

# Dependency Grammar

Thanks to Detmar Meurers, Markus Dickinson, Joakim Nivre and  
Sandra Kübler.

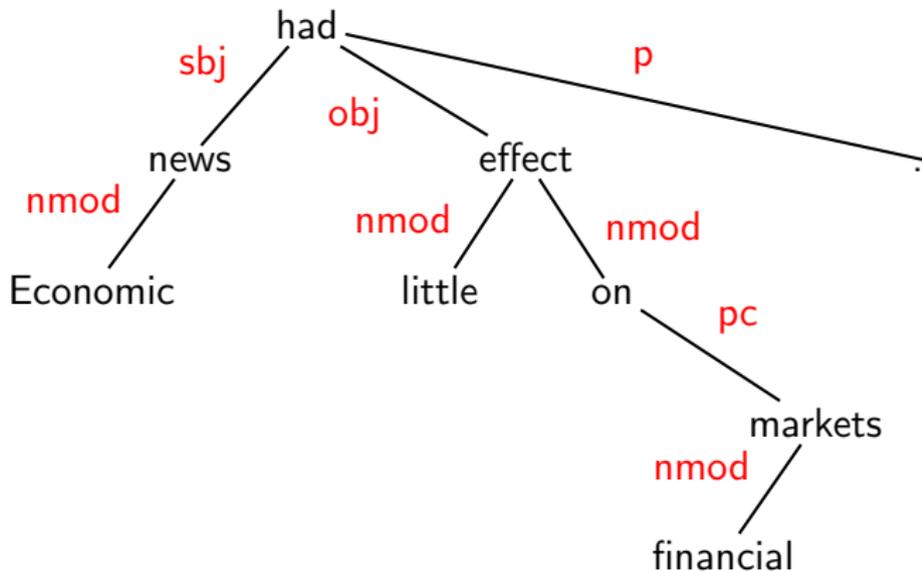
# Dependency Grammar

- ▶ Not a single grammatical framework: wide range of different kinds of DG
  - ▶ just as there are wide ranges of “generative syntax”
- ▶ Increasing interest in DG in CL
- ▶ However, “the mind of most Western linguists goes completely blank when they are shown a dependency tree.”

# The basic idea

Syntactic structure consists of lexical items, linked by binary asymmetric relations called dependencies.

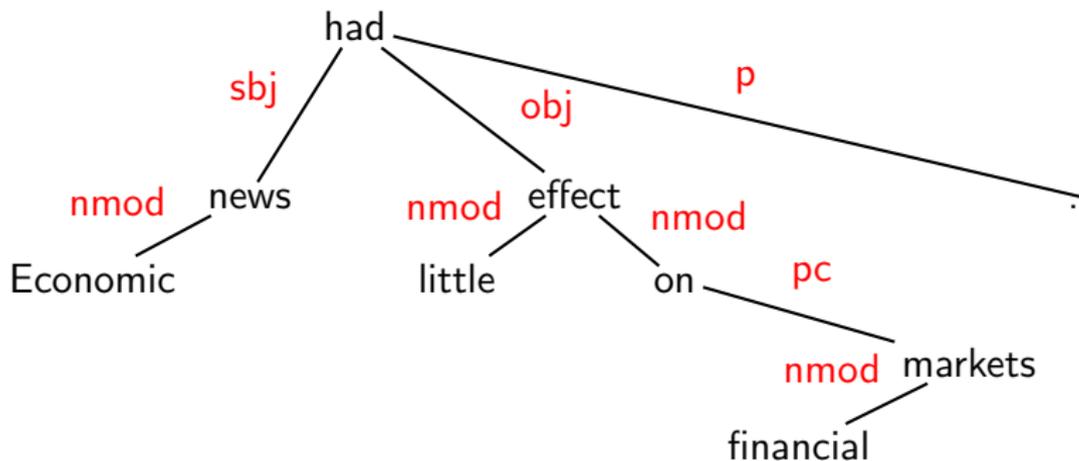
# A DG structure



# Comparison

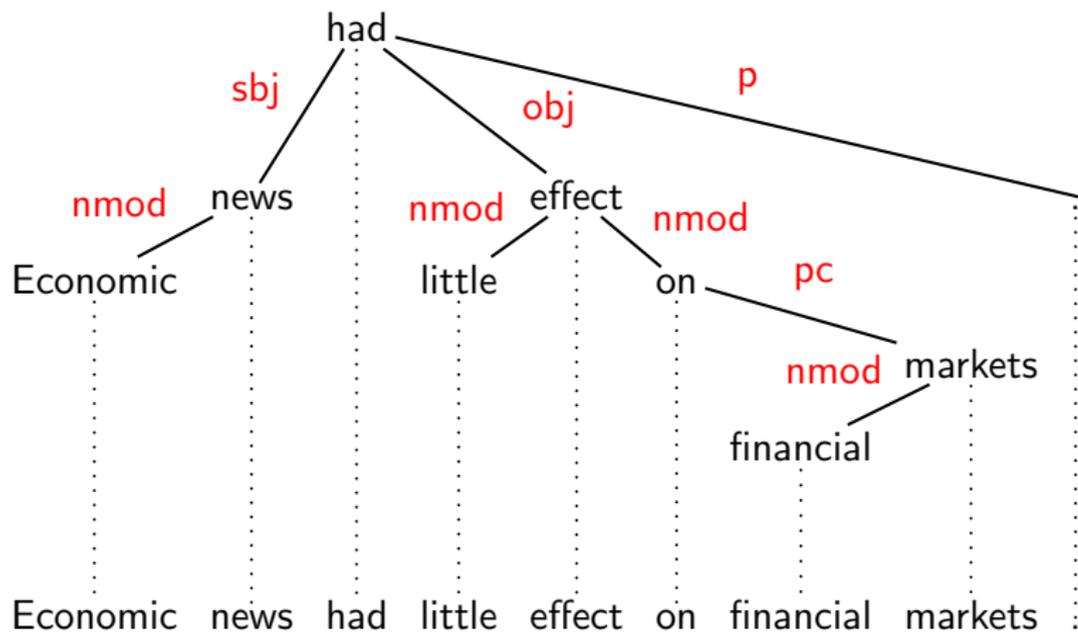
- ▶ Dependency structures explicitly represent
  - ▶ head-dependent relations (**directed arcs**),
  - ▶ functional categories (**arc labels**),
  - ▶ possibly some structural categories (parts-of-speech).
- ▶ Phrase structures explicitly represent
  - ▶ phrases (**nonterminal nodes**),
  - ▶ structural categories (**nonterminal labels**),
  - ▶ possibly some functional categories (grammatical functions).
- ▶ Hybrid representations may combine all elements.

# DG vs PS

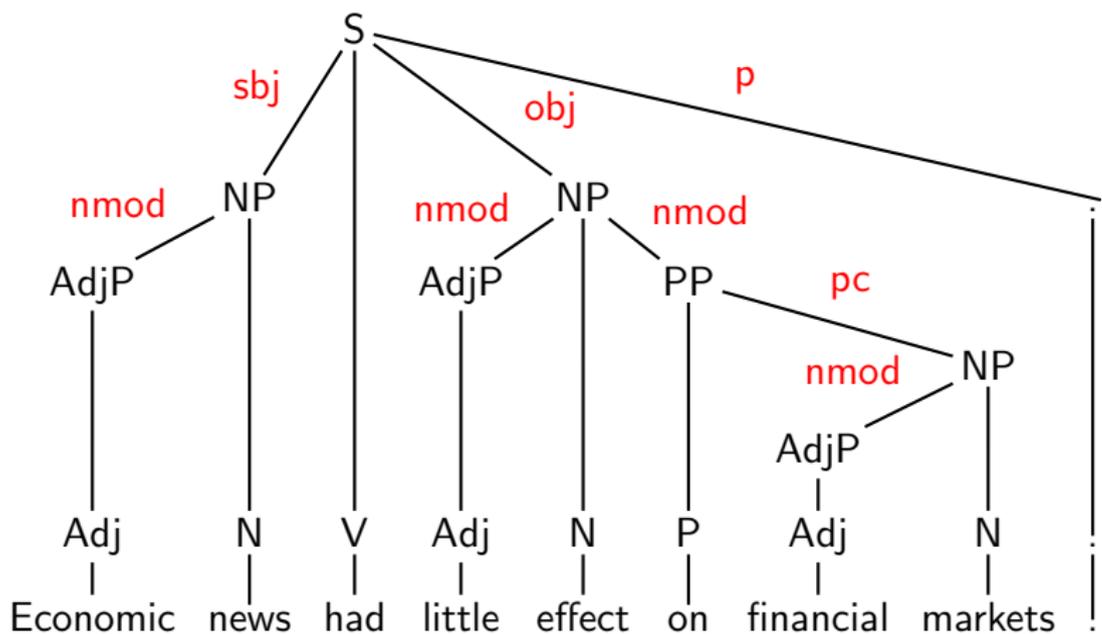


Economic news had little effect on financial markets .

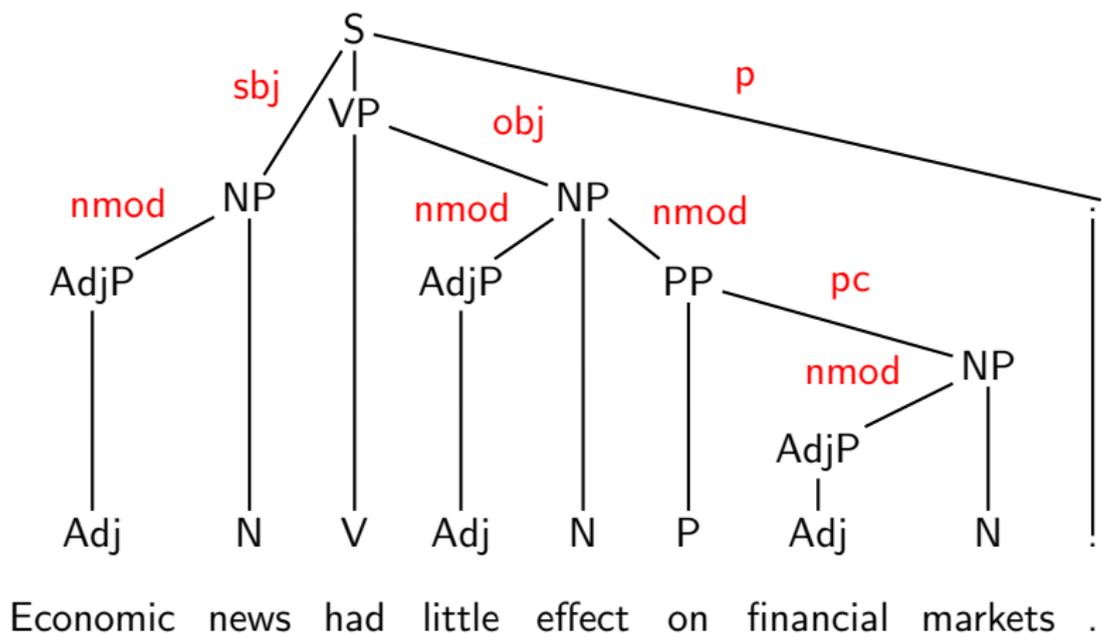
# DG vs PS



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# DG vs PS



**DG  $\Rightarrow$  PS**

# DG $\Leftrightarrow$ PS

- ▶ PS  $\rightarrow$  DG: ignore projections (merge N,  $\bar{N}$ , NP, etc)  
(Assumes that heads are marked.)

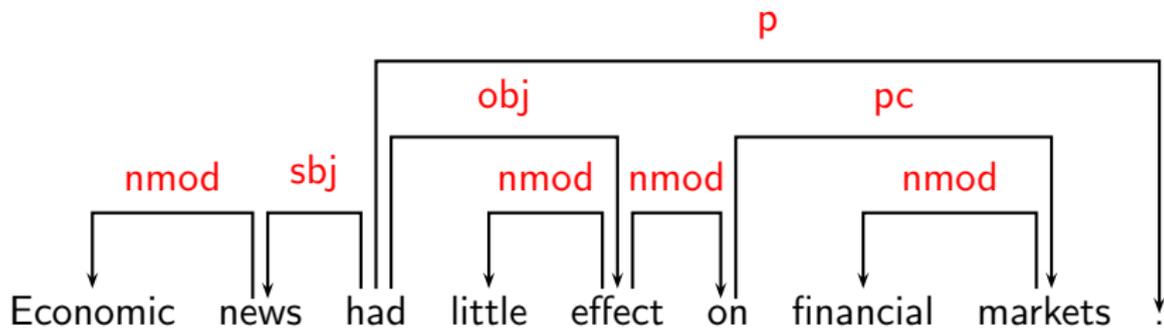
# DG $\Leftrightarrow$ PS

- ▶ PS  $\rightarrow$  DG: ignore projections (merge N,  $\bar{N}$ , NP, etc)  
(Assumes that heads are marked.)
- ▶ DG  $\rightarrow$  PS: introduce distinction between lexical (X) and phrasal (XP) categories (at least)  
Not unique: how many projections (how many levels between X and XP); is the arity of branching limited?

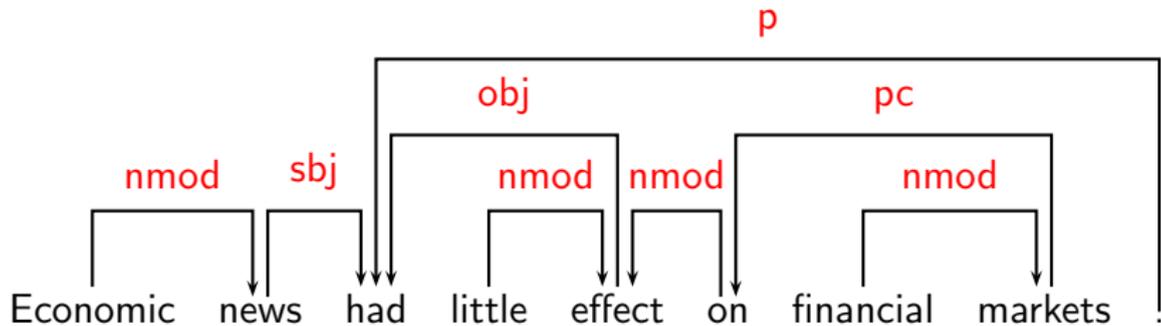
## Some Frameworks

- ▶ Functional Generative Description (FGD) (Sgall et al 1986)
- ▶ Word Grammar (WG) (Hudson 1984, 1990)
- ▶ Meaning-Text Theory (MTT) (Mel'čuk 1988)
- ▶ Dependency Unification Grammar (DUG) (Hellwig 1986, 2003)
- ▶ (Weighted) Constraint Dependency Grammar ([W]CDG) (Maruyama 1990, Harper & Helzerman 1995, Menzel & Schroder 1998)
- ▶ Functional Dependency Grammar (FDG) (Tapanainen 1997, Jarvinen 1998)
- ▶ Topological/Extensible Dependency Grammar ([T/X]DG) (Duchier 2001, Debusmann et al 2004)

# Notational Variants



# Notational Variants



## Some Theoretical Issues

- ▶ Dependency structure sufficient as well as necessary?
- ▶ Mono-stratal or multi-stratal syntactic representations?
- ▶ What is the nature of lexical elements (nodes)?
  - ▶ Morphemes?
  - ▶ Word forms?
  - ▶ Multi-word units?
- ▶ What is the nature of dependency types (arc labels)?
  - ▶ Grammatical functions?
  - ▶ Semantic roles?
- ▶ What are the criteria for identifying heads and dependents?
  - ▶ Are Prepositions heads, dependents or attributes?
- ▶ What are the formal properties of dependency structures?

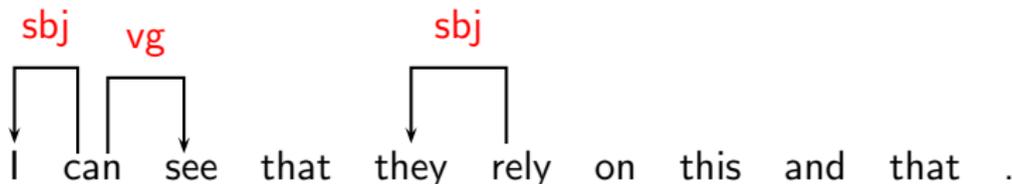
## Some Tricky Cases (and one possible solution)

- ▶ Complex verb groups (auxiliary ↔ main verb)
- ▶ Subordinate clauses (complementizer ↔ verb)
- ▶ Coordination (coordinator ↔ conjuncts)
- ▶ Prepositional phrases (preposition ↔ nominal)
- ▶ Punctuation



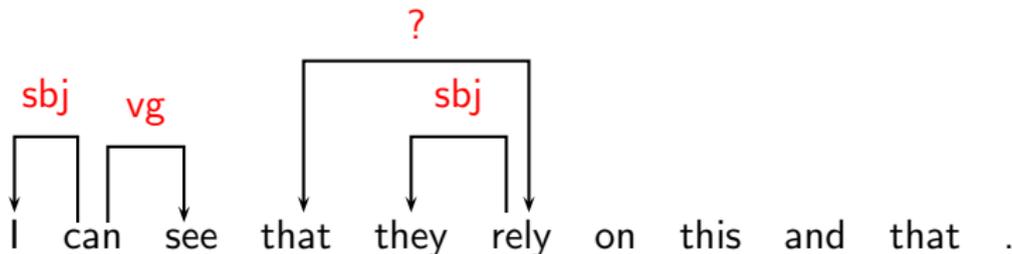
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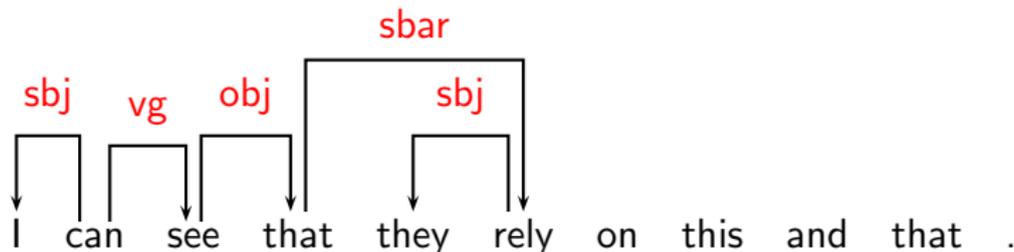
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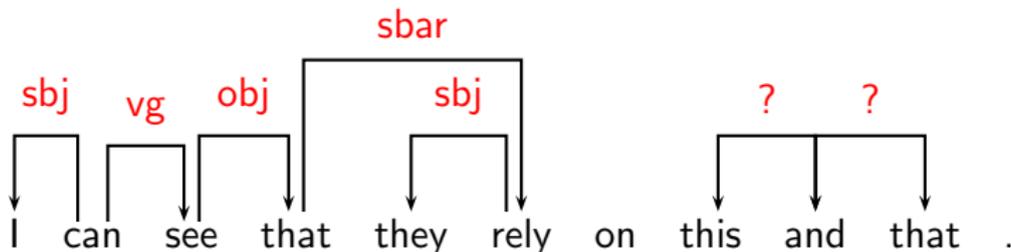
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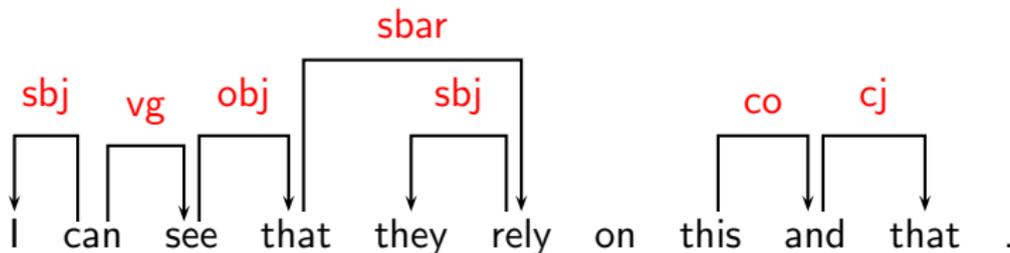
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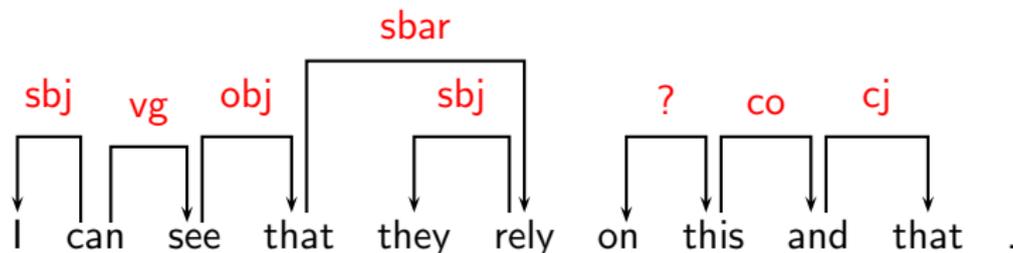
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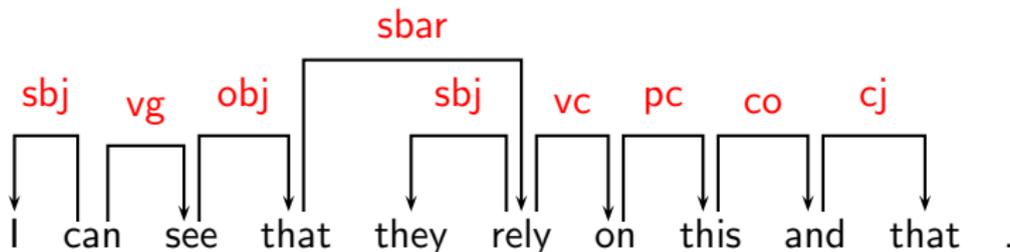
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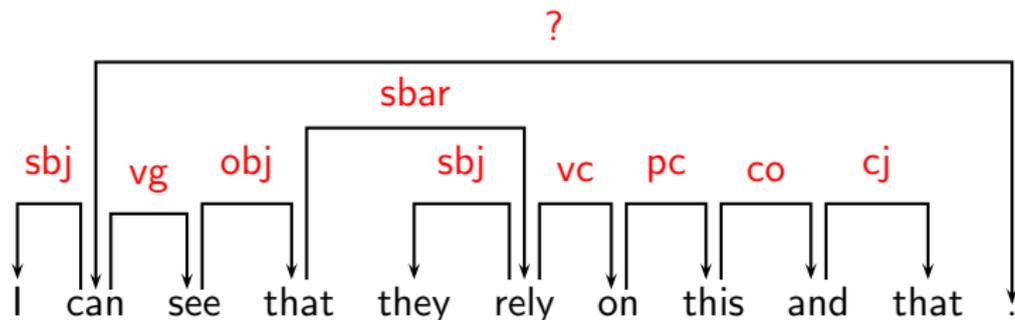
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