

New (and old) disparities of European knowledge production: the case of research collaboration networks

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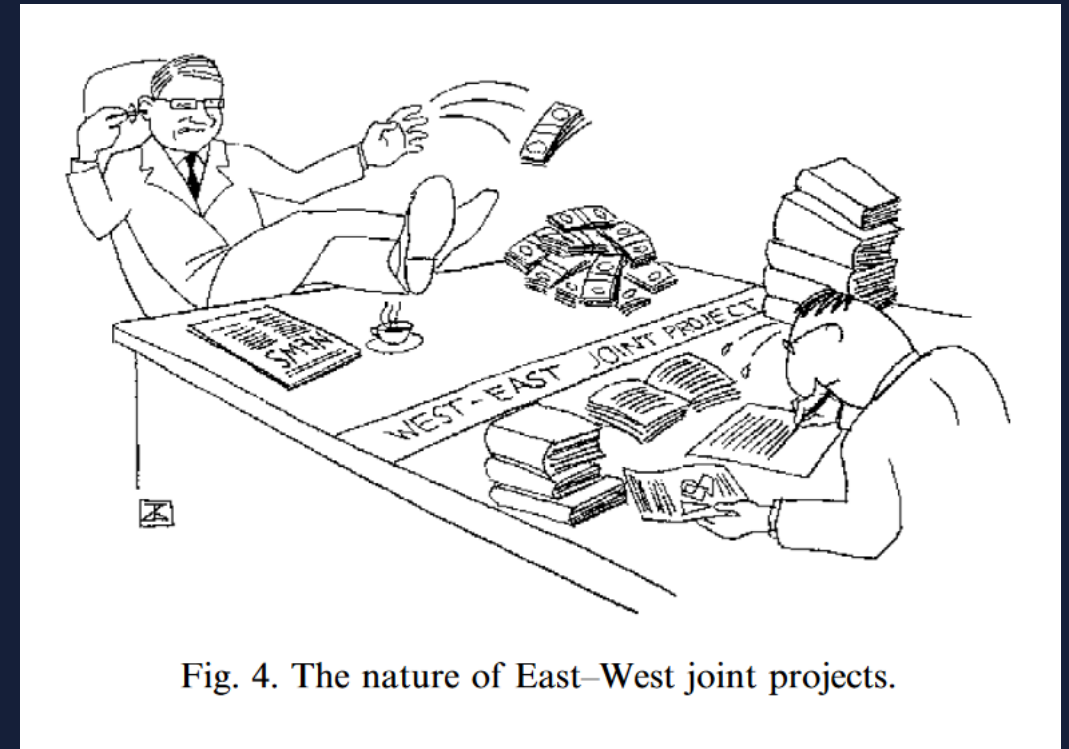
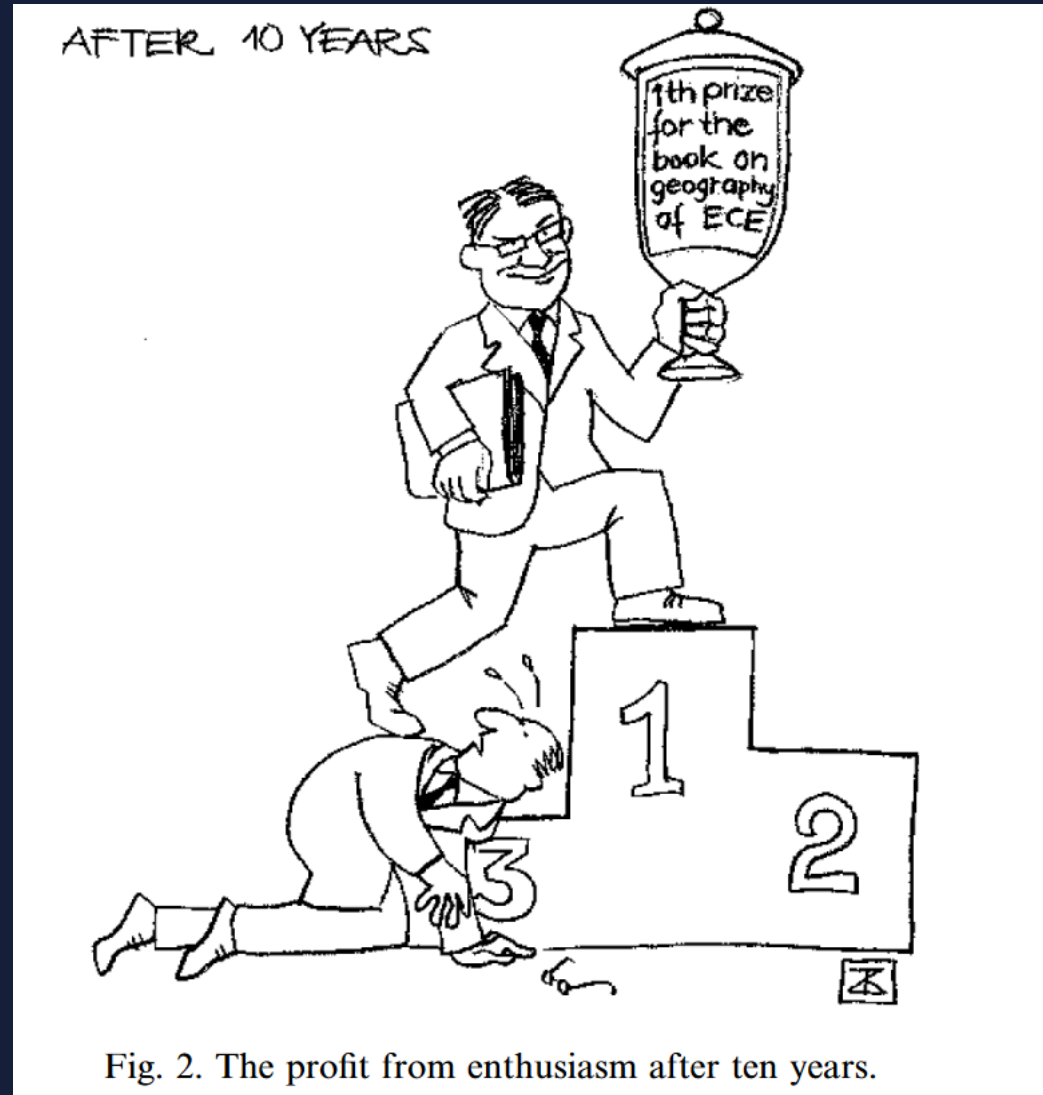
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Focus of the presentation

- Growing impact of the role of scientific collaborations in the past decades – inherent development of international academic field, international scientific policy initiatives (Bukvova 2010; Melin, Persson 1996)
- Levels of scientific collaborations: from individuals to institutions (Katz, Martin 1997)
- Educational (training programmes, supervision) and research (joint projects, publications) collaboration forms, co-operations of academic, business, industrial actors (de Wit-de Vries et al. 2019; Koitaranta 2020)
- Analysis of scientific collaborations: influence on scientific production (patents, number and place of publications, citations, impact factor), patterns of collaborations (network characteristics, position of participants, socio-economic attributes, geographic location)

Inequalities of scientific collaborations

- Project-based European research collaborations, financed by national and international donor organisations
- Formalised collaborations: specified topic, defined time span, resources to objectives
- Globalisation of knowledge production: fruitful collaborations or the emergence of unequal power relations? (Paasi 2015)
- Evolution of a ,Western' hegemony regarding different forms of knowledge production (publications, collaborative researches) (Paasi 2015; Timár 2004)
- Inequalities in practices of division of labour and the utilization / impact of produced knowledge
- ,Western' partners: conceptualisation, participants with peripheral position: empirical background work, without making their knowledge universally accepted (Jehlička 2021; Timár 2004)



Timár (2004): More than 'Anglo-American', it is 'Western': Hegemony in geography from a Hungarian perspective

European research collaborations and their disparities

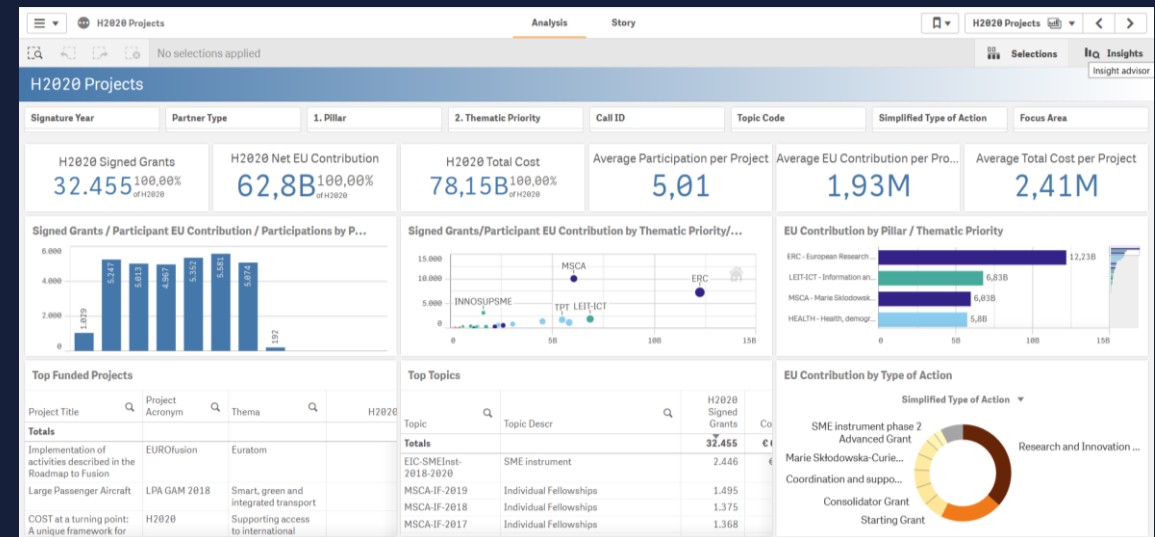
- Collaborative research and innovation programmes initiated by the EU are also characterised by these asymmetric power relations
- Important EU goal: fostering co-operations among member states for stimulating balanced territorial development and integration
- Research programmes for establishing and supporting EU policies (pl. ESPON, EU Framework Programmes for Research and Technological Development – FP1-7, Horizon)
- FP, Horizon: securing positions of the European Union in global knowledge production, removing barriers to innovation, enhancing perspectives of collaborative innovation actions between public and private sectors
- Unequal positions in collaboration networks – participation in research projects, differences in the obtainment of financial resources

European research collaborations and their disparities

- Main ,dividing line': between ,old' and ,new' members of the EU – the latter only gained about the 5% of financial resources in Horizon 2020 programme (EC 2018)
- Huge (20-25x) differences in per capita EU financial contributions too – Denmark → Bulgaria, Romania (Fisch 2017, 2018)
- East-Central European countries (+Germany, France, Italy) net contributors to the programme vs. winners of the division of resources: United Kingdom, Benelux states, Nordic and Mediterranean countries (Fisch 2017, 2018)
- From former FPs to H2020: strengthening positions of already central actors, subordinate role of participants with peripheral positions
- Slightly improving integration of Central and Eastern European countries within the EU regarding FP, Horizon research collaborations, BUT
- There are wide-ranging relations among central actors, while peripheral participants barely co-operate with each other and are linked to collaboration networks via central actors (Roediger-Schluga, Barber 2008; Breschi, Cusmano 2004)

Main objective of the research, methodology

- Analysing inequalities of the European scientific field and knowledge production based on information on Horizon 2020 research and innovation collaborations
- How to analyse that?
- CORDIS database – different attributes of institutions, project participations, financial contributions and coordinator roles
- GIS-based analyses by using geographical location data of institutions participating in H2020 research and innovation actions



Main objective of the research, methodology

- Attributes of institutions participating in H2020 initiatives (and their spatial distribution patterns) – analysing different positions of academic actors in European scientific (and socio-economic) power relations, with special regard to positions of Central and Eastern European countries
- Up to 2021 32.000 projects have started in the H2020 framework programme with 162.000 project participations and 39.000 individual participants
- Limited scope of current analysis – only ‘Societal Challenges’ pillar, only projects started between 2014-2019, only research and innovation actions, only 39 European countries
- 23.141 project participations and 8.496 individual participants
- Data on geographical location of participating institutions (address) – GIS tools (geocoding)
- Adjusting geocoded address data to administrative structures – LAU (local administrative unit) level
- 2762 localities (cities, other settlements, lower administrative structures) with H2020 project participant institutions
- (Descriptive) analysis of different attributes of institutions, projects, EU financial contribution and coordinator role

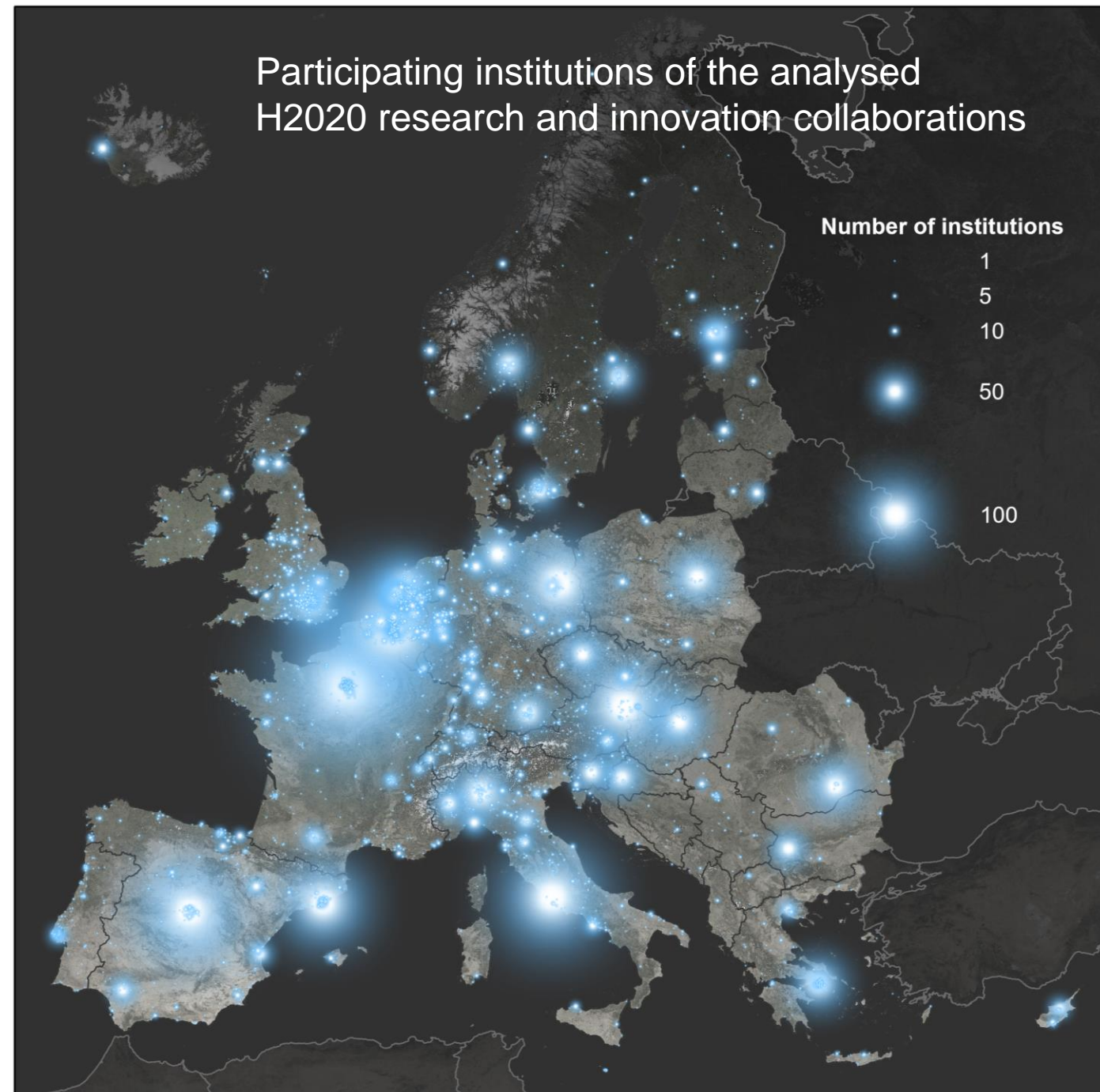
Spatial differences in the distribution of H2020 collaborations

Absolute differences in European spatial patterns of institution, project and financial contribution attributes based on LAU-level localization – maps with proportional and graduated symbols

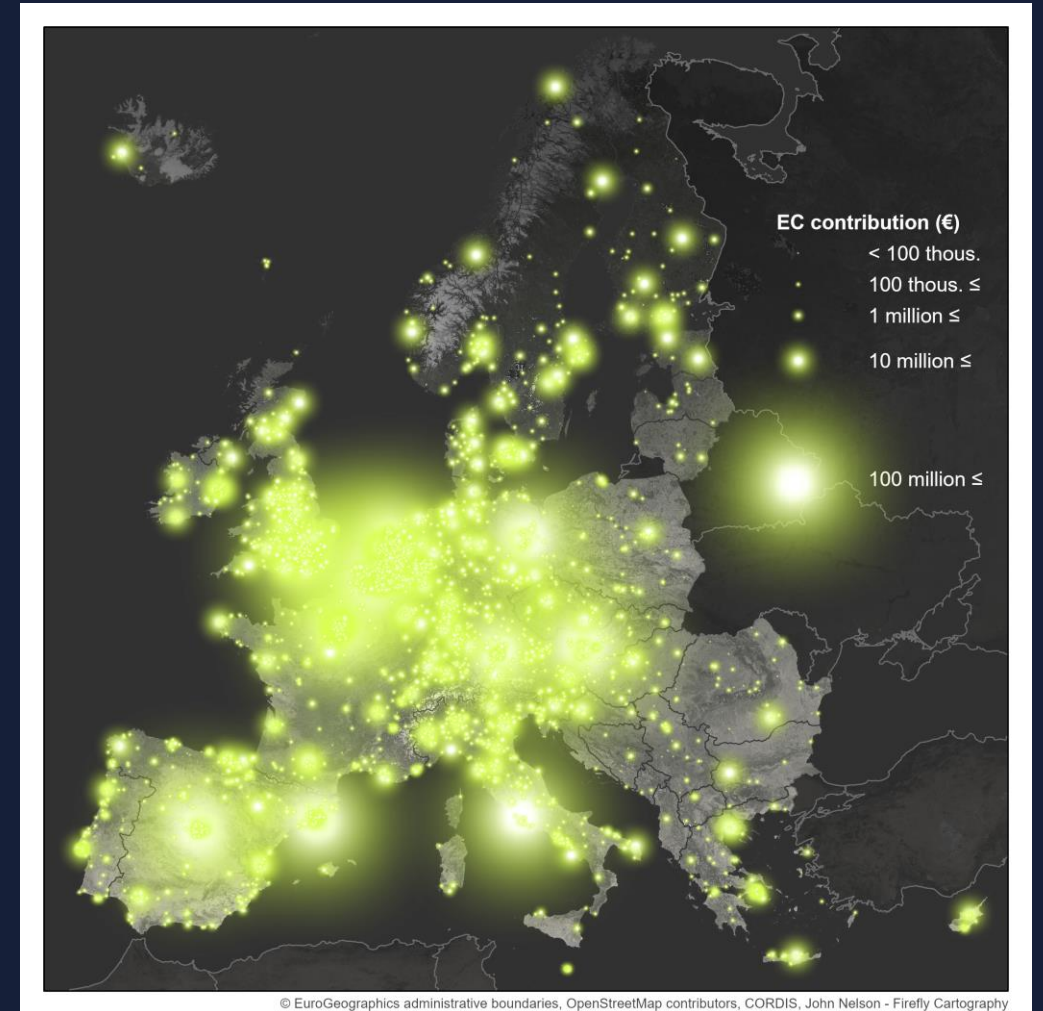
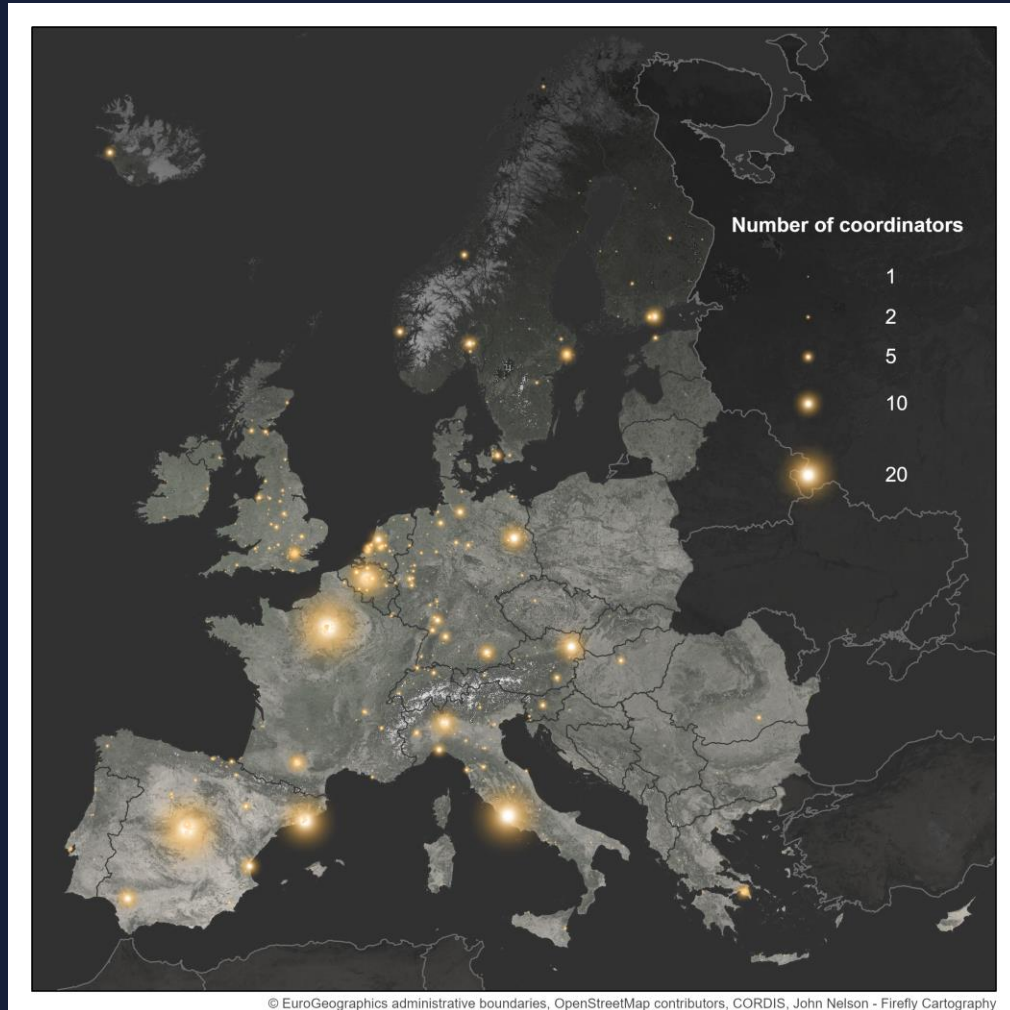
Dominance of European metropolises

Thicker density (and bigger weight) of participants in Western Europe

In Central and Eastern Europe only capital cities and some smaller local centres can join to international research networks



Coordinators (L) and EC contribution to projects (R) of the analysed H2020 research and innovation collaborations



Relative positions in spaces of H2020 collaborations

Representation of relative positions on choropleth maps

Distorting effect of administrative structures -> using a regular hexagonal grid instead

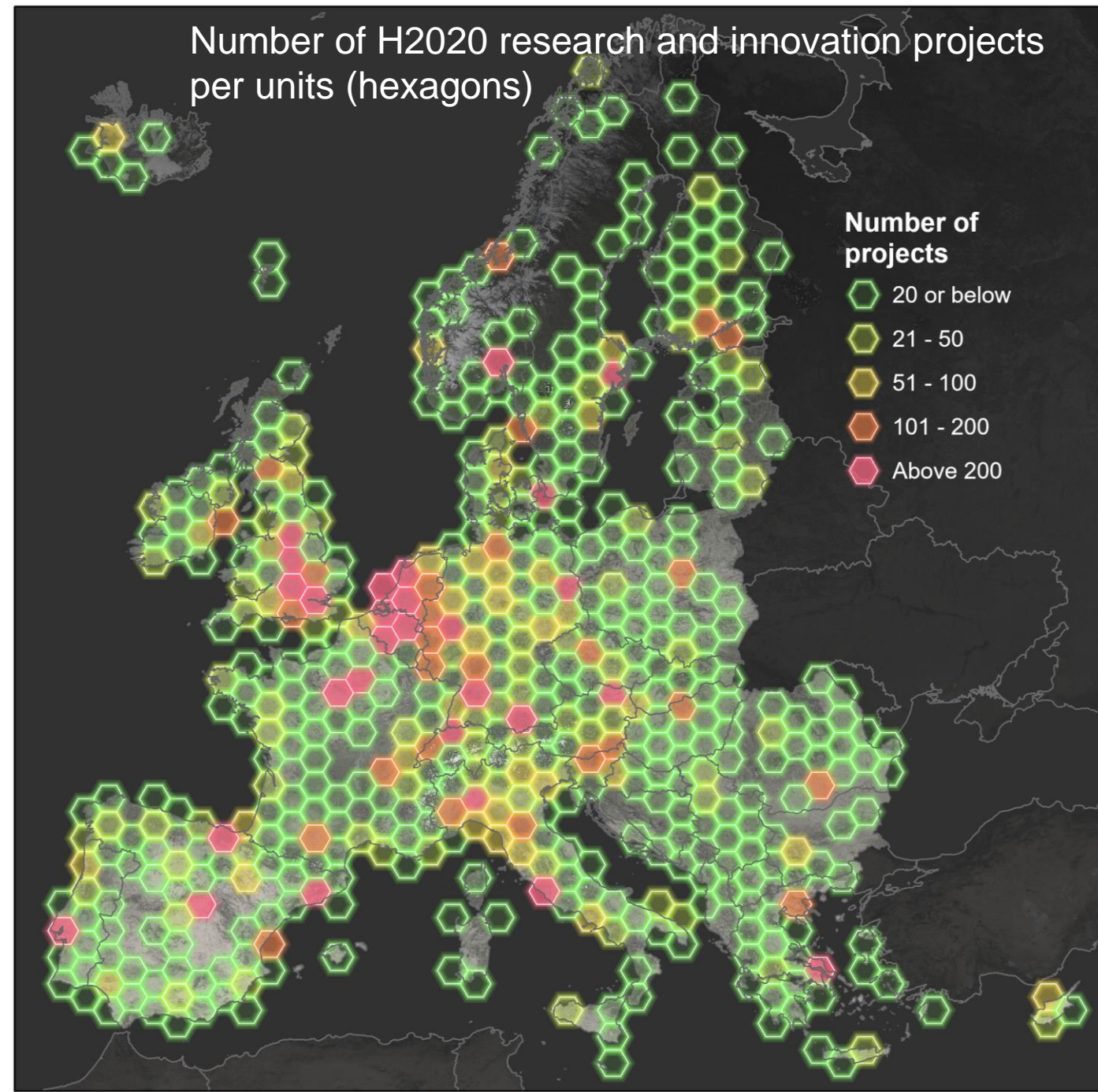
Position of W-European urban areas (Atlantic core within the scientific space)

Centres in the periphery (metropolises)

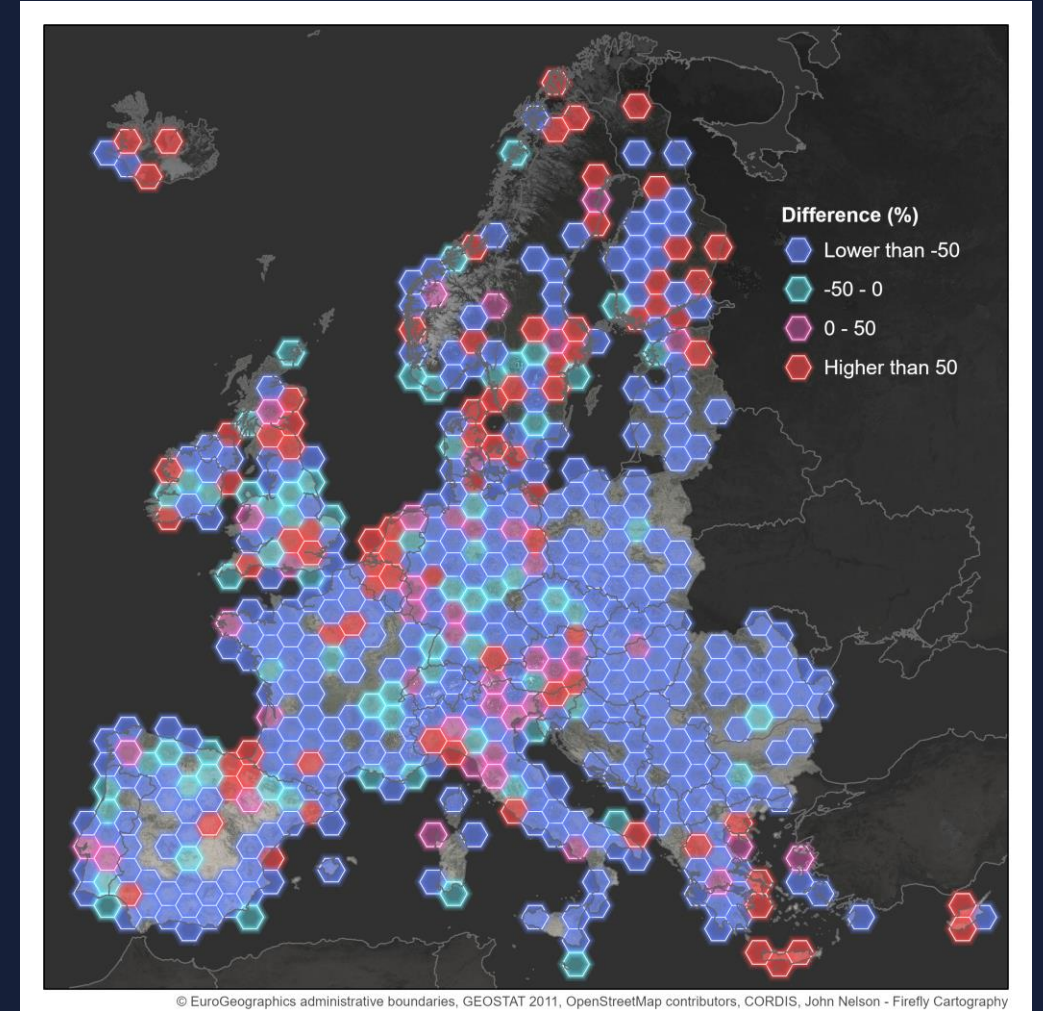
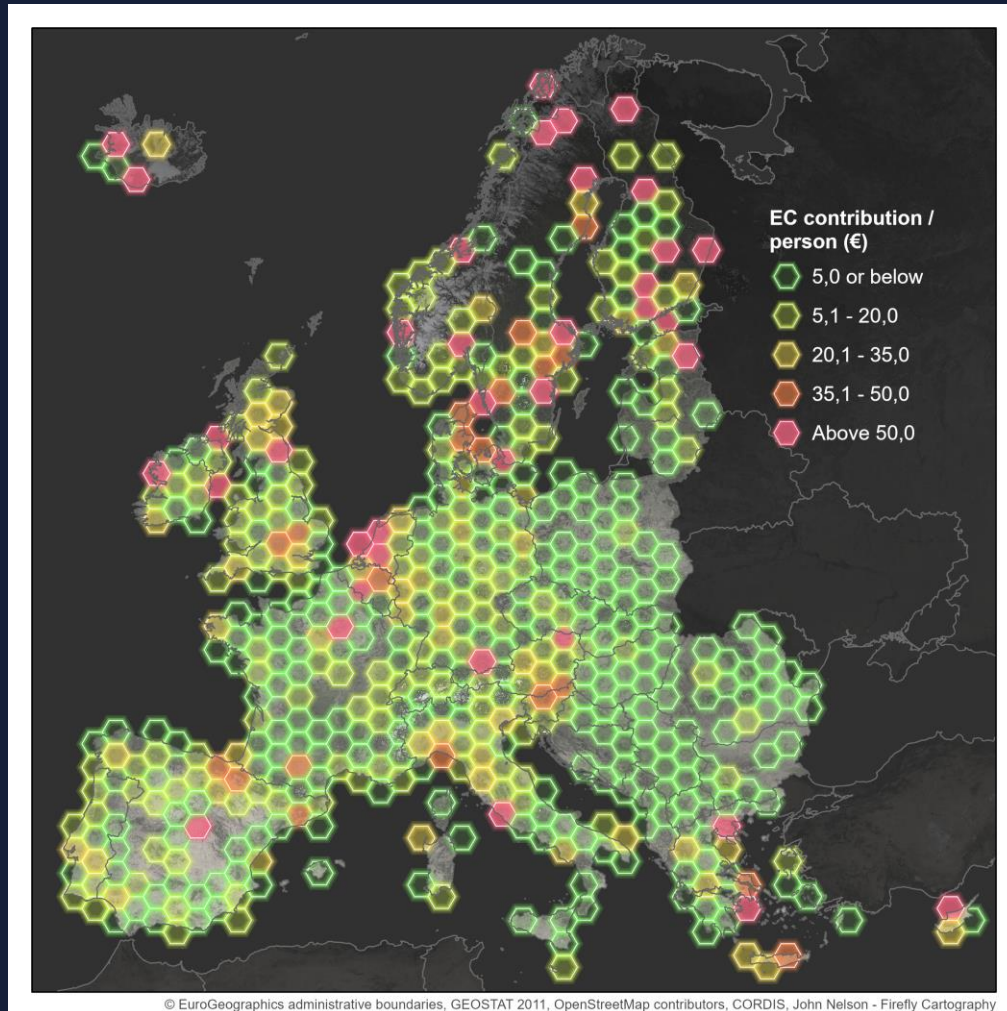
In CEE countries only capital city regions have favourable positions

Further attributes to be analysed

- Comparison between project attributes
- Per capita representation
- Differences between project and population distributions



The amount of EC contribution per person considering H2020 research and innovation actions (L), difference between the spatial distribution of EC contribution and population (R)



Spatial concentration of H2020 collaborations

Analysed aspects have already shown significant concentration

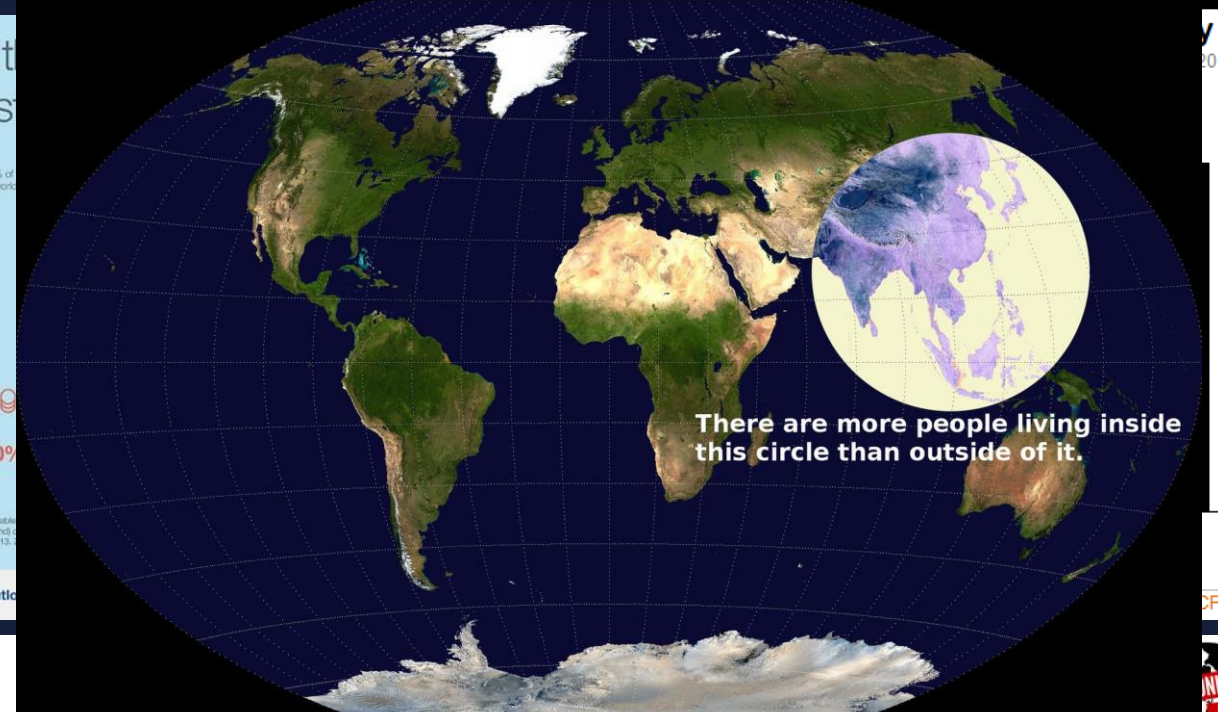
Indices measuring spatial concentration

Emphasizing societal 'gaps'

E.g. „10% of population possesses 50% of incomes”

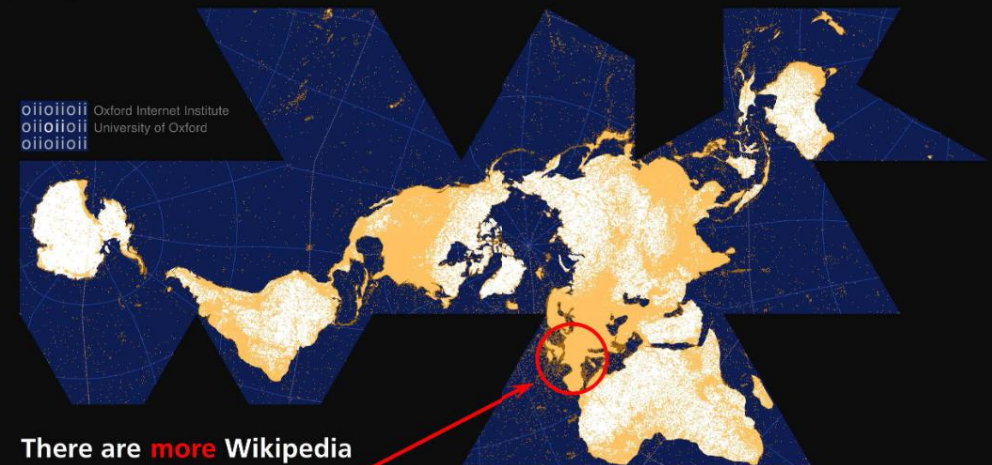
Visualization of extreme differences

Drawing virtual circles inside which there is more of something (a phenomenon, multitude of people etc.) than outside of it



The Geographically Uneven Coverage of Wikipedia

While it is an invaluable resource of knowledge for numerous users, Wikipedia's articles have a strong bias in their geographic distribution. Below map is based on 3336,473 geotagged articles in November 2012 data dumps of 44 language versions. Each article is represented by an orange dot.



There are **more** Wikipedia articles **inside** this circle **than outside** of it

This map is part of the Information Geographies project at <http://geography.ox.ac.uk>.

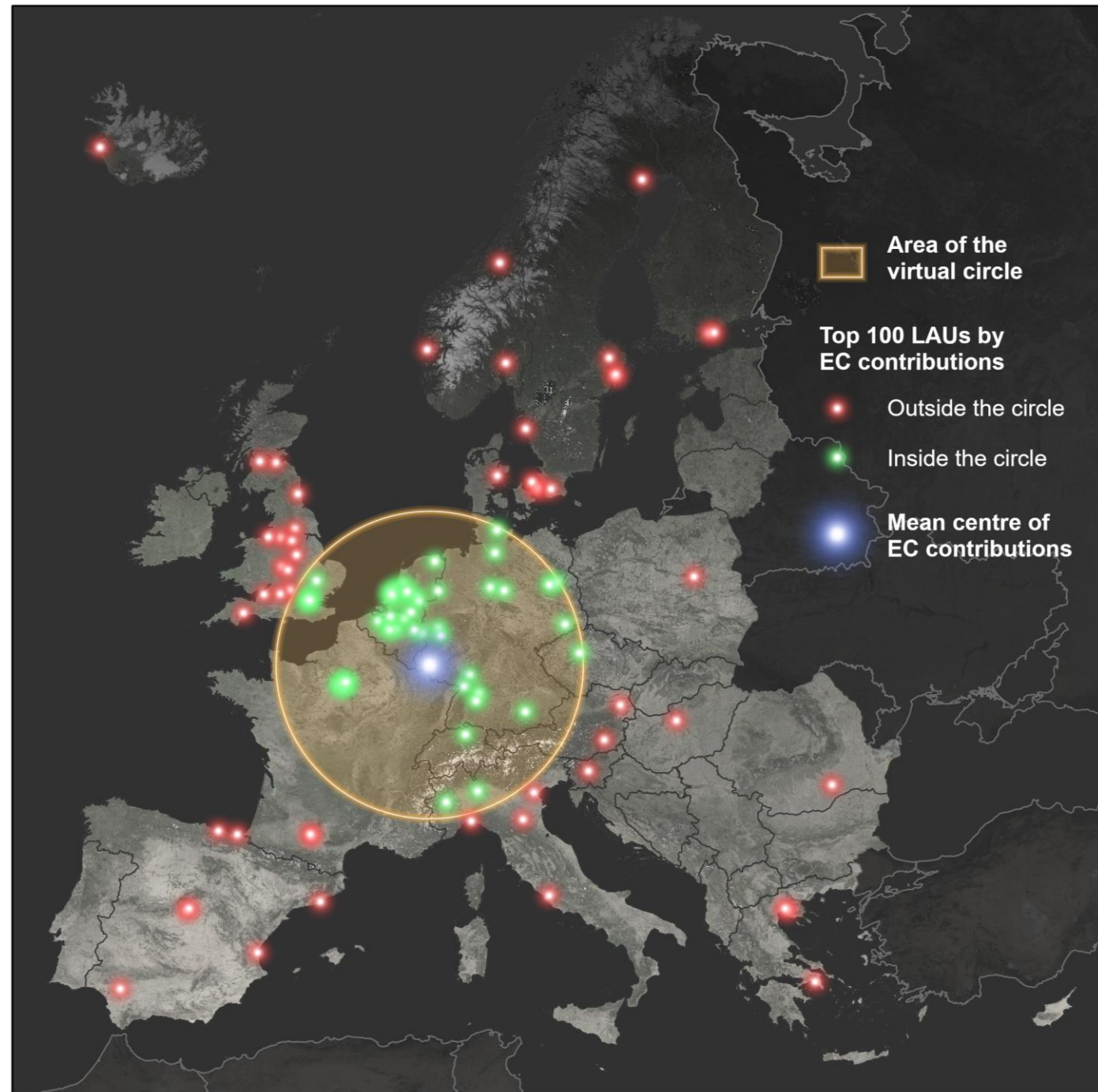
CC-BY-NC
Ralph Straumann, Mark Graham
Data sources: Wikipedia, Natural Earth

How big is the surface of the circle inside which there are more institutions, projects, EC contributions etc. than outside of it?

Process model in ArcGIS ModelBuilder by using basic GIS tools (mean centre, distance from mean centre, sum of attributes accumulated by distance, drawing buffer etc.)

Mean centre and concentration of different attributes in Western Europe

Special position of centres in peripheral areas (geographical vs. scientific position)



Summary

- EU framework programmes for stimulating the establishment of research collaborations, strengthening synergies, supporting EU policy goals
- H2020 research and innovation collaborations: characteristic spatial patterns and significant spatial concentration
- Dominant scientific centres at the European level (metropolises) also have dominant positions in spaces of collaborations in every respect
- Further active actors of these networks: other Western- and Northern-European centres and their hinterlands, capital cities, some local centres in the Mediterranean area (and to a lesser extent in CEE)
- Besides general similarities, analysed attributes show differences as well – different aspects of positions regarding institutions, projects, coordinators and financial contribution