# RISIS

# The heterogeneity of European Higher Education Institutions. A configurational approach

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# Why heterogeneity?

- European HEIs very diverse in terms of activity profile, subject orientation, size, etc.
  - public policies distinguishing between sectors of higher education
  - differentiation processes of HEIs and of scientific disciplines

- We have a poor understanding of such heterogeneity beyond the university/colleges distinction
  - Main lines of differentiation
  - Blurring between groups/types
  - Country differences

- Classifications as useful tools to analyze heterogeneity
  - Building groups homogeneous across some dimensions
  - Important also for the legitimacy and status of institutions

# Why it matters

- Heterogeneity matters for higher education policy and management
    - As demonstrated by the US Carnegie classification

- Types of HEIs have different identities, business model, markets
    - Need differentiated strategies and development process
    - Will also be responsive in different way to policy interventions

- A better understanding of heterogeneity is pre-requisite for tailored policies

- Types of HEIs are a way to address such issues
    - Summarizing core differences and making them understandable
    - And clarifying the position of individual HEIs

# Organizational configurations

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- Organizational attributes are not independent or randomly distributed
    - Some 'configurations' are more frequent than others
    - Expressing deeper organizational attributes such as mission, strategy, internal organization
    - That cannot be observed directly

- Constructing 'types' of organizations
    - Unique combinations of organizational attributes that determine relevant outcomes
    - Revealed by data by grouping observations through statistical methods
    - But interpretable in conceptual terms

- Conceptual design and empirical analysis are complementary
    - In the identification of relevant dimensions
    - In the interpretation of results

# State of the art

- A priori classifications > Carnegie classification of US universities
  - Based on the profound knowledge of the systems
  - Clear and robust criteria + fine-tuning with institutions
  - Works for broad groups, refinement difficult (doctoral universities)
  - Not applicable in Europe because of national differences

- Data-driven classifications using statistical methods
  - Based on empirical data and therefore more robust
  - Results depend largely on the metrics and selected dimensions
  - Relevance sometimes unclear

- The two approaches need to be integrated in an interactive way
  - A priori intuition on the relevant dimensions
  - Statistical approaches based on actual data
  - Expert assessment of classification results

# Goals of the paper

- Develop a data-driven classification of European HEIs

- Taking into account relevant dimensions derived from the literature

- Using statistical advanced methods (LCA)

- Show how the classification can be used for analyzing HE systems in Europe

# Dimensions

- Activity profile
  - Research (publications, EU-FP projects)
  - Education (students)
  - Third-mission (patents)

- Subject scope
  - Generalists vs. specialists
  - Social sciences and humanities vs. natural sciences

- Resourcing
  - Academic staff as a proxy

- Structural distinctions (exogenous)
  - Legal status: public vs. private
  - Research mandate (based on PhD)

# Dimensions

- Activity profile (normalized by staff)
  - Research (publications, EU-FP projects, PhD degrees)
  - Education (students)
  - Third-mission (patents)

- Subject scope
  - Subject concentration: generalists vs. specialists
  - Social sciences and humanities vs. natural sciences

- Resourcing
  - Academic staff as a proxy

- Structural distinctions (exogenous)
  - Legal status: public vs. private
  - Research mandate (based on PhD)

# Data and sample

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- Data from the European Tertiary Education Register ([www.eter-project.com](www.eter-project.com)), 2014 edition

- Enriched with data from Leiden publication database, EU-FP EUPRO database and PATSTAT thanks to RISIS integration

- Final sample (excluding cases with missing staff data): 2,034 observations in 28 European countries

# Methods: LCA

- Modeling the distribution of the observed variables
- Mixture of normal distribution contingent to the observation belonging to a class
- Probability of a class contingent of the regulatory variables (logistic regression)

$$f(\boldsymbol{y}) = \sum_{ij} \pi_i f_i(\boldsymbol{y})$$

$$\pi_i = f_i(\mathbf{x}) = \frac{\exp(\gamma_i)}{\sum_1^g \exp(\gamma_i)}$$

$$\gamma_i = \theta_i + \mu_i \, (legal\ status) \quad + \vartheta_i \, (research\ mandate)$$

- The model computes the distribution parameter and the distribution of cases by class
- Optimal number of classes can be identified using fit statistics (AIC/BIC)
- Attributing cases to classes with the highest probability

# Results

Final solution with six classes
- Based on 8-class model
- Best balance between model fit and parsimony

Classes can be clearly characterized in terms of
- Their identity
- The positioning in the space of configurations
- Their characteristics

Two major dimensions
- Research vs. education
- Natural sciences vs. social sciences and humanities

# Classes

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Class 1 (*research universities; 312 HEIs*)
- Cambridge, Oxford, Basel, Twente, etc.
- Much higher research intensity.

Class 2 (*science-oriented universities; 156 HEIs*)
- TU, Munich, ETH Zurich, Karolinska
- Oriented towards 'sciences' (including bio), high patent intensity..

Class 3 (*technical colleges; 113 HEIs*)
- UAS in Germany, Switzerland, Portugal.
- Low research, high patent, specialized in technical sciences.

Class 4 (*generalist universities and colleges; 408 HEIs*)
- Macerata, Kalgenfurt, Pantheon-Assas, some UAS as well
- Strong social sciences, lower research intensity, 'newcomers'

Class 5 (*SSH universities; 206 HEIs*)
- Academy of arts theological universities
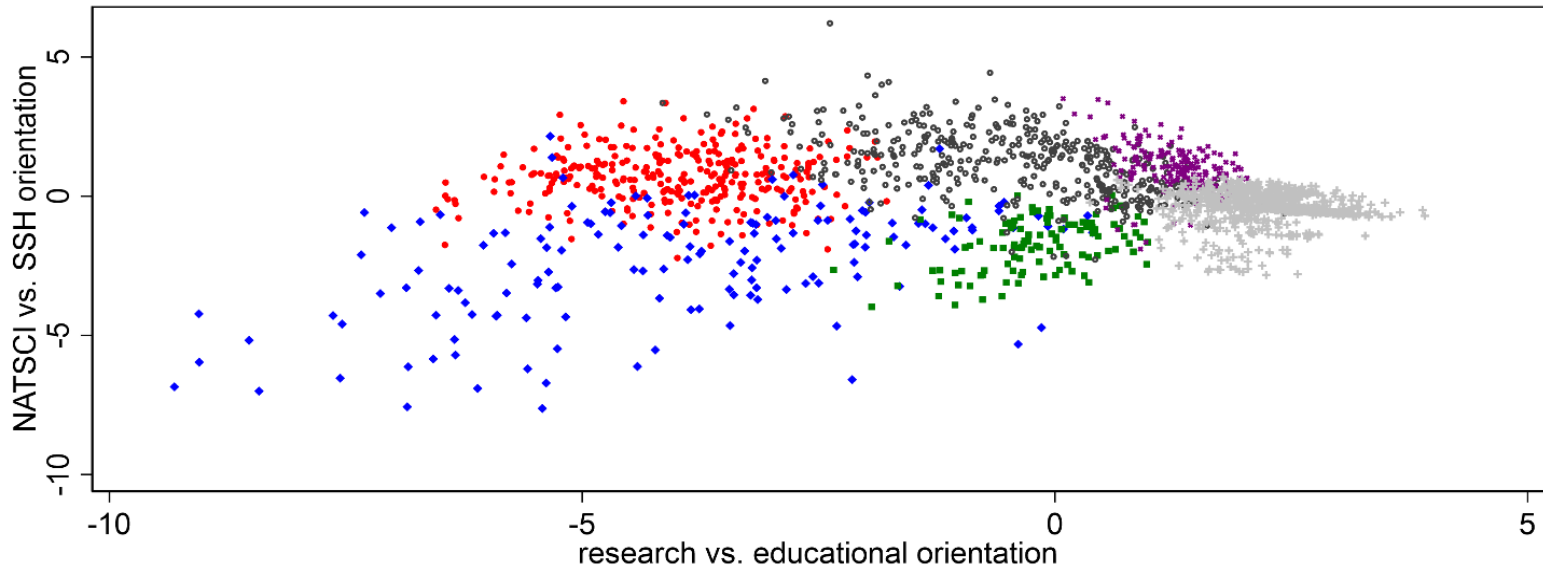- Highly specialized and reputed

Class 6 (*specialized colleges; 807 HEIs*)
- teacher education institutions, music colleges, colleges of economics and of public administration
- No research, mostly bachelor education

# Resourcing

- Large differences in the volume of resources by class
  - Research-oriented classes (1, 2, 6) have two times revenues per student than education-oriented classes
  - But only slight differences in the composition of revenues
  - Core allocation by the state accounts for most revenues in all classes
- Differences in resources are associated with political decisions
  - Research supplement based on students
  - Differences by field in amount of funding

# Positioning

Scatter plot with x-axis "research vs. educational orientation" (range -10 to 5) and y-axis "NATSCI vs. SSH orientation" (range -10 to 5).

Legend:
- Research universities
- Science-oriented universities
- Technical colleges
- Generalist universities and colleges
- SSH specialised universities
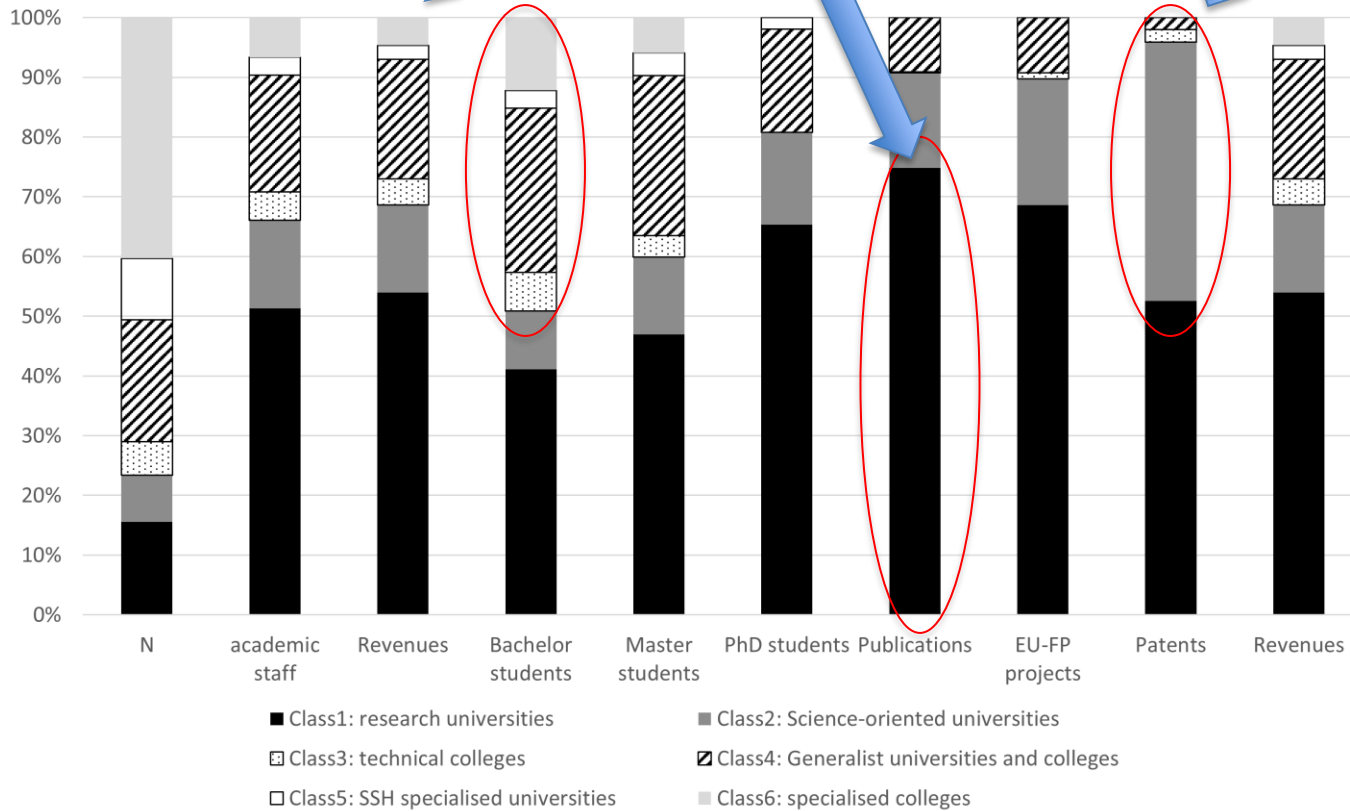- Specialised colleges

# Share of activities

75% of publication in the research universities

Half of bachelor students in non-research classes

Half of patents in science universities



| | N | academic staff | Revenues | Bachelor students | Master students | PhD students | Publications | EU-FP projects | Patents | Revenues |

■ Class1: research universities
■ Class2: Science-oriented universities
⊡ Class3: technical colleges
◪ Class4: Generalist universities and colleges
□ Class5: SSH specialised universities
▨ Class6: specialised colleges

# Comparing national systems
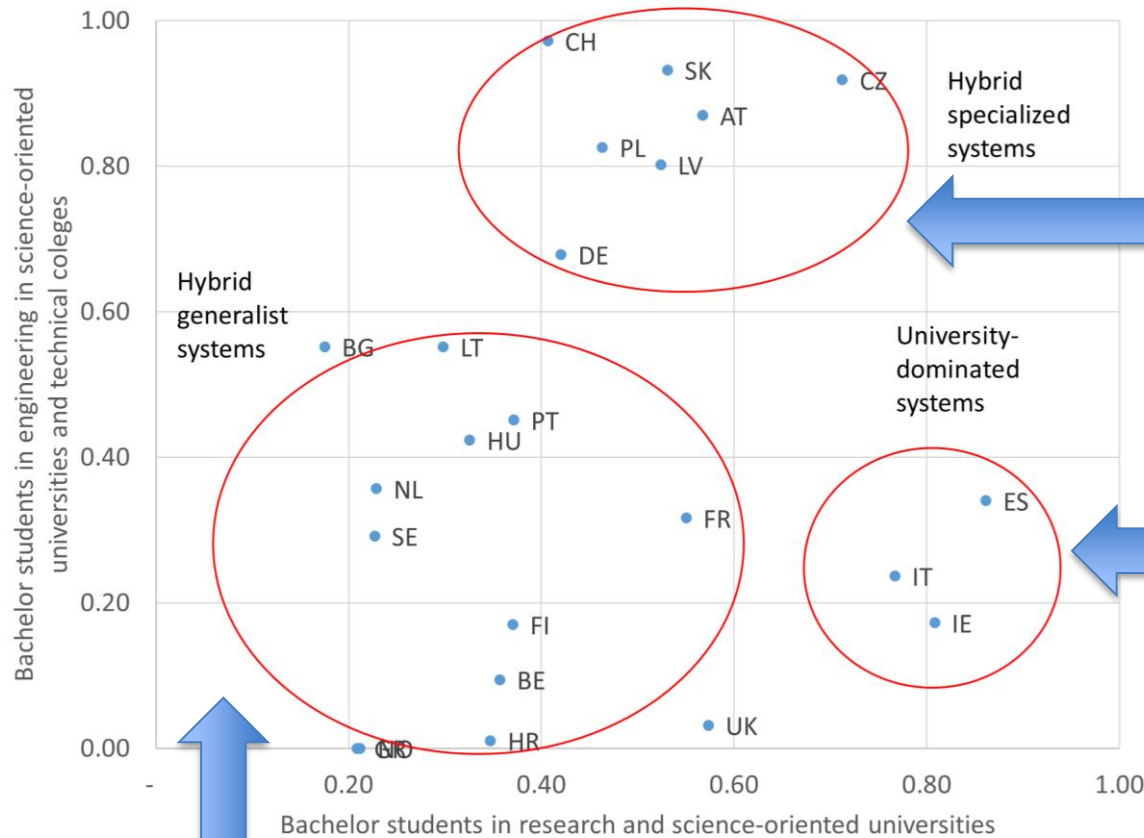


Technical education in specialized universities and colleges

All education in universities

# Where do we find UAS?



Segregated systems · Systems with overlap · Integrated systems

# Discussion

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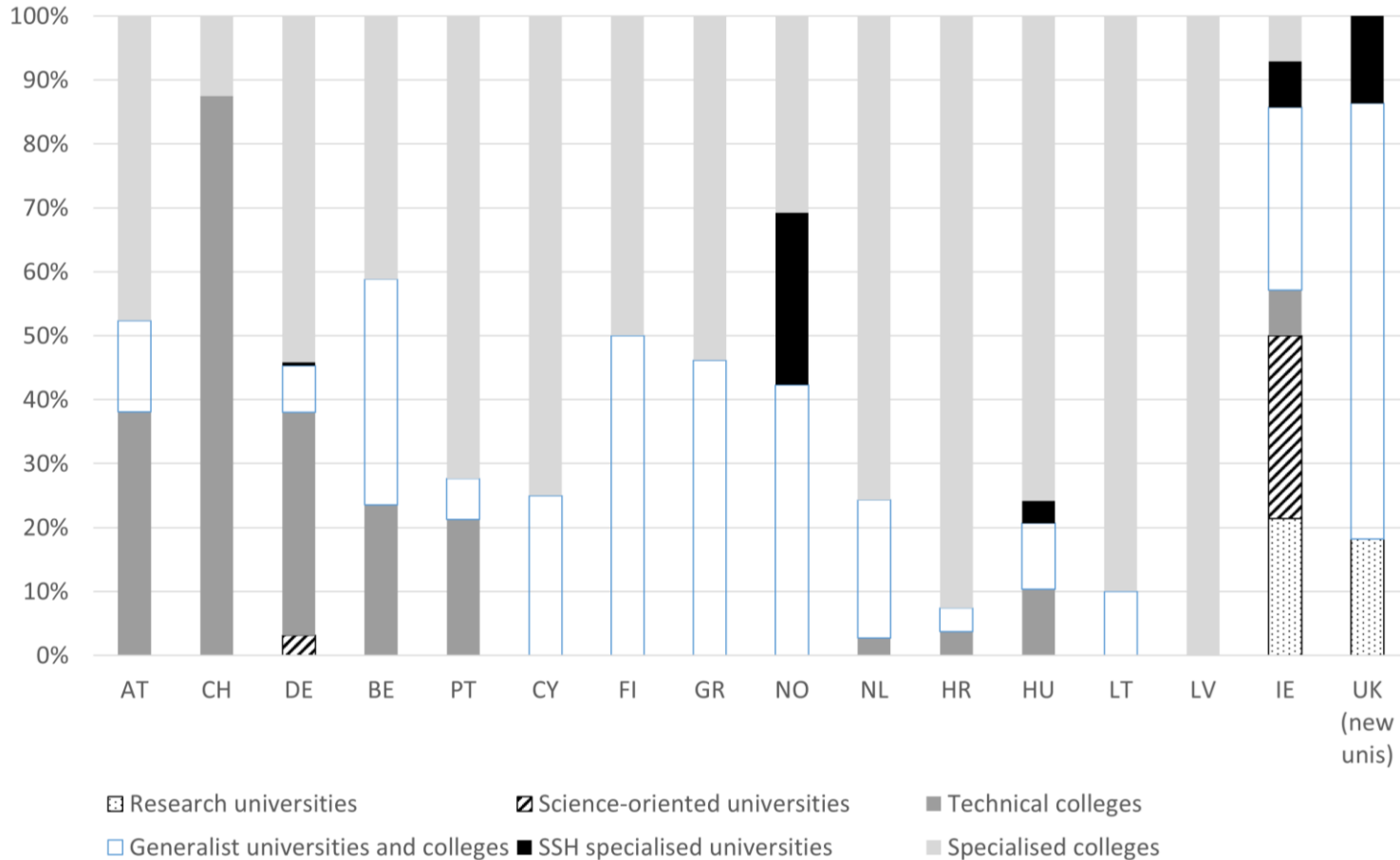
- We have developed a data-driven classification of European HEIs
  - Classes are meaningful and interpretable
  - Cut across national distinctions and histories

- The classification is useful for comparative analysis
  - Structural distinctions between systems
  - Blurring between UAS and university sector

- Classification is useful to get a meaningful picture of higher education in Europe
  - And to think about positioning and policy interventions

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# THANK YOU !

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