

POLICY INSIGHTS FROM ANALYSING EUROPEAN UNIVERSITIES

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OECD Workshop

**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)

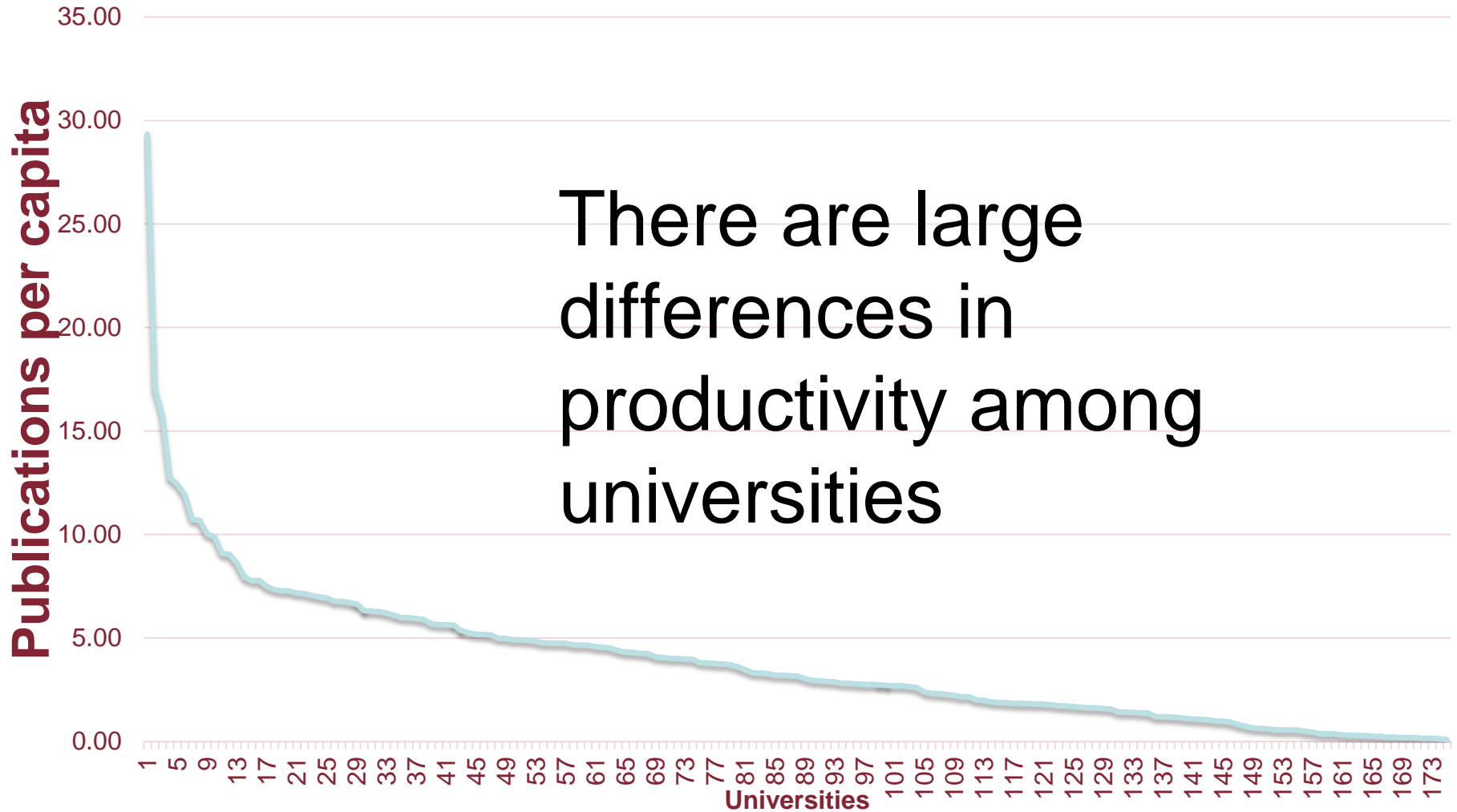
All European Higher Education Institutions (HEIs)- data on students and staff + institutional data. 2293 institutions. Data 2011-2012 available. Data 2013 and 2014 in progress.

- GRBS (Global Research Benchmarking System)

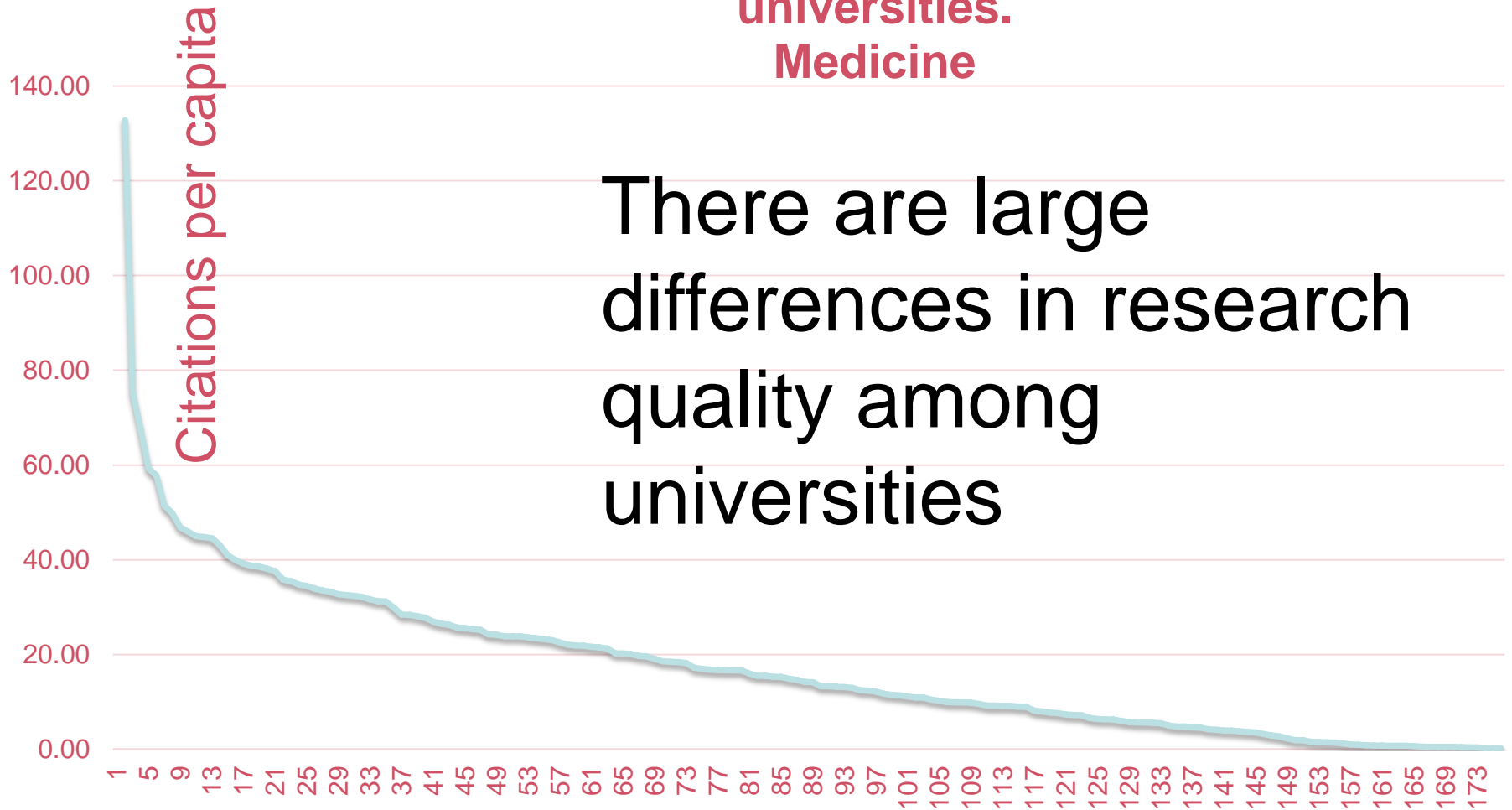
Data on Scopus publications 2007-2010 and 2008-2011 disaggregated by 251 Subject categories for North America, Asia and Europe

- Eurostat- regional covariates

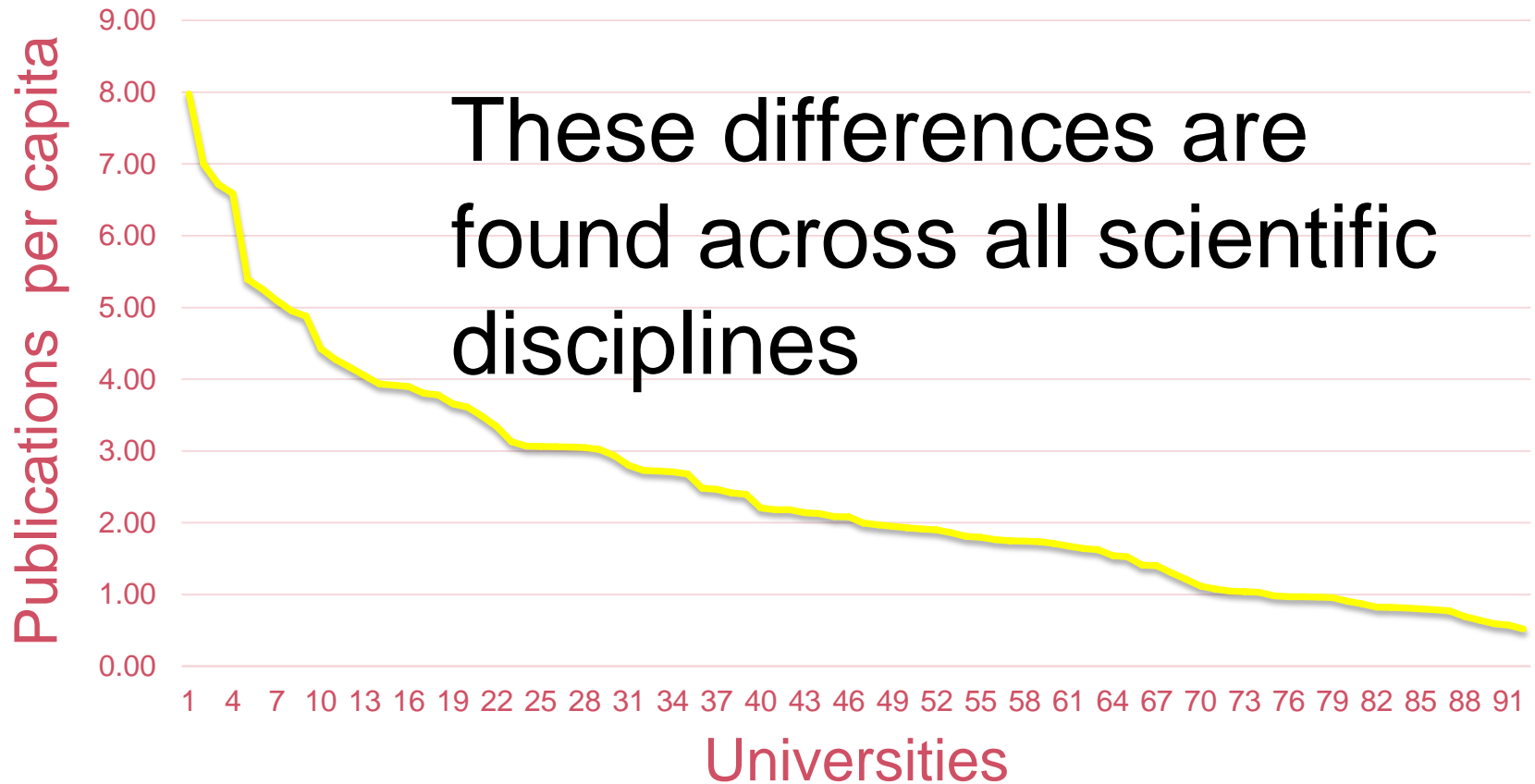
Distribution of publications per capita among European universities. Medicine



Distribution of citations per capita among European universities. Medicine

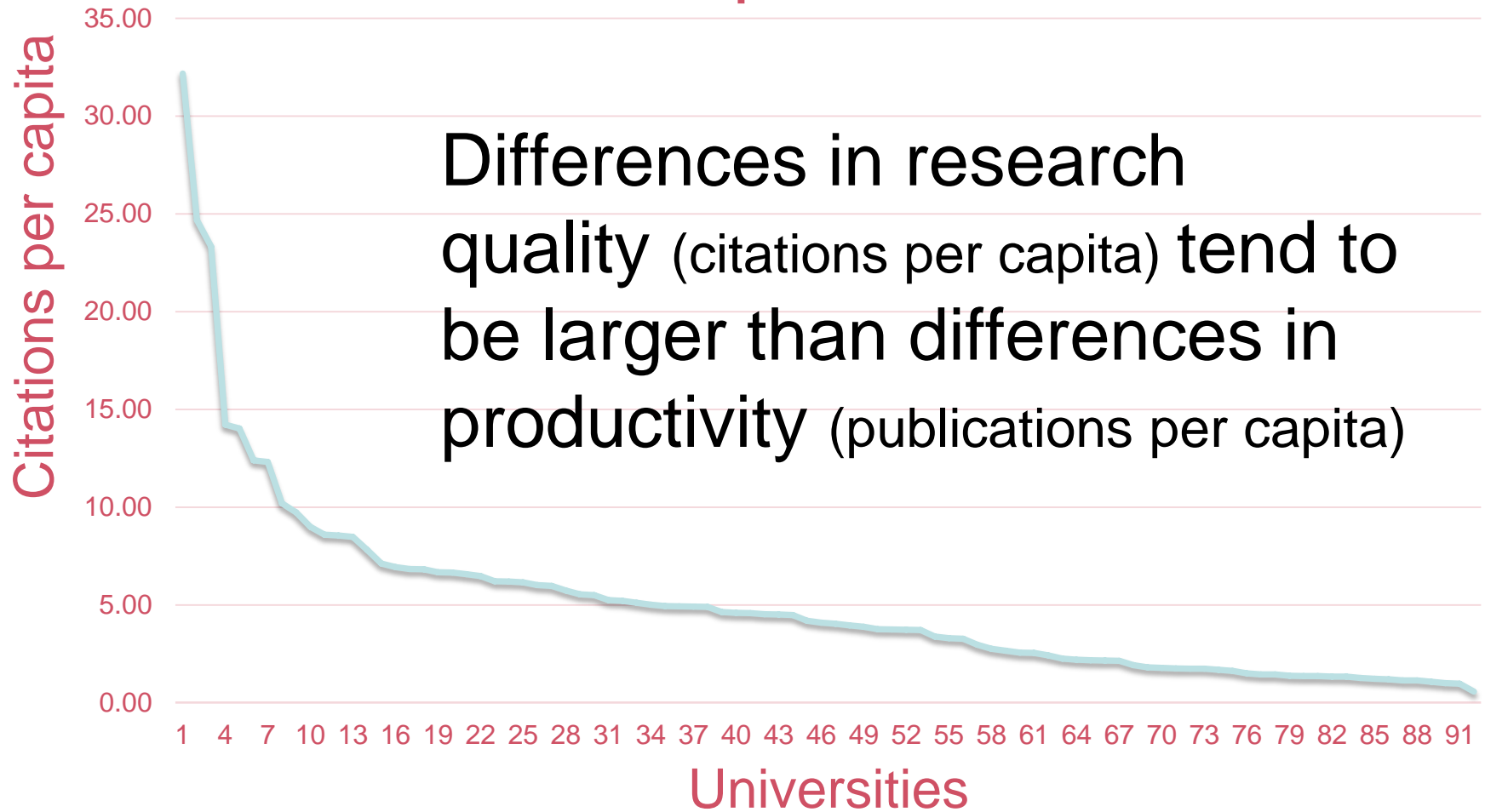


**Distribution of publications per capita among
European universities.
Computer science**



Distribution of citations per capita among European universities.

Computer science



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
 - Generalist vs specialist
 - Size
 - Public vs private
 - PhD intensity
 - Hospital
 - Internationalization
 - Student load
 - Regional level
 - GDP per capita
 - No beds per 100,000 inhabitants
 - GERD per capita
 - 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

	Agri	Bio	Chem	Comp	Earth	Econ	Eng	Env	Health	Mater	Math	Medic	Life	Phys
Harvard														
Michigan-Ann Arbor														
MIT														
UC Berkeley														
Toronto *														
ETH Zurich														
Nanyang Tech U														
Nat U Singapore														
Stanford														
Oxford														
UC Los Angeles														
Hong Kong U														
Georgia Tech														
Cambridge														
UC San Diego														
Maryland														
Minnesota														
Washington-Seattle														
Wisconsin-Madison														
Yale														
Hong Kong Polyt U														
Johns Hopkins														
McGill *														
Nat.I Cheng Kung U														
Nat.I Chiao Tung														
New York														
Northwestern														

Eindhoven														
Goteborg														
Hong Kong U S&T														
Jilin														
KLU														
King's College														
Korea Adv Inst S&T														
Kyoto														
Kyushu														
Leiden														
Nagoya														
Oregon														
Peking														
PennState- U Park														
Pohang														
Radboud Njimegen														
Seoul National U														
Southeast														
Sungkyunkwan														
Swedish U Agr Scien														
TU Denmark														
Edinburgh														
Manchester														
Southampton														
Paris V														
Pierre Marie Curie														
UCL														

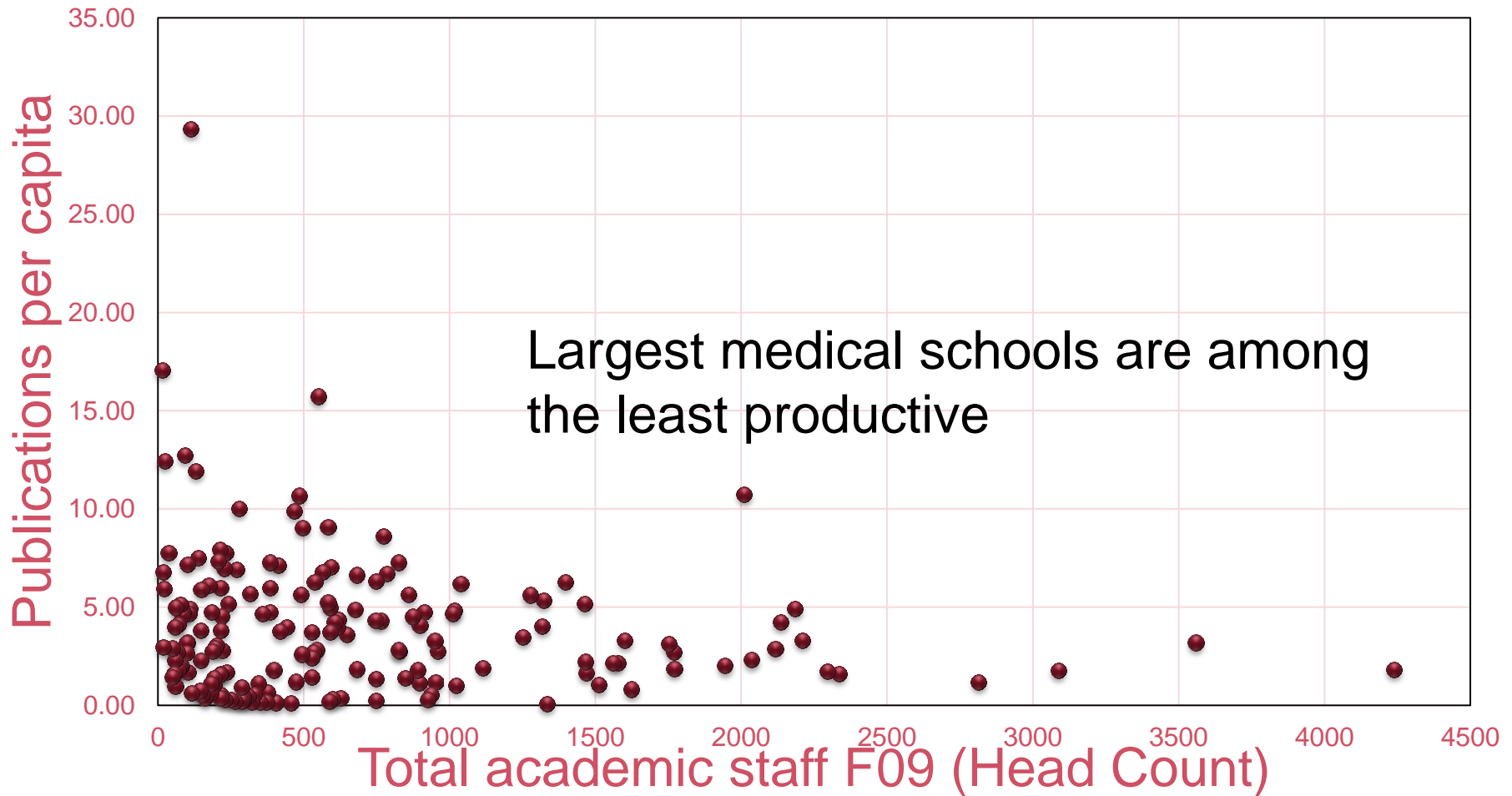
Should we concentrate research funding in a small number of large universities?

Underlying rationale: **economies of scale**

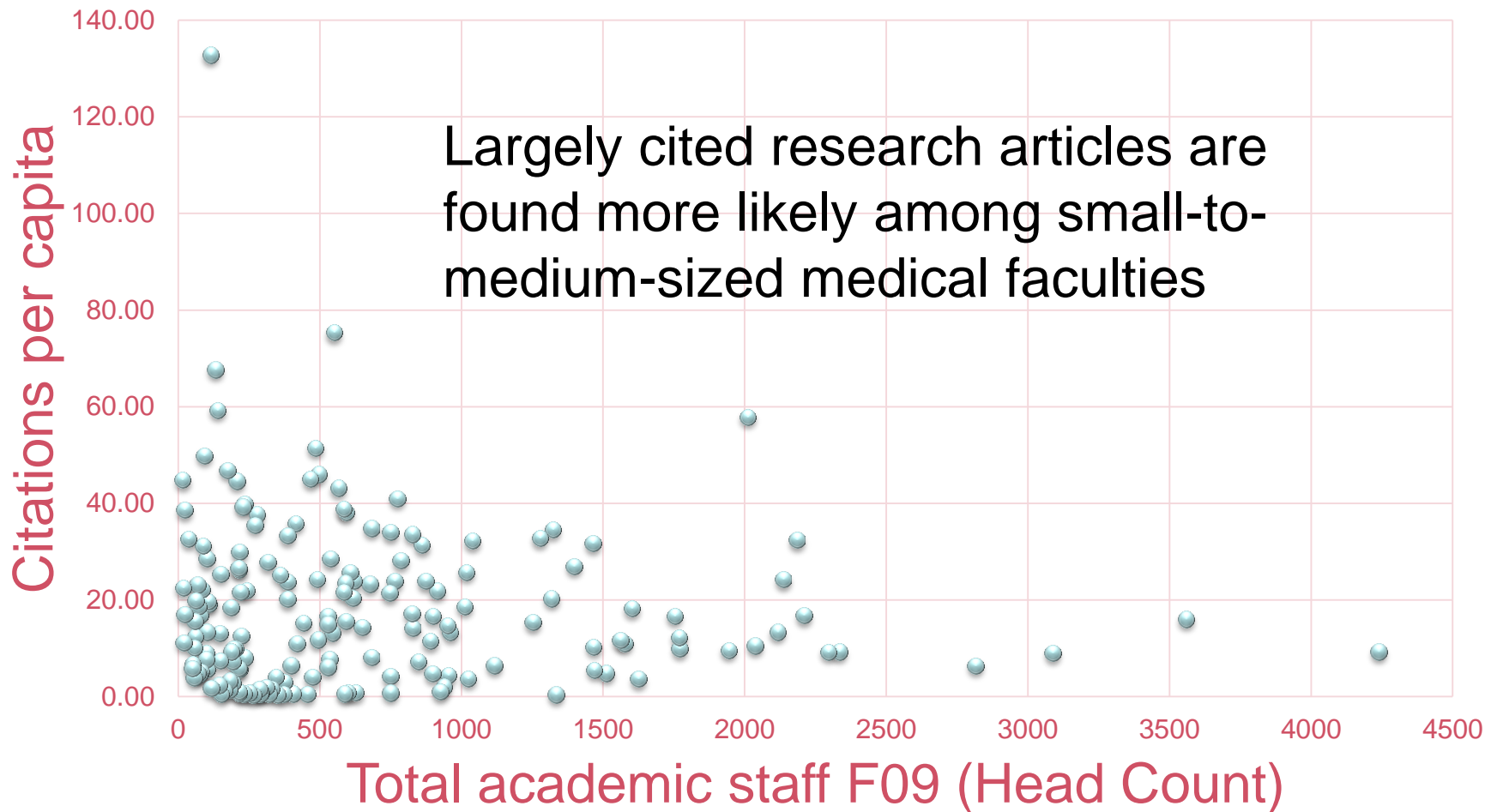
Clearly separate empirical issues:

- 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

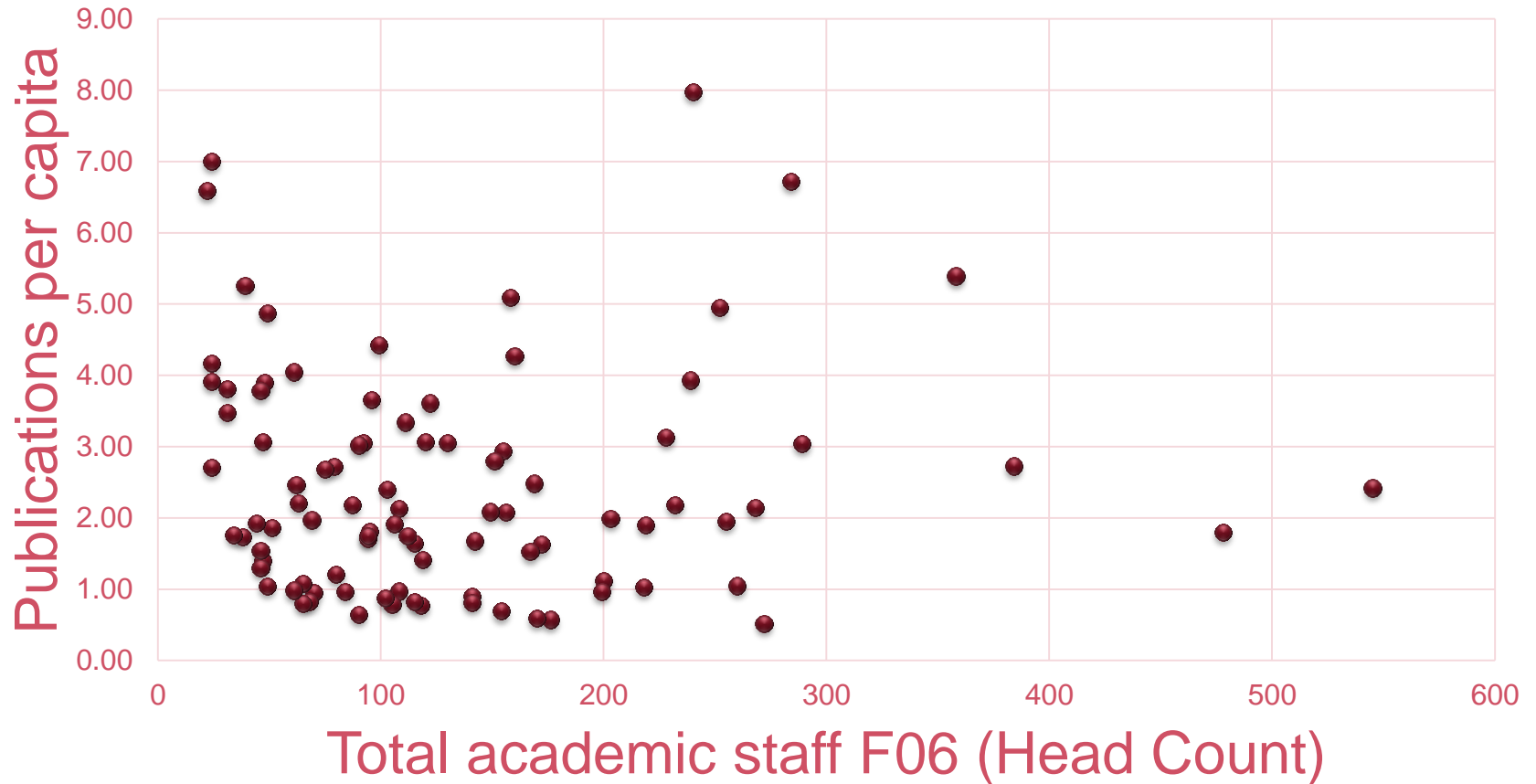
Publications per capita by size of academic staff in European universities. Medicine



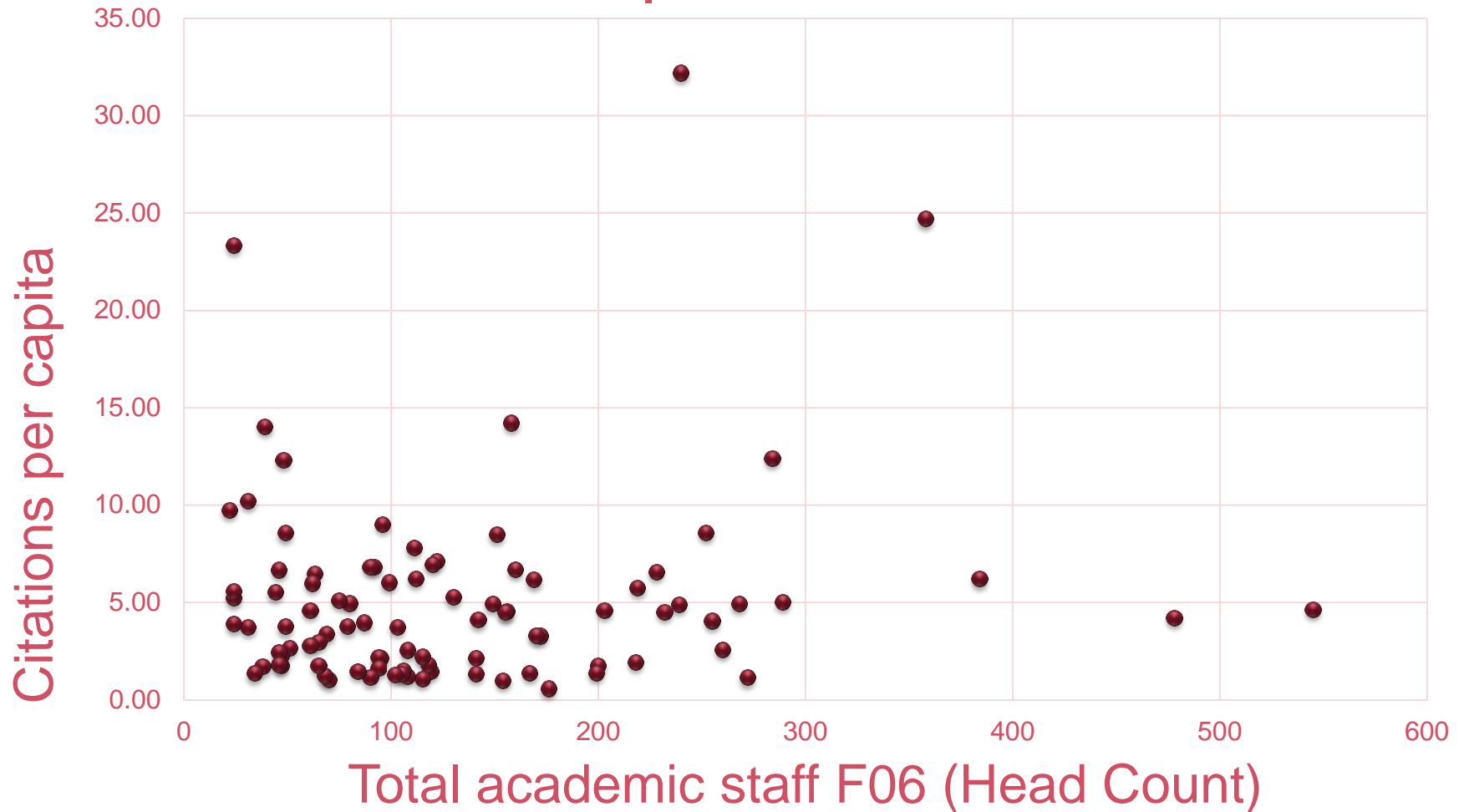
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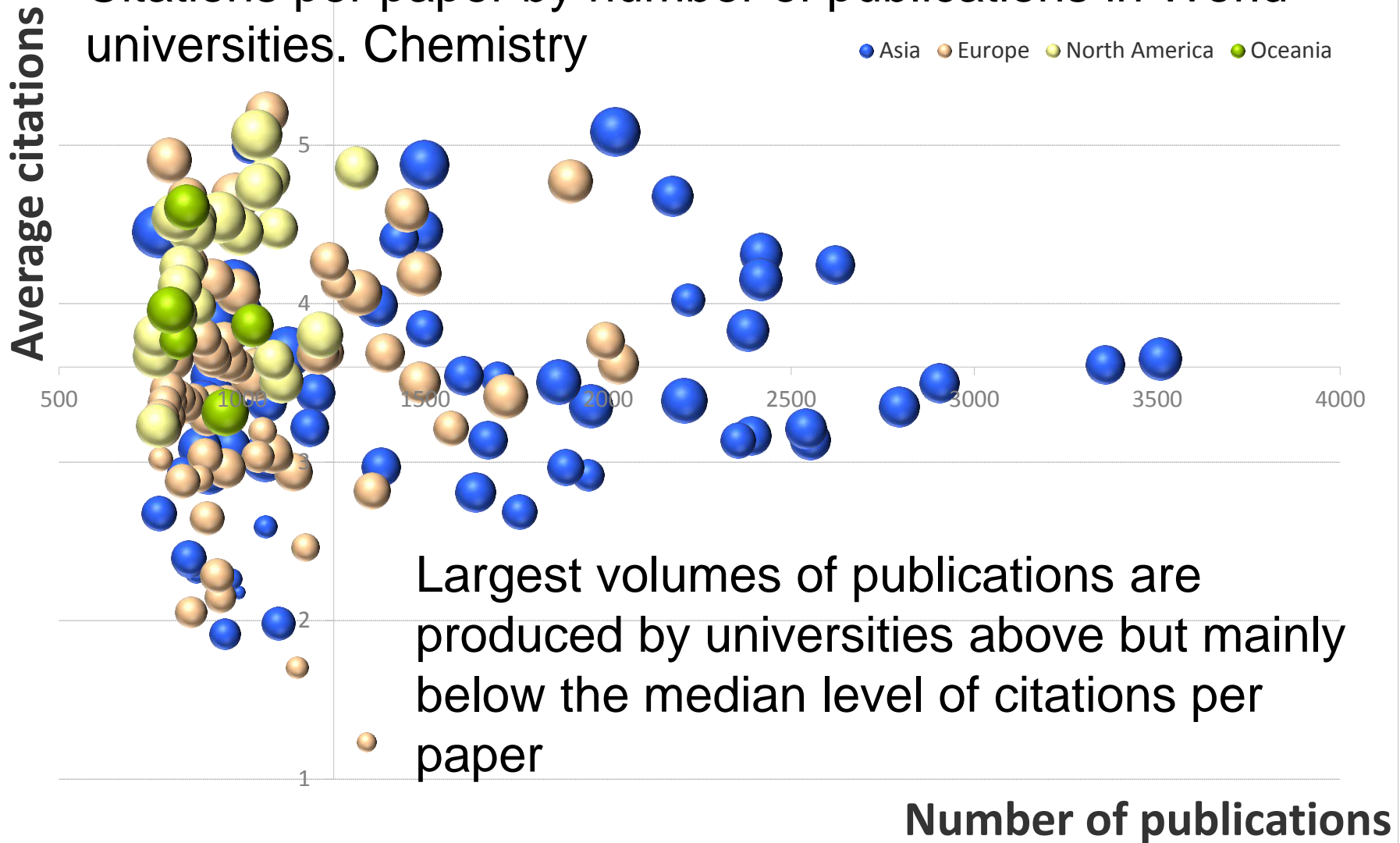
Publications per capita by size of academic staff in European universities. Computer science



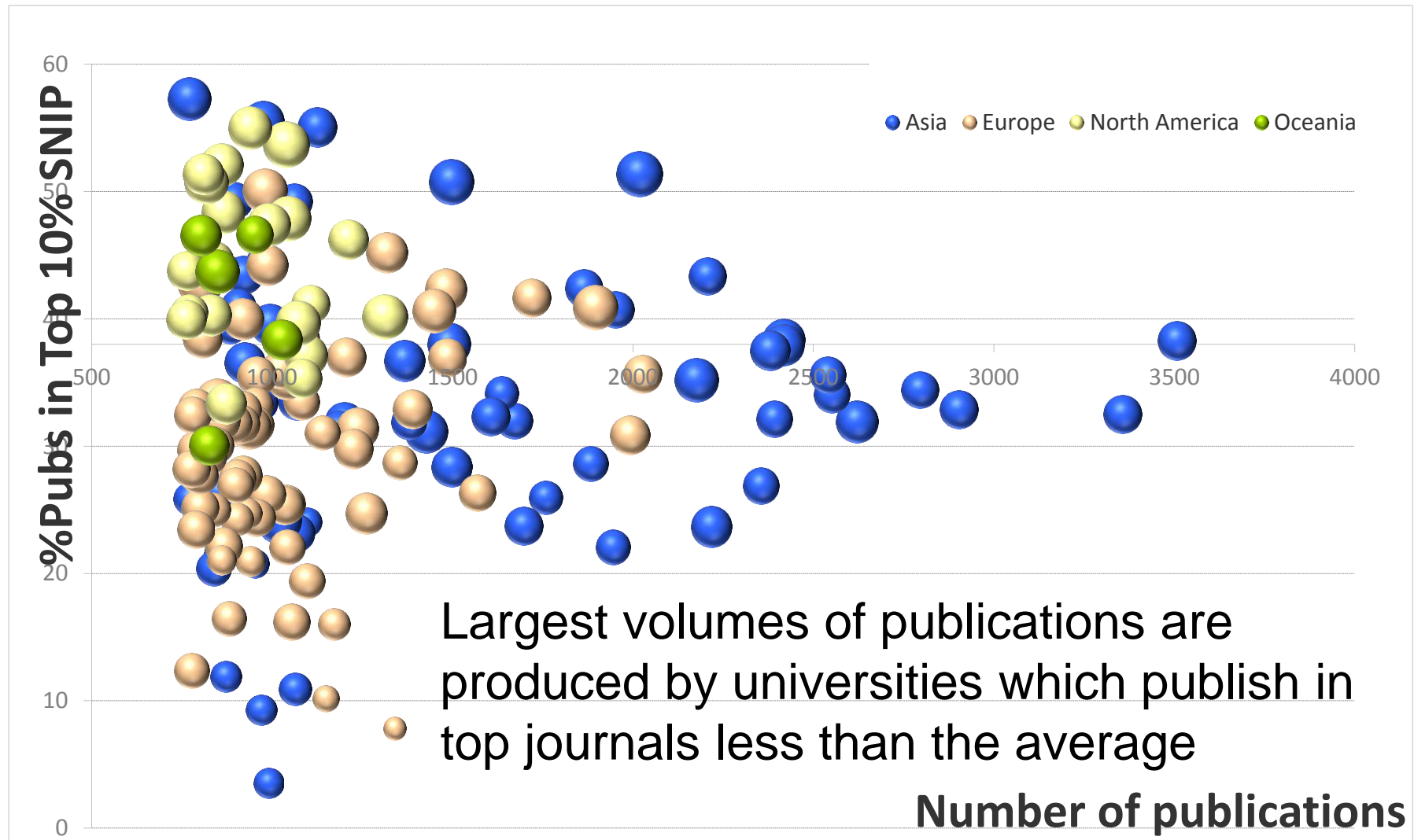
Citations per capita by size of academic staff in European universities. Computer science



Citations per paper by number of publications in World universities. Chemistry



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



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 | - Publications |
| - PhD students | - Citations |
| - Excellence indicators | - 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

Bonaccorsi A., Colombo M.G., Guerini M., Rossi Lamastra C. (2014) The impact of local and external university knowledge on the creation of knowledge-intensive firms: evidence from the Italian case. *Small Business Economics*, DOI 10.1007/s11187-013-9536-2

Bonaccorsi A., Colombo M.G., Guerini M., Rossi Lamastra C. (2013) University specialization and new firm creation across industries. *Small Business Economics* DOI 10.1007/s11187-013-9509-5.

Bonaccorsi A., Colombo M.G., Guerini M., Rossi Lamastra C. (2016a) Estimating the impact of public research on entrepreneurship and firm growth. *In preparation*

Bonaccorsi A., Colombo M.G., Guerini M., Rossi Lamastra C. (2016b) Quality of research and firm growth. *In preparation*

Pockets of excellence

Bonaccorsi A. (2016) Addressing the disenchantment. Universities and regional development. *Journal of Economic Policy Reform*, forthcoming.