bi-grams with at least one member in common).



LEXICAL CONSTELLATIONS

- Lexical Constellation = collocational network hierarchically organised in two or more centres of lexical attraction.
  - The context of the node is organized around two or more domains of lexical attraction.
  - Shared collocation as a necessary but not sufficient condition.



LEXICAL CONSTELLATIONS

- Suitable for capturing inter-collocability relations (restrictions on combinations of different collocations of the same node)
- Methodology: compare the influence of the node and the influence exerted by other items or structures that co-exist within the same textual window.
  - More precisely: compare conditional probabilities of the type: P(*c1* | *n*,*c2*), where *n* stands for the node, and *c1* and *c2* represent two different collocates.

LEXICAL CONSTELLATIONS

- Positive inter-collocability:
  - *C2* is a *positive co-collocate* of *c1* if the probability of (*n*,*c1*) co-occurring with *c2* is higher than the probability of the node occurring with *c2* alone. The collocation (*n*,*c2*) is made more probable by the selection of *c1*.
  - *C1* is a *positive co-collocate* of *c2* if the probability that (*n*,*c2*) co-occurs with *c1* is higher than the probability of the node co-occurring with *c1*. The collocation (*n*,*c1*) is made more probable by the selection of *c2*.

LEXICAL CONSTELLATIONS

- Negative inter-collocability:
  - *C2* is a *negative co-collocate* of *c1* if the selection of the collocation (*n,c1*) diminishes the probability of (*n,c2*). The capacity of the node for predicting the choice of *c2* is higher than the capacity of the collocation (*n,c1*) for predicting the choice of *c2*.
  - *C1* is a *negative co-collocate* of *c2* if the selection of the collocation (*n,c2*) diminishes the probability of (*n,c1*). The capacity of the node for predicting the choice of *c1* is higher than the capacity of the collocation (*n,c2*) for predicting the choice of *c1*.

CONSTELLATIONS OF *GOODS*

- Corpus: *ukWaC* (1,565,274,190 tokens)
- Query system and tools: SketchEngine
- Queries syntactically restricted:
  - **Verb + *goods***
  - **Adjective + *goods***, where A+N collocation performs the semantic role of THEME (object in active construction, subject in passive construction).

Assumption: the verb is likely to exert an influence on the entire argument phrase, not only on the head. Phenomenon of *valency stratification* (collocability between predicates of the same argument is constrained).

CONSTELLATIONS OF *GOODS*

- Potential co-collocates: semantically related (to test hypothesis: lexical constellations can be generalized to conceptual structures):
  - *return, replace, reject* ('consumer does not accept the goods initially bought or received')
  - *faulty, defective, damaged* ('flaw, imperfection')

- Frequency threshold: 3
- Statistical filter: *logDice*

Table 2: Adjectival co-collocates of *replace*.

CONSTELLATIONS OF *GOODS*

	f(v,m,n)	f(m,n)	P(m|v,n)	P(m|n)
faulty	35	354	2.35%	0.36%
unwanted	21	149	1.41%	0.15%
defective	20	137	1.34%	0.14%
unused	7	20	0.47%	0.02%
undamaged	6	10	0.40%	0.01%
damaged	8	209	0.54%	0.21%
non-faulty	4	11	0.27%	0.01%
stolen	8	434	0.54%	0.44%

Adjectival co-collocates of *return*

Table 2: Adjectival co-collocates of *replace*.

CONSTELLATIONS OF *GOODS*

	f(v,m,n)	f(m,n)	P(m|v,n)	P(m|n)
faulty	30	354	19.11%	0.36%
defective	12	137	7.64%	0.14%
damaged	12	209	7.64%	0.21%
electrical	6	850	3.82%	0.86%

Adjectival co-collocates of *replace*.

	f(v,m,n)	f(m,n)	P(m|v,n)	P(m|n)
faulty	6	354	5.41%	0.36%
defective	3	137	2.70%	0.14%

Adjectival co-collocates of *reject*.

CONSTELLATIONS OF *GOODS*

	f(v,m,n)	f(v,n)	P(v|m,n)	P(v|n)
return	35	1491	9.89%	1.50%
replace	30	157	8.47%	0.16%
receive	19	913	5.37%	0.92%
buy	17	1592	4.80%	1.60%
reject	6	111	1.69%	0.11%
supply	6	961	1.69%	0.97%
collect	3	270	0.85%	0.27%
sell	7	2237	1.98%	2.25%

Verbal co-collocates of *faulty*.

CONSTELLATIONS OF *GOODS*

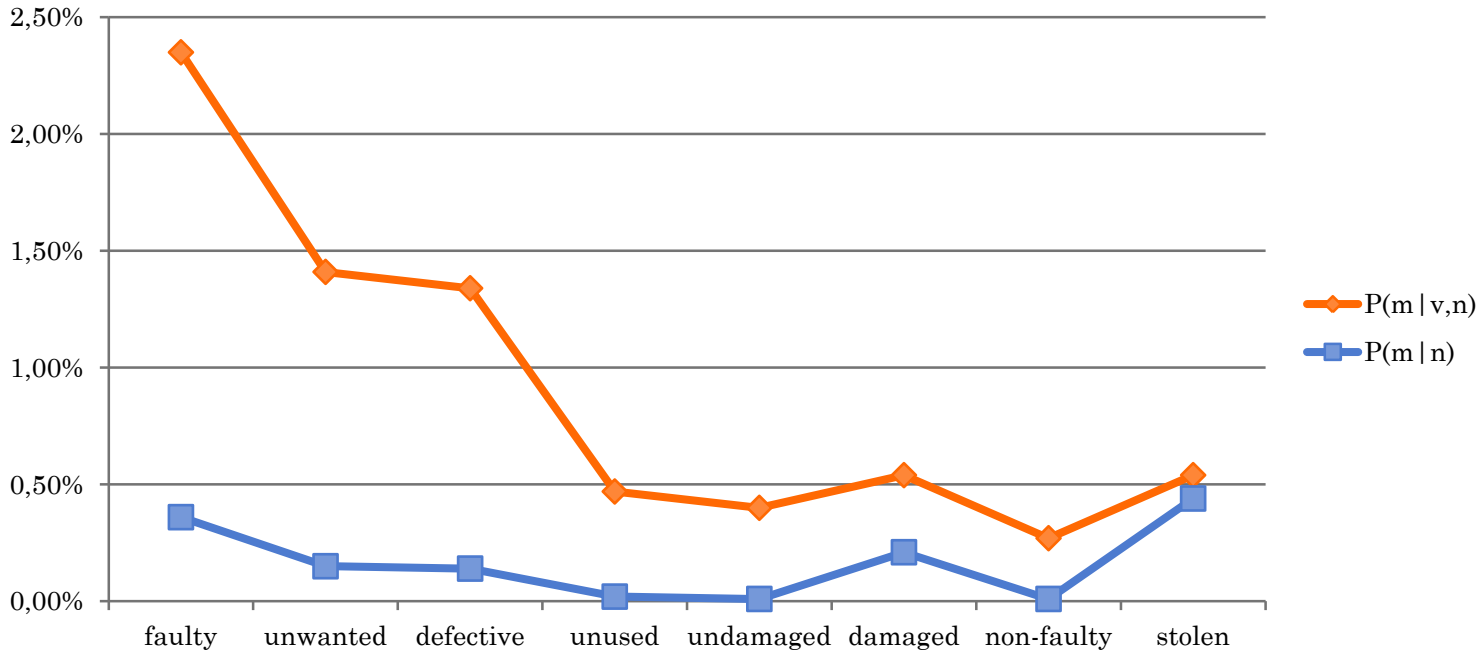
	f(v,m,n)	f(v,n)	P(v|m,n)	P(v|n)
return	20	1491	14.60%	1.50%
replace	12	157	8.76%	0.16%
reject	3	111	2.19%	0.11%
inspect	3	121	2.19%	0.12%
deliver	4	1930	2.92%	1.94%

Verbal co-collocates of *defective*.

	f(v,m,n)	f(v,n)	P(v|m,n)	P(v|n)
receive	15	813	7.18%	0.82%
replace	12	157	5.74%	0.16%
return	8	1491	3.83%	1.50%
inspect	3	121	1.44%	0.12%
deliver	4	1930	1.91%	1.94%

Verbal co-collocates of *damaged*.

CONSTELLATIONS OF *GOODS*

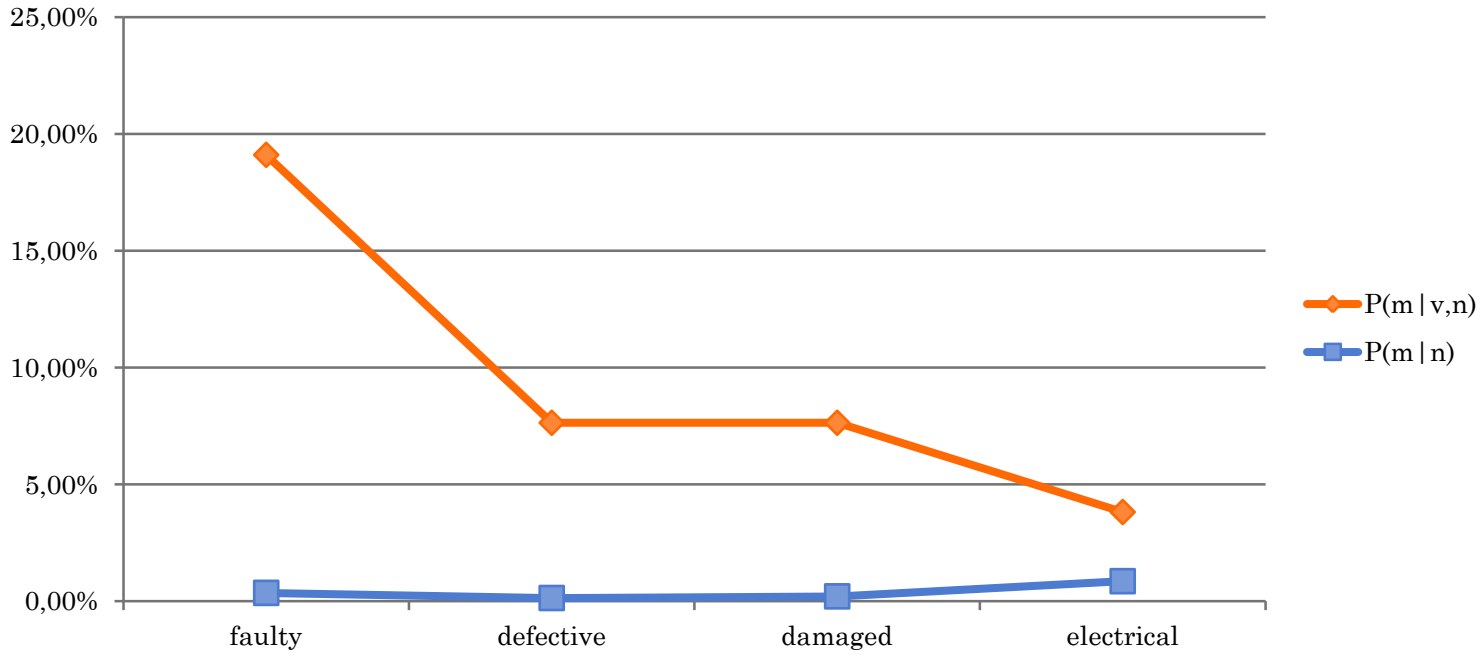


Comparing intra-collocational and inter-collocational dependencies.

Node: *goods*. Collocate: *return*.

Grammatical class of co-collocates: adjective.

CONSTELLATIONS OF *GOODS*



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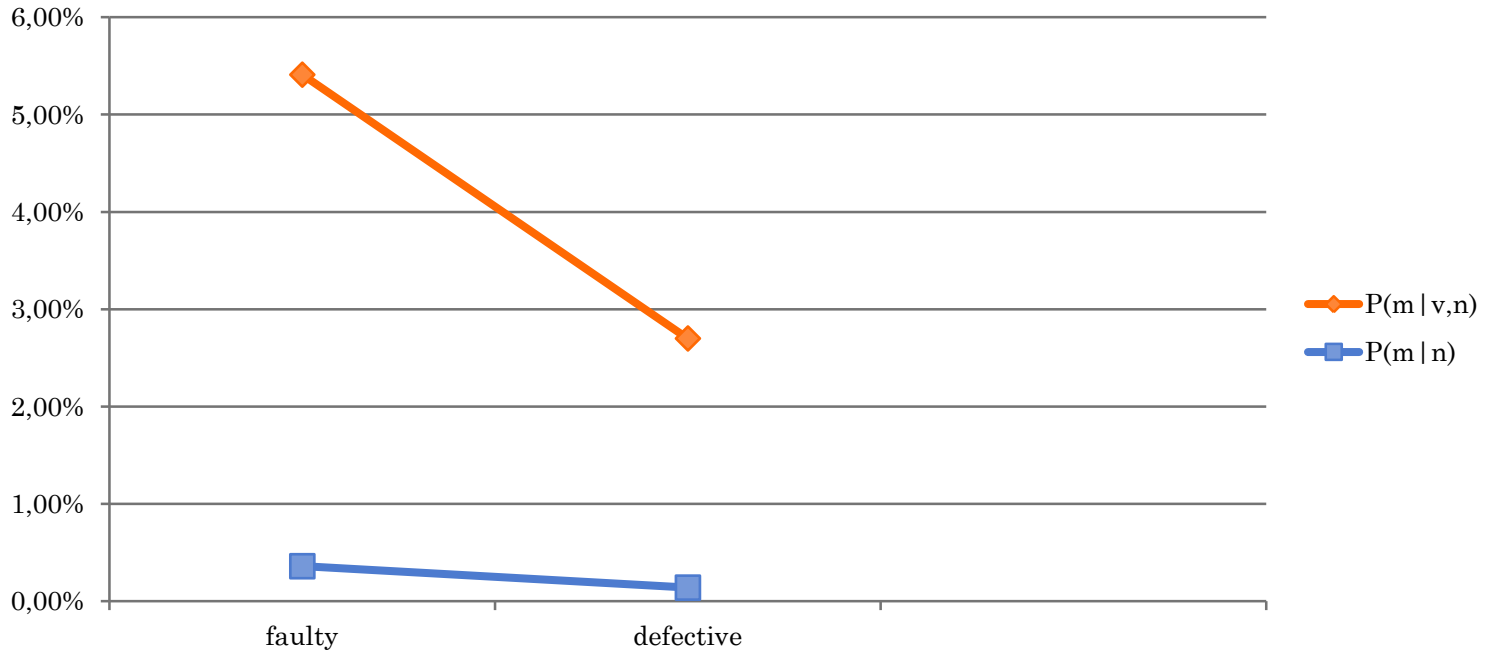

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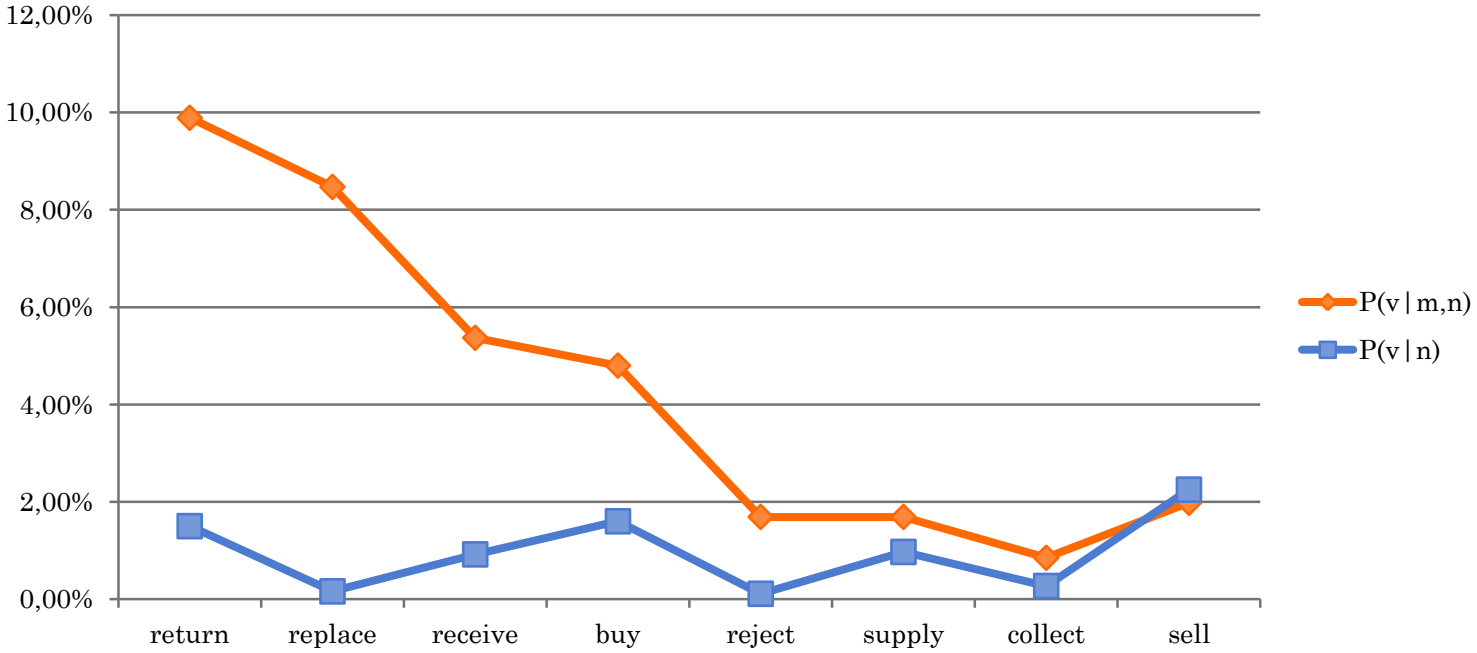
CONSTELLATIONS OF *GOODS*

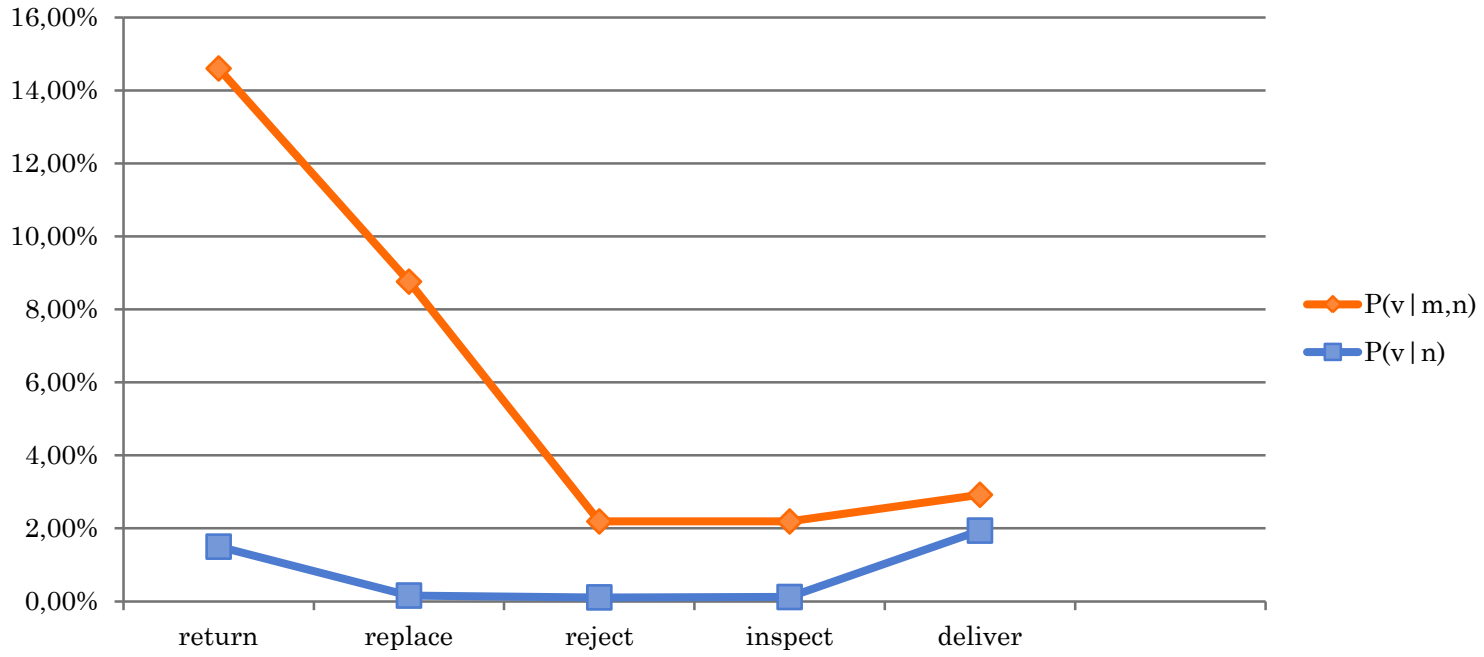


Comparing intra-collocational and inter-collocational dependencies.

Node: *goods*. Collocate: *faulty*.

Grammatical class of co-collocates: verb.

CONSTELLATIONS OF *GOODS*

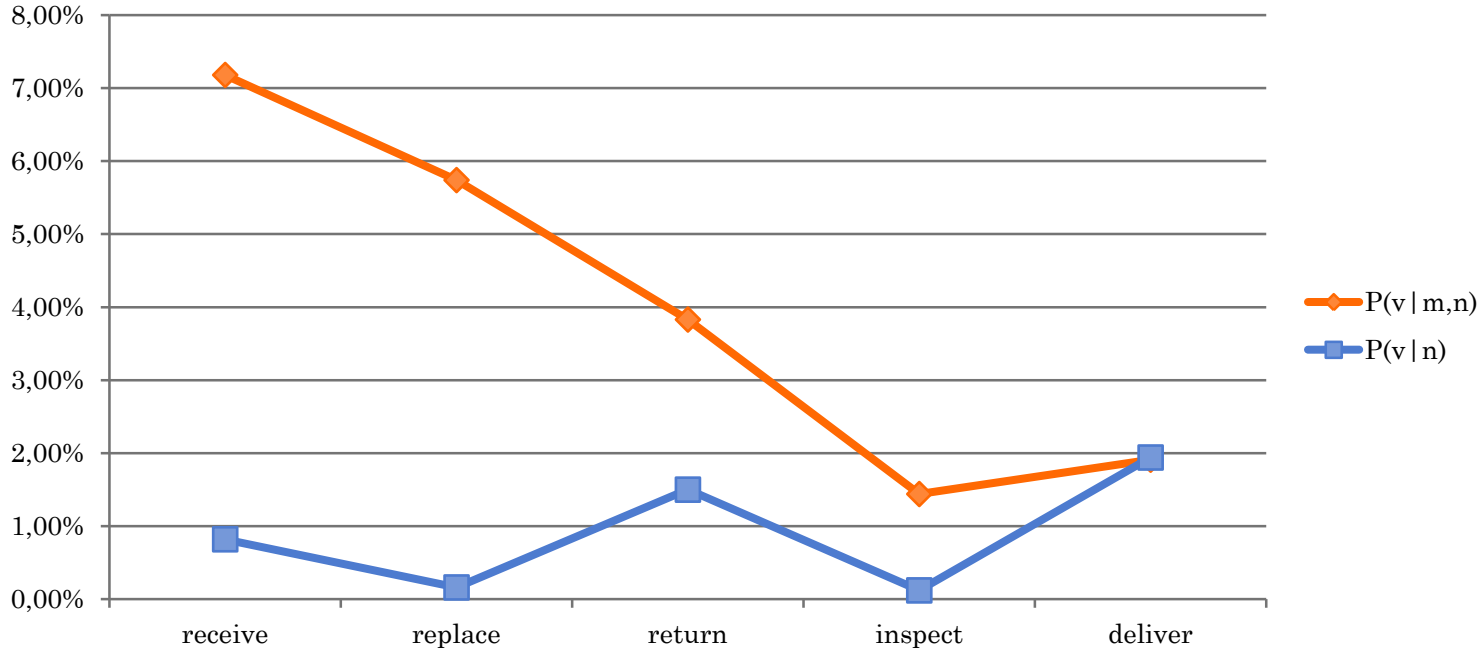


Comparing intra-collocational and inter-collocational dependencies.

Node: *goods*. Collocate: *defective*.

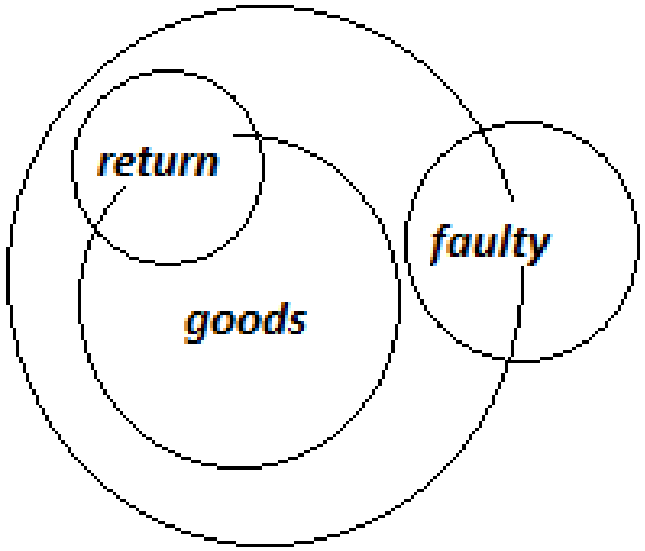
Grammatical class of co-collocates: verb.

CONSTELLATIONS OF *GOODS*



Comparing intra-collocational and inter-collocational dependencies.
Node: *goods*. Collocate: *damaged*.
Grammatical class of co-collocates: verb.

CONSTELLATIONS OF *GOODS*



Faulty as a positive co-collocate of *return* in the context of *goods*

CONSTELLATIONS OF *GOODS*

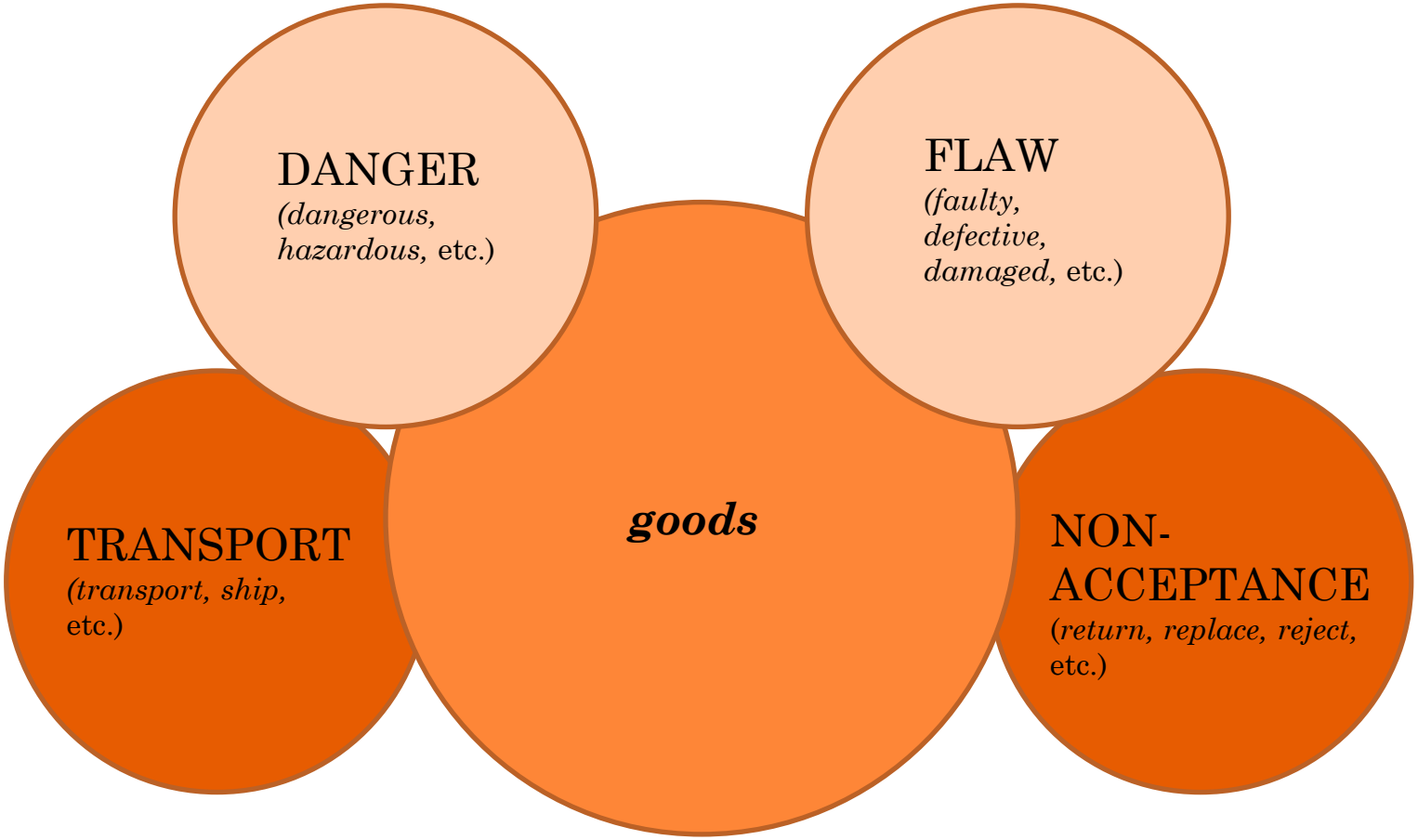
- Semantic regularities: verb-noun collocations expressing 'non-acceptance of goods' are likely to converge with adjective-noun collocations describing goods as 'having a flaw'.
- Semantic systematicity is also a characteristic of negative inter-collocability: the collocations *ship/transport goods* tend to avoid the selection of modifiers describing a 'flaw' or 'imperfection'.

CONSTELLATIONS OF *GOODS*

- Overall tendency towards mutual inter-collocability: *defective* is a co-collocate of *return*, and conversely, *return* is a co-collocate of *defective*. The same holds for other pairs:

(*defective*, *replace*), (*defective*, *reject*)
(*faulty*, *return*), (*faulty*, *replace*)
(*faulty*, *reject*), (*damaged*, *return*)
(*damaged*, *replace*).

CONSTELLATIONS OF *GOODS*

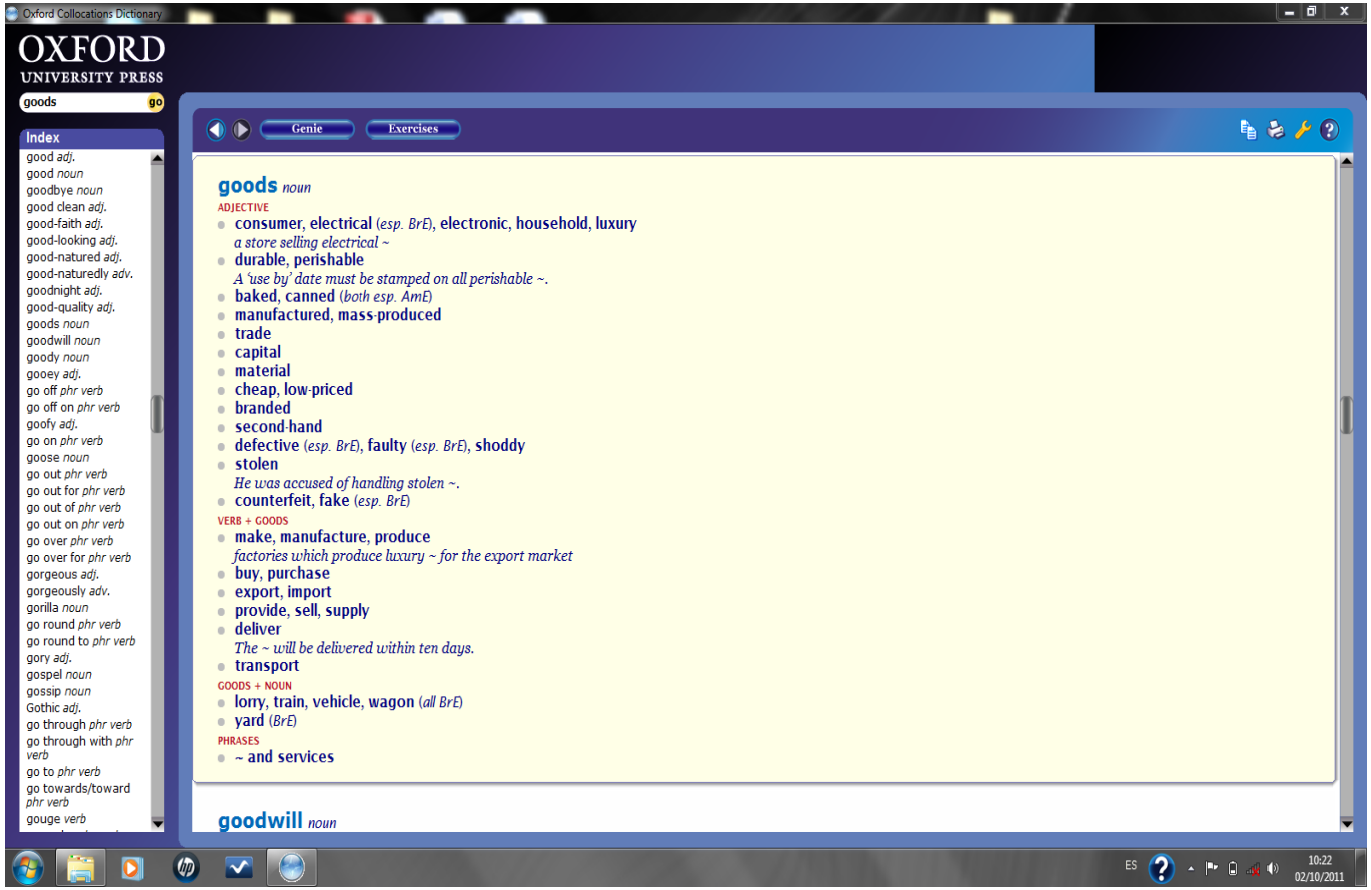


Semantically motivated interdependencies among collocates of *goods*

CONSTELLATIONS IN THE DICTIONARY

- Conventional collocation dictionaries provide a purely "intra-collocational" perspective. They describe dependencies between members of a collocation, not between collocations. **No specification of interactions between collocates of the same headwors**.
- This holds true for the major dictionaries of English and Spanish word combinations: *The BBI Dictionary*, *Oxford Collocations Dictionary*, *Macmillan Collocations Dictionary*, *Diccionario de Colocaciones del Español (DiCE)*, and *REDES*, among others.

CONSTELLATIONS IN THE DICTIONARY



An entry from the OCD on CD-ROM

CONSTELLATIONS IN THE DICTIONARY

- Our project: to devise a dictionary design (and eventually compile a dictionary) suitable for describing "inter-collocational" dependencies.
- Focus on **positive** inter-collocability: which collocations of a headword are more likely to be activated in the same textual window?

CONSTELLATIONS IN THE DICTIONARY

- Why?
  1) Resource of fluency and cohesion. The word fits within a context broader than the simple collocational bi-gram.
  2) Strength of patterning. Inter-collocational dependencies often stronger than intra-collocational dependencies (e.g. the dependency of the collocation *defective goods* on *return*, measured in terms of conditional probability, is ten times higher than the dependency of *goods* on *return*). The bi-gram is often weaker than the constellation.

CONSTELLATIONS IN THE DICTIONARY

- Why?
  1) Resource of fluency and cohesion.
  2) Strength of patterning.
  3) Accuracy in semantic description: *faulty*, *defective*, or *damage* are better represented by their verbal co-collocates (*reject, return, replace*) than by the noun (*goods*).

CONSTELLATIONS IN THE DICTIONARY

- How?

1) Dynamic management of information (a ***dynamic*** collocation dictionary). The information presented in the entry is readjusted to the selections made by the user. **Possible only in electronic format**.

2) Progressiveness. Three stages (accessed through successive menus).

2.1 Simple/plain collocational information (node and collocates). Semantic groups as in many collocation dictionaries (OCD, Macmillan, DiCE, etc.)

2.2 Positive co-collocates and conceptual patterns.

2.3 Conceptual patterns and examples.

CONSTELLATIONS IN THE DICTIONARY

- Additional principles of the DCD model:

  a) Compactness. Succinct format.

  - Metalinguistic information kept to a minimum. Only basic grammatical categories (Verb, Noun, Adjective, etc,) and semantic labels.

  - The structure of constellations is signalled only by means of arrows and by highlighting words in authentic examples.

  b) Systematicity: subsume as much lexical information as possible under general combination rules. Surface collocations connected by semantic labels.

CONSTELLATIONS IN THE DICTIONARY

(...)
Modifier + *goods*
• *dangerous, hazardous*
• *perishable vs. durable*
• *illegal, stolen, contraband, fake, counterfeit*
• *faulty, defective, damaged*
• *unwanted*
• *cheap vs. luxury*
• *cotton, woollen, leather,*
• *electronic, electrical*
• *agricultural, industrial*
(...)

Extract from a DCD entry (first stage)

CONSTELLATIONS IN THE DICTIONARY

Verb + Modifier + *goods*

- *dangerous, hazardous*

⇨ TRANSPORT THINGS FROM ONE PLACE TO ANOTHER

Verb + Modifier + *goods*

- *illegal, stolen, contraband, fake, counterfeit*

⇨ TAKE THINGS SECRETLY TO OR FROM A PLACE

Verb + Modifier + *goods*

- *faulty, defective, damaged*

⇨ REFUSE TO ACCEPT THE GOODS RECEIVED OR BOUGHT

⇨ PROVIDE NEW GOODS

Extracts from a DCD entry (second stage)

CONSTELLATIONS IN THE DICTIONARY

Verb + Modifier + *goods*

⇨ REFUSE TO ACCEPT THE GOODS RECEIVED OR BOUGHT

e.g. *You are not legally obliged to* ***return faulty goods*** *to the seller.*

Defective goods were returned *to the factory for rectification*

Faulty *or* ***damaged goods*** *can* ***be returned*** *for replacement or repair.*

Usually there are no problems with ***rejecting faulty goods.***

Why is 'notice' necessary when the buyer ***rejects defective goods****?*

(...)

Extracts from a DCD entry (third stage)

CONSTELLATIONS IN THE DICTIONARY

Verb + Modifier + *goods*

⇨ TRANSPORT THINGS FROM ONE PLACE TO ANOTHER

e.g. *If you **transport dangerous goods**, you must be trained.*

*Professional drivers are well-trained in **transporting hazardous goods***

*This is a certificate for vehicles which **carry dangerous goods** or **hazardous substances**.*

*Chemical tankers have a design enabling them to **carry hazardous load**.*

*How to **transport dangerous cargo** from US?*

(...)

Extracts from a DCD entry (third stage)

CONCLUDING REMARKS

- There are compelling reasons to complement intra-collocational analysis with inter-collocational analysis. Just like the choice of a word restricts the choices of other words in its vicinity, the choice of a collocation constrains the choice of other collocations with the same node.
- Patterns of inter-collocational dependency are sufficiently strong to deserve lexicographical record.
- The proposal contributes to maximizing the utility of adopting an electronic format in combinatorial lexicography.

CONCLUDING REMARKS

- Compared to plain collocational analysis, constellational analysis provides a better representation of word meaning. The model offers a more exhaustive account of the connection of combinatorial and semantic properties of words.
- The Lexical Constellation model helps to abridge the distance between the collocation dictionary and the general-purpose dictionary.

Thank you for your patience

SOME REFERENCES

Almela, M. (2011). Improving corpus-driven methods of semantic analysis: a case study of the collocational profile of 'incidence'. *English Studies*, 92(1), pp. 84-99.

Almela, M., Cantos, P. & Sánchez, A. (2011). From collocation to meaning: revising corpus-based techniques of lexical semantic analysis. In I. Balteiro (ed.) *New Approaches to Specialized English Lexicology and Lexicography*. Newcastle u. T.: Cambridge Scholars Press, pp. 47-62.

Mason, O. (2000). Parameters of collocation: the word in the centre of gravity. In J. M. Kirk (ed.) *Corpora Galore. Analyses and techniques in describing English*. Amsterdam: Rodopi, 267-280.

Cantos, P., Sánchez, A. (2001). Lexical constellations: what collocates fail to tell. *International Journal of Corpus Linguistics*, 6(2), pp. 199-228.