Top-down data Analysis with Treemaps

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Outline

- Introduction
- Methods
  - Comparison treemaps
  - Density treemaps
  - Confidence intervals
- Implementation in R
- Conclusions and future research

Introduction

A National Statistical Institute (NSI) produces statistics on:

- Economic growth
- Consumer pricing
- Income of persons and households
- Count of population
- Unemployment
- ...

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Typical production process:

- Data collection
  - Survey data
  - Administrative data
- Data editing
  - Automated editing
  - Interactive editing
- Data analysis (aggregated level)
- Publication

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- **Data analysis (aggregated level)**
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Interactive data editing:

Traditional approach

- Analysis of data at record level
- Tabular format only

Top-down approach

- Analysis of aggregated data
  In case of unexpected outcome: zoom in
- Tabluar format and visualizations

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Structural Business Statistics (SBS)

- Large business survey
- Production process:
  1. Survey of circa 50,000 responding enterprices
  2. Automated data editing
     - Thousands error: Respondents are requested to fill in the values in thousands, but they often don't
     - Wrong sign: Respondents often fill in a negative number for variables such as expenditures
     - Obvious typos
  3. Interactive data editing and analysis
  4. Publication

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Methods

Treemaps

- Space-filling visualization method
- Hierarchically structured data
- Applications
  - Hard drive storage
  - Stock market analysis
  - **Statistical data editing/analysis**

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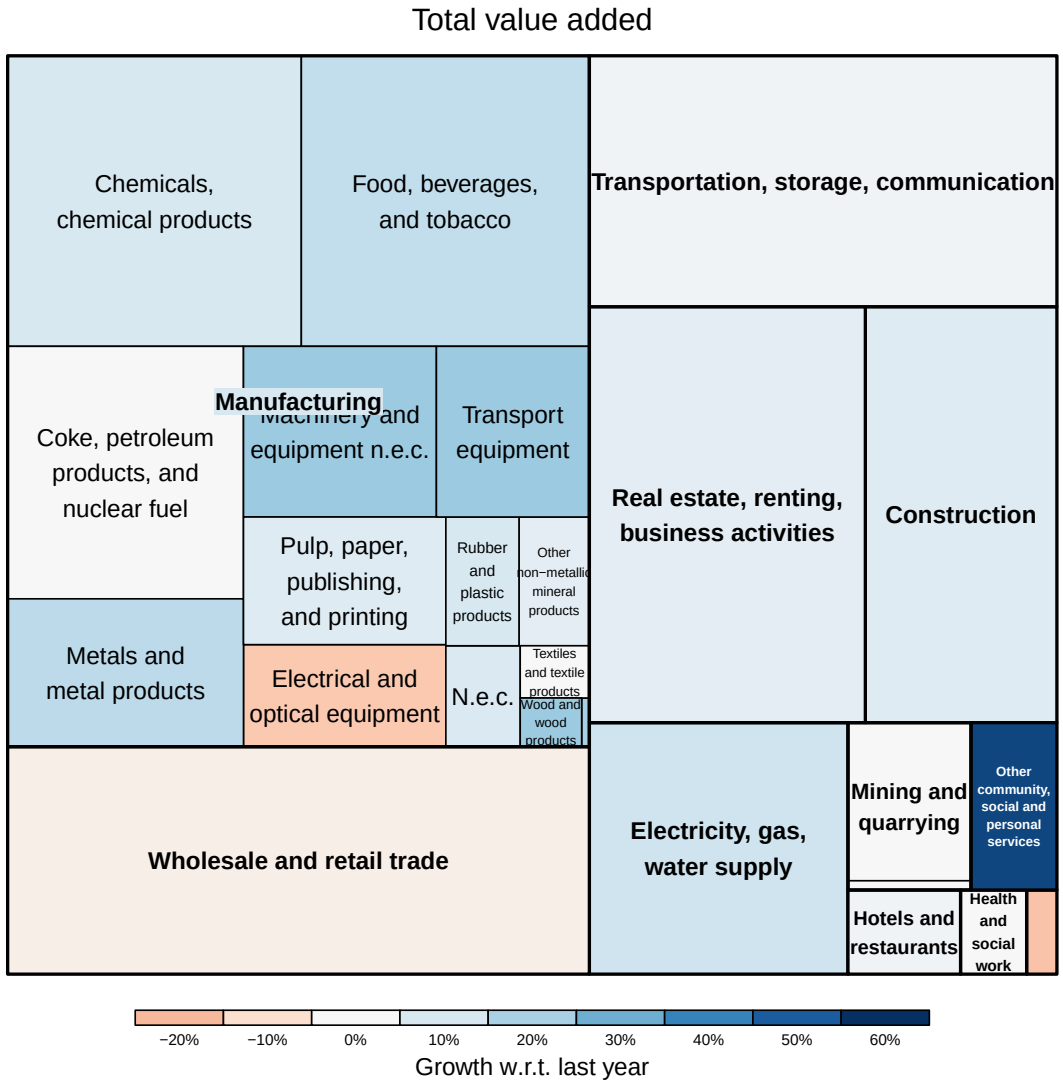
Comparison treemaps

Goal

Detect disruptive or unextected changed in time

Sizes Aggregated variable y at period t

Colors Growth of y w.r.t. period $t-1$



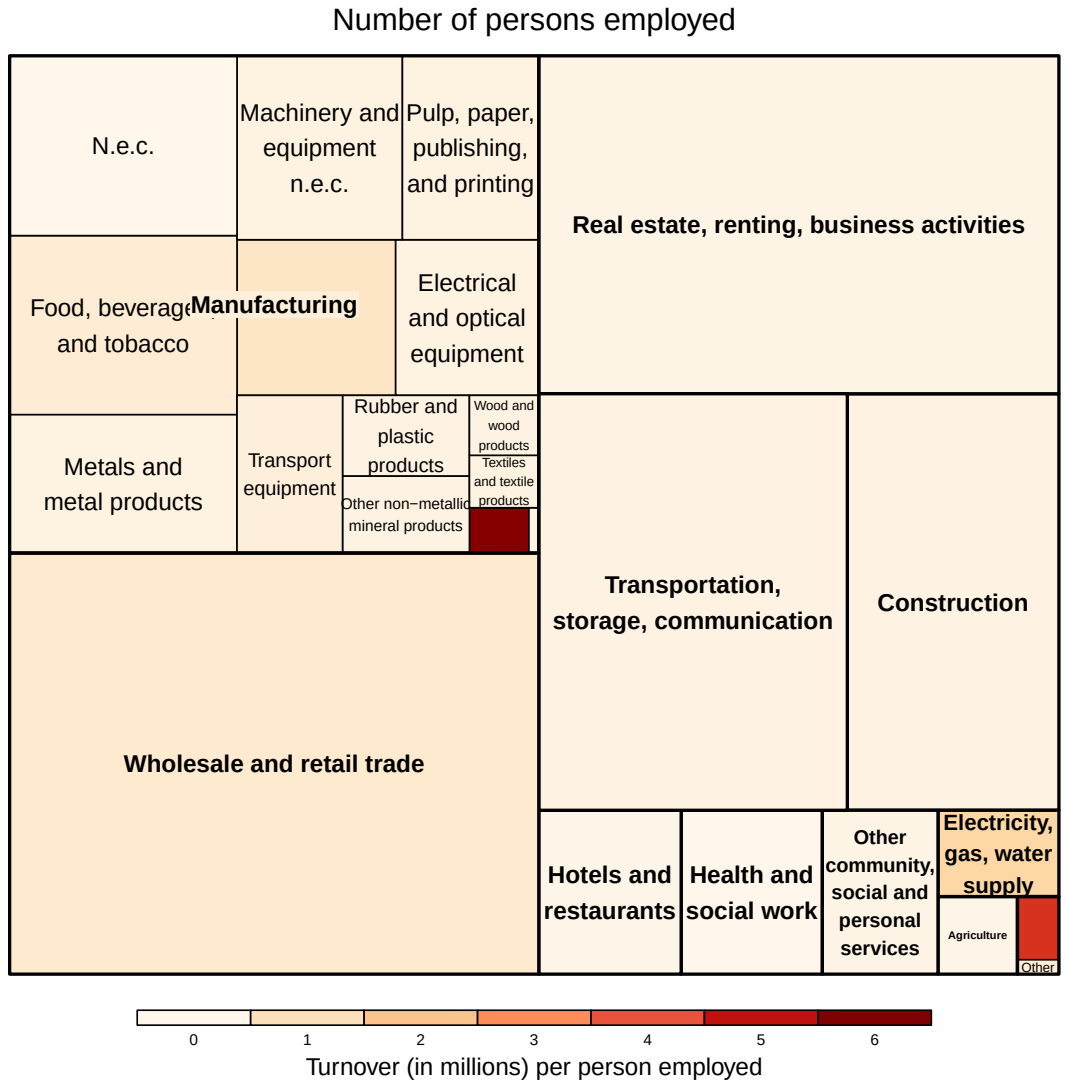
Density treemaps

Goal

Analyze the relationship between two variables

Sizes Aggregated variable y

Colors Density parameter x/y



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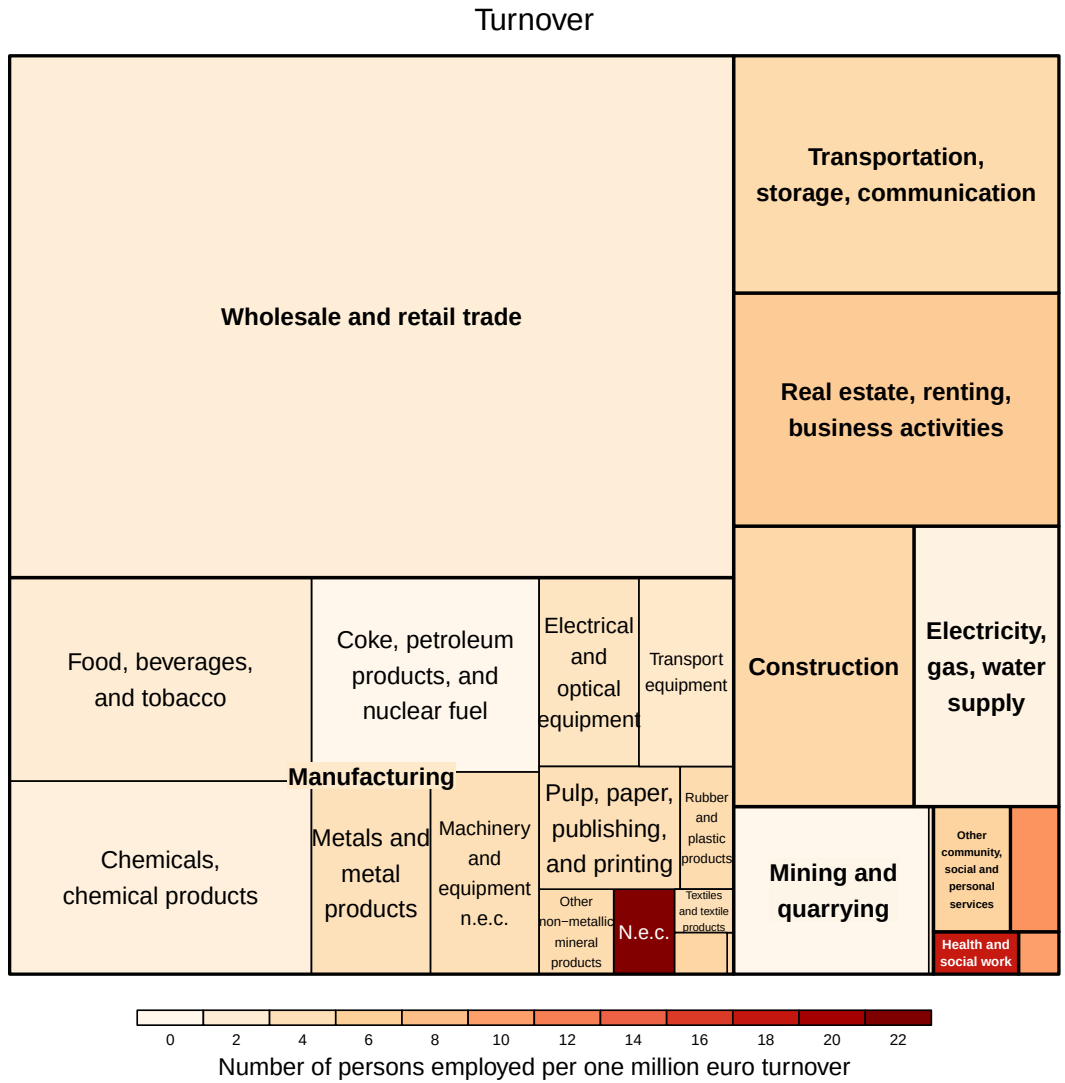
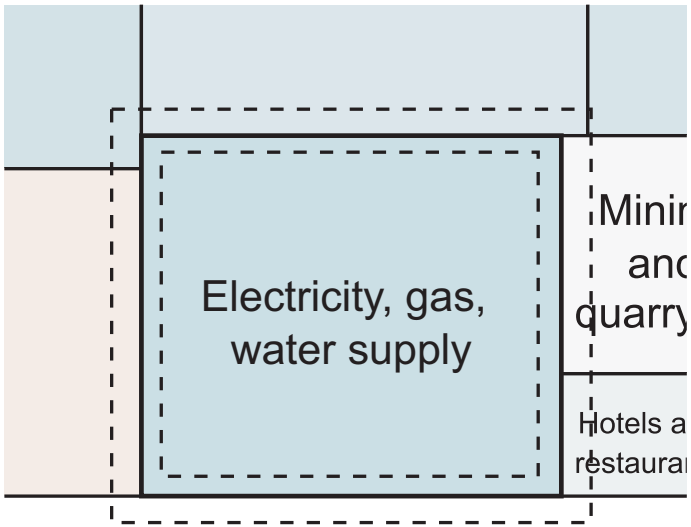


Confidence intervals

Goal

Visualize the confidence interval along with the corresponding estimation of a parameter



Implementation in R

- Package **treemap**
- Available on CRAN
- Main function

  tmPlot
  ```
  tmPlot(myDataFrame,
         index = myIndexVariables,
         vSize = mySizeVariable,
         vColor = myColorVariable,
         ...)
  ```

- Used algorithm: ordered treemap (pivot-by-size)

Conclusion and future research

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- Method of visualizing hierarchically structured data
- Top-down data analysis

Future research

- Communication between R visualizations and MacroView (tool developed at Statistics Netherlands for top-down analysis)
- Evaluation of treemaps by data analysts

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