POLICY INSIGHTS FROM ANALYSING EUROPEAN UNIVERSITIES

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Assessing the Impacts of Public Research Systems
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Outline of policy issues

1. Can we do something to improve the productivity and quality of research of universities in our country?

2. Should we concentrate research funding in a small number of large universities?

Appendix
Can we measure the impact of university research at regional level on

• Entrepreneurship
• Productivity
• Growth of companies
Research strategy

• Construction of a census (= validation by National Statistical Authorities, NSAs)
• Data integration from heterogeneous sources after substantial disambiguation work

Data sources

• ETER (European Tertiary Education Register)
  All European Higher Education Institutions (HEIs)- data on students and staff + institutional data. 2293 institutions. Data 2011-2012 available. Data 2013 and 2014 in progress.

• GRBS (Global Research Benchmarking System)
  Data on Scopus publications 2007-2010 and 2008-2011 disaggregated by 251 Subject categories for North America, Asia and Europe

• Eurostat- regional covariates
There are large differences in productivity among universities.
There are large differences in research quality among universities.
These differences are found across all scientific disciplines.
Distribution of citations per capita among European universities.

Computer science

Differences in research quality (citations per capita) tend to be larger than differences in productivity (publications per capita).
Can we do something to improve the scientific productivity of universities in our country?

- ETER + GRBS data
- Multilevel approach
- Dependent variable = 4 indicators of scientific productivity and quality (% publications in, or citation from, top 10% or 25% SNIP journals)

Independent variables
  - University level
    - Age
    - Size
    - PhD intensity
    - Internationalization
  - Regional level
    - GDP per capita
    - GERD per capita
  - Public vs private
  - Hospital
  - Student load
  - Generalist vs specialist
  - No beds per 100,000 inhabitants
  - No. medical doctors per 100,000 inhabitants
Main results in the Medicine sector

- Size of university affects negatively
- Overall research excellence + internationalization of PhD strong positive effect
- Age of university no effect
- Generalist universities better than specialist
- Public vs private no effect
- PhD intensity no effect
- Overall student load at university level (surprising) positive effect
- Strong context effects (GERD at regional level)
Policy insights

• The generalist model («Humboldtian model») is a dominant model, performing relatively well

• There is complementarity between research and education - universities with a high student load are not necessarily performing badly in research

• Age and governance (private/ public) do not have any systematic effect

• Larger universities do not perform better
Scientific productivity is influenced by the governance at university level

- Importance of university autonomy
- Policies should create incentives for competitive recruitment
- Universities should adopt consistent quality criteria for recruitment, assessment and promotion

Large difference between US and Continental Europe with respect to the scientific excellence model
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Should we concentrate research funding in a small number of large universities?

Underlying rationale: **economies of scale**

Clearly separate empirical issues:

- **Economies of scale in administrative activities** *(YES)*
  - Efficiency in the utilization of common infrastructures and services
  - Administrative activities

- **Economies of scale in higher education** *(YES, BUT..)*
  - Teaching in a large classroom requires the same effort than teaching in a small one
  - But increasing the scale of interaction-intensive activities (tutoring, supervision) reduces quality

- **Economies of scale in research** *(NO)*
  - Threshold for research teams at small level
  - No systematic evidence of increasing returns at department or university level
Publications per capita by size of academic staff in European universities.

Medicine

Largest medical schools are among the least productive
Largely cited research articles are found more likely among small-to-medium-sized medical faculties.
Publications per capita by size of academic staff in European universities.

Computer science
Citations per capita by size of academic staff in European universities. Computer science.
Citations per paper by number of publications in World universities. Chemistry

Largest volumes of publications are produced by universities above but mainly below the median level of citations per paper

Number of publications
Percentage of publications in top 10% journals by volume of publications of World universities. Chemistry

Largest volumes of publications are produced by universities which publish in top journals less than the average.
Policy insights

• No evidence of increasing returns to scale in research activities

• Policies of restructuring aimed at administrative rationalization- legitimate policies but no argument from gaining efficiency in research

• Research funding should be channeled directly to research teams according to their scientific productivity/ quality

• Better policy is to push researchers to compete with world level frontier in their own field
Can we measure the impact of university research at regional level?

Dependent variable: rate of creation of new firms at province level
Italy data at province level

Independent variables (breakdown by Field of Science/Field of Education)
- Academic staff
- PhD students
- Publications
- Patents
Impact of public research on entrepreneurship

Main results

- Impact on entrepreneurship depends on the subject matter
  - Science and Social sciences and humanities (SSH) lowest impact
  - Engineering largest impact
- Impact greater in laggard regions
- Impact follows different paths
  - Knowledge embedded in publications less important
  - Knowledge embedded in people (Academic staff; PhD students) more important
  - Geographic decay different for different channels (publications decay at 50km; academic staff decay at 100km)
Impact of public research on firm growth

Dataset: number of new firms created in all European countries in 2010 (n> 500,000).

Source: ORBIS

Dependent variables
- Firm growth (economic and financial data)
- Productivity (value added)

Independent variables (breakdown by Field of Science/ Field of Education) at NUTS 2 and 3 level
- Academic staff
- PhD students
- Excellence indicators
- Publications
- Citations
- Financial endowment at regional level
Policy insights

• Multiple channels of impact of universities on regional economy

• Importance of teaching

• Spillovers are discipline- and industry-specific

• Avoid «monistic» policies (e.g. exclusive focus on technology transfer based on patents)- beyond commercialization of research only
Policy insights/2

• Largest effect when there is complementarity between public research (= publications) and private R&D (= patents) in the same region - policies aimed at complementarities more effective

• Density effects are important

• **Co-specialization** between research fields and industry specialization often missing

• In laggard regions we do not see «excellent universities» but mainly **pockets of excellence**
Policy insights/3

• Further steps

  • **Quality of research vs volume** (= does high quality research produce more spillovers on entrepreneurship, productivity, and company growth?)
  • **Social impact** of public research can be measured
    • Value surveys
    • Social capital
    • Civic/ political participation

• STI innovation model vs DUI (doing, using, interacting)
Conclusions

Integration of heterogeneous microdata with data from officially validated censuses is a promising strategy
• comparative cross-country analysis
• benchmarking
• econometric exercises

Many important (and controversial) policy issues can be addressed with an evidence-based approach

The measurement of the impact of public research on economy and society is close to become a reality
Productivity of university research and returns to scale

Bonaccorsi A., Secondi L. (2016a) The determinants of research performance in European universities. A large scale multilevel analysis, *Submitted for publication*

Bonaccorsi A., Secondi L. (2016b) Field of science differences in research performance. *In preparation*

Bonaccorsi A., Secondi L. (2016c) Are there economies of scale in research? *In preparation*

Models of academic excellence

Bonaccorsi A., Haddawy P., Cicero T., Saeed H. (2106) Explaining the transatlantic gap in scientific excellence, *Submitted for publication*

Bonaccorsi A., Haddawy P., Cicero T., Saeed H. (2106) The solitude of stars. Academic excellence in European universities. *In preparation*
Impact of university research


Pockets of excellence