

Fiatalodó és megújuló Egyetem – Innovatív tudásváros
A Miskolci Egyetem intelligens szakosodást szolgáló intézményi fejlesztése
EFOP-3.6.1-16-2016-00011

PATTERNS OF THE ADDED VALUE AND THE INNOVATION IN EUROPE – WITH SPECIAL REGARDS ON THE METROPOLITAN REGIONS OF CEE

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BEFEKTETÉS A JÖVŐBE

CONTENT

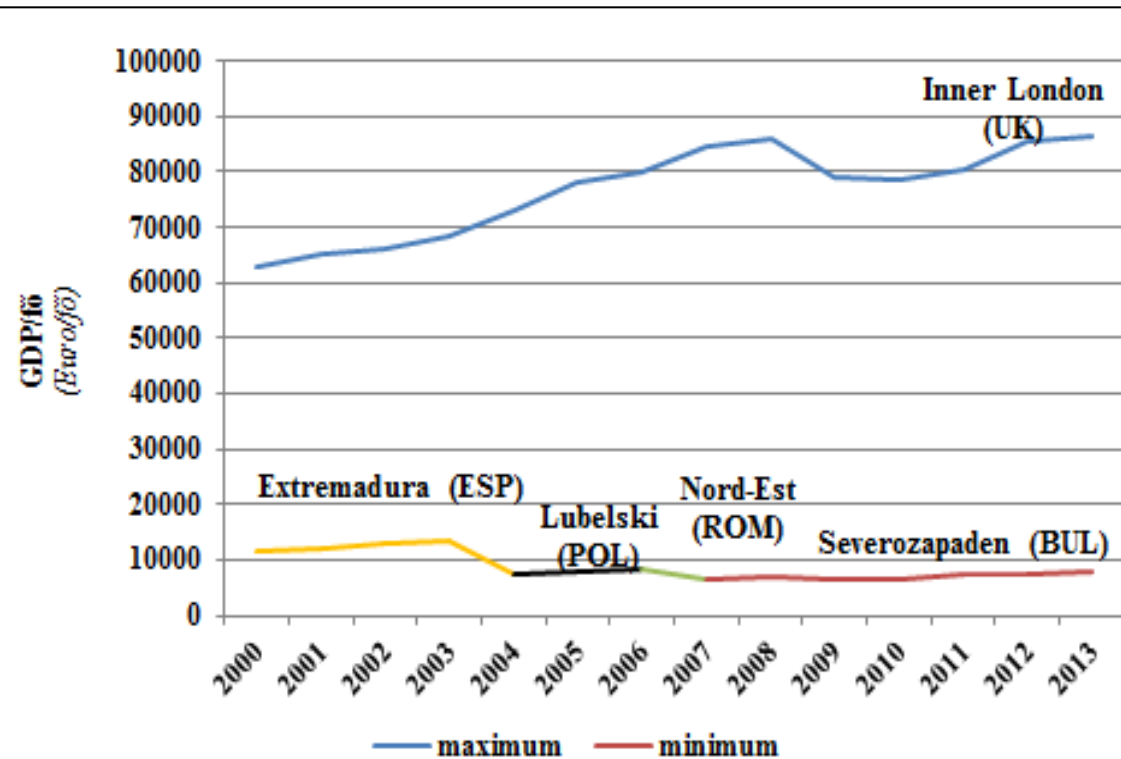
1. Territorial differences, convergence and the role of innovation
2. Patterns of GVA and patent applications
3. Local spatial autocorrelation
4. Role of metropolitan regions
5. Patterns of innovation across the European metro areas
6. Conclusion

INTRODUCTION

- The territorial social and economic inequality is one of the most fundamental characteristics of space economics (Nemes Nagy, 1990; Nagyné Molnár, 2007.). There are not two points in the space which have the same characteristics, because their economic, social and cultural parameters are different (Nagyné Molnár, 2007; Benedek-Kurkó, 2011.).

Differences of the GDP/capita (EUR/capita) in the EU

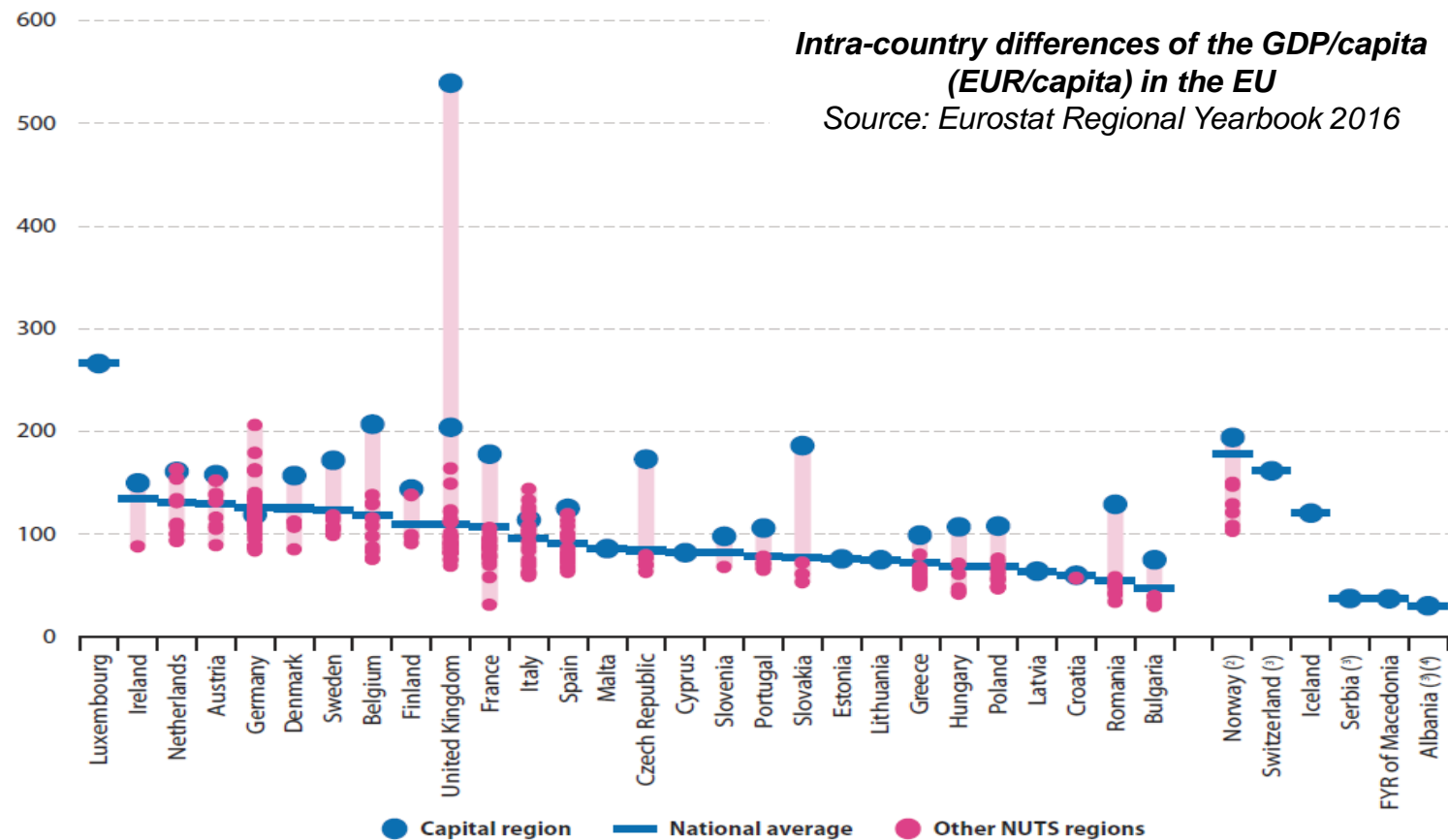
Source: own compilation based on Eurostat data



SPATIAL DIFFERENCES

- Huge intra- and inter-country differences in the EU

Figure 6.1: Gross domestic product (GDP) per inhabitant in purchasing power standard (PPS) in relation to the EU-28 average, by NUTS 2 regions, 2014 ⁽¹⁾
(% of the EU-28 average, EU-28 = 100)



CONVERGENCE OF PERIPHERIES AND THE ROLE OF INNOVATION

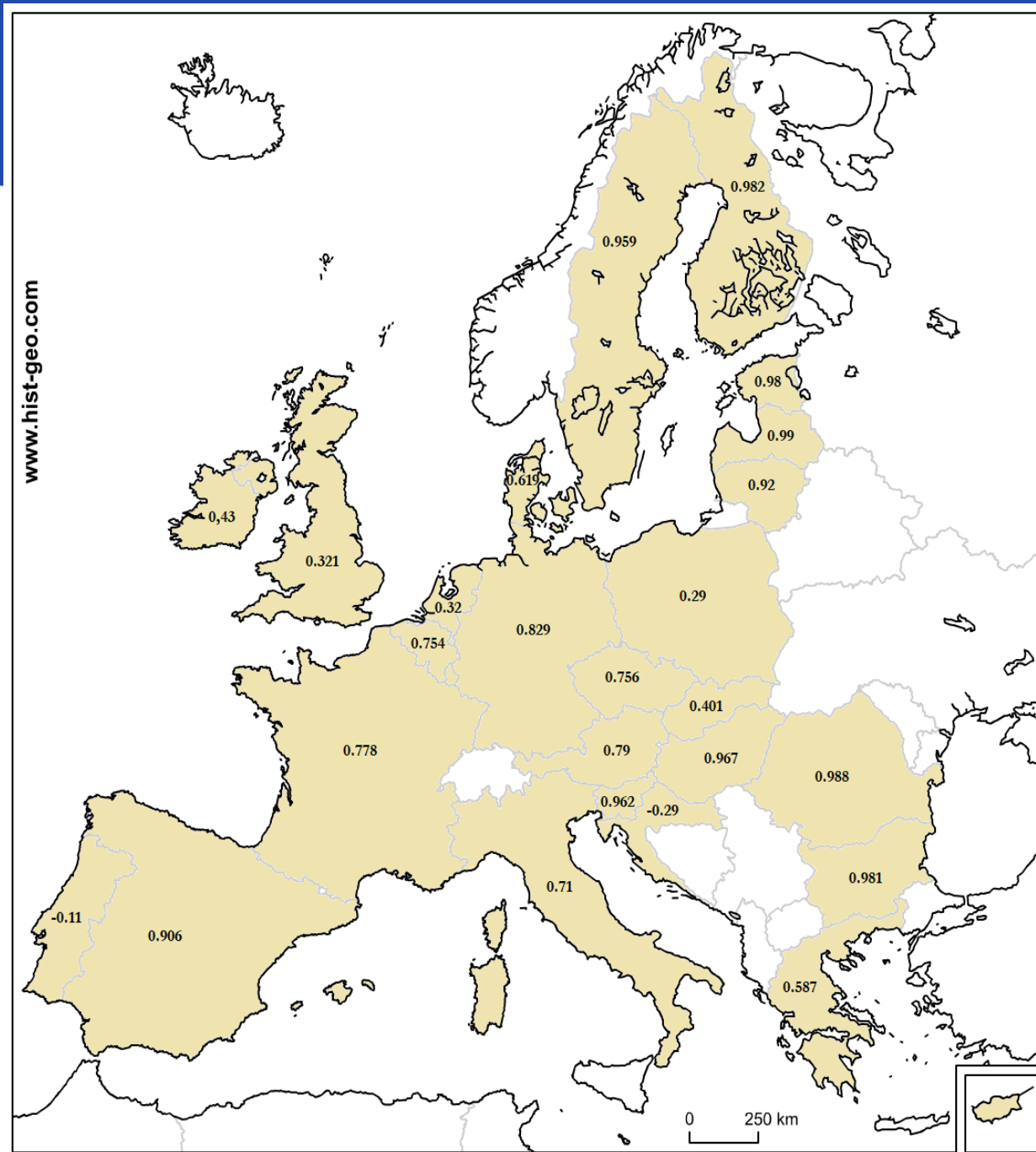
- Innovation is aimed at increasing productivity and gaining competitive advantage, thereby leading to an increase in the level of economic development of countries and regions.
- Innovative regions tend to have higher productivity and income levels, which leads to differences in regional levels of economic development. In conclusion it can be said that regional development and convergence process depends on innovation, but it also depends on other factors like institutions, infrastructure, political stability etc. (Paas-Vahi, 2012, pp. 118-119.)
- The role of “innovation factor” and its interrelation with other growth factors in regional development is considered by many specialists (Schumpeter, Romer ...) as determinant for transformation to a knowledge society. (Burnasov et al. 2014, pp. 30.)

CORRELATION OF THE GDP AND PATENT APPLICATION (2015)

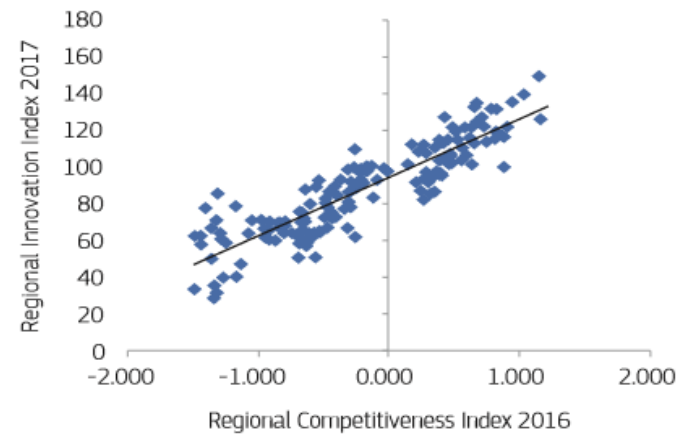
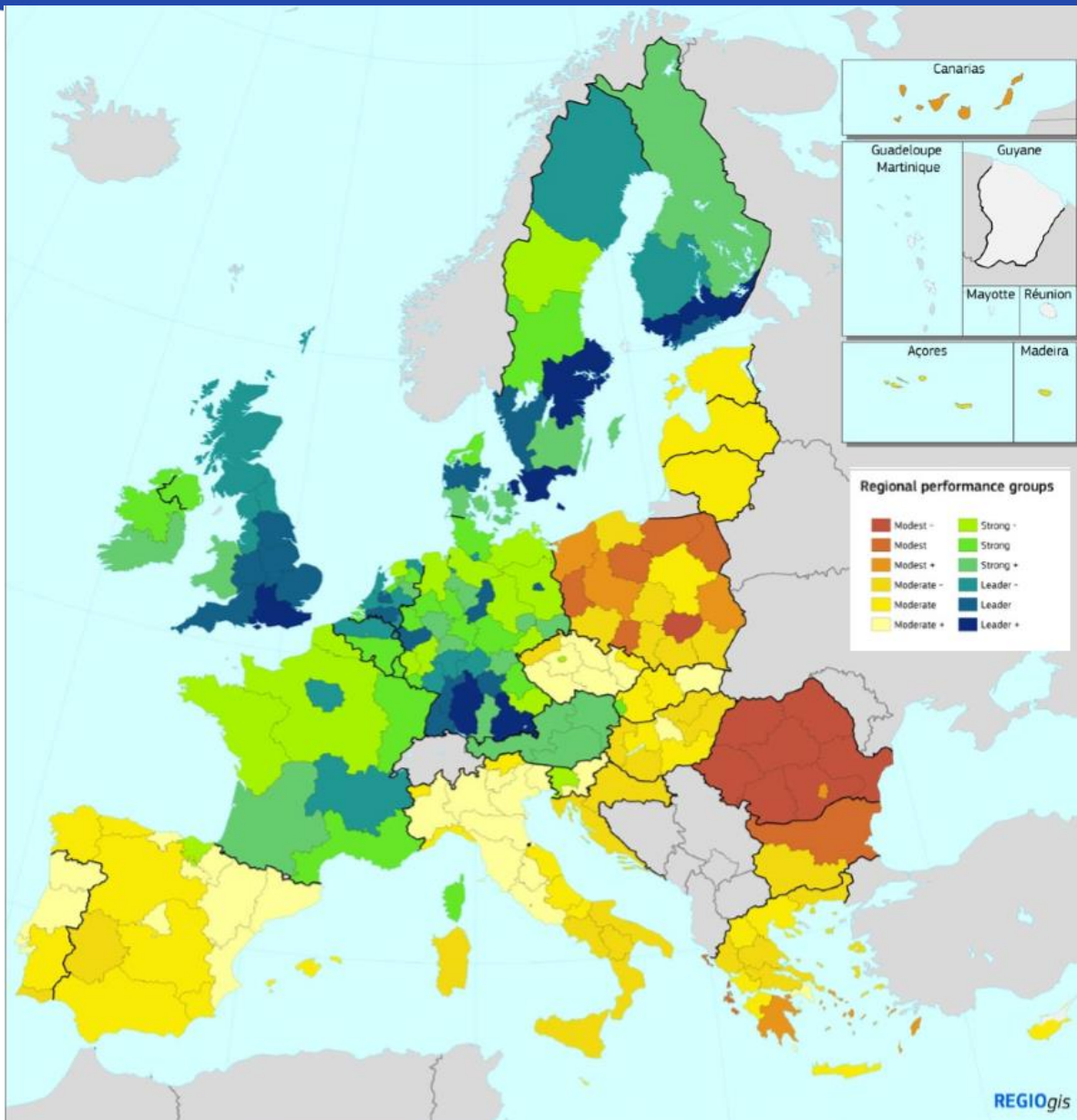
EU-28 average: 0.6454

Metropolitan regions: 0.7154

Source: own compilation based on
<http://www.hist-geo.co.uk/europe/outline-eu/europe-borders-1.php>



REGIONAL INNOVATION SCOREBOARD 2017



Source: Regional innovation scoreboard 2017
<https://ec.europa.eu/docsroom/documents/31491/attachments/1/translations/en/renditions/native>

AIM OF THE RESEARCH

- To analyse the patterns of the gross value added and the innovation (with special regards on R&D expenditures and patent applications) in the European NUTS3 regions.
- To identify the major tendencies of concentration in the European spatial structure and to see the trends of change in the indicators.
- Research question:
 - whether the values of the gross value added and the patent applications are concentrating in the metropolitan areas, or there are significant hot spots outside them.

METHODOLOGY, DATA

- Analysis of spatial patterns
- Spatial autocorrelation (Local G_i^*)
- Creation of complex indicator
- Eurostat:
 - NUTS 3 data
 - metropolitan regions data
 - 2005, 2015

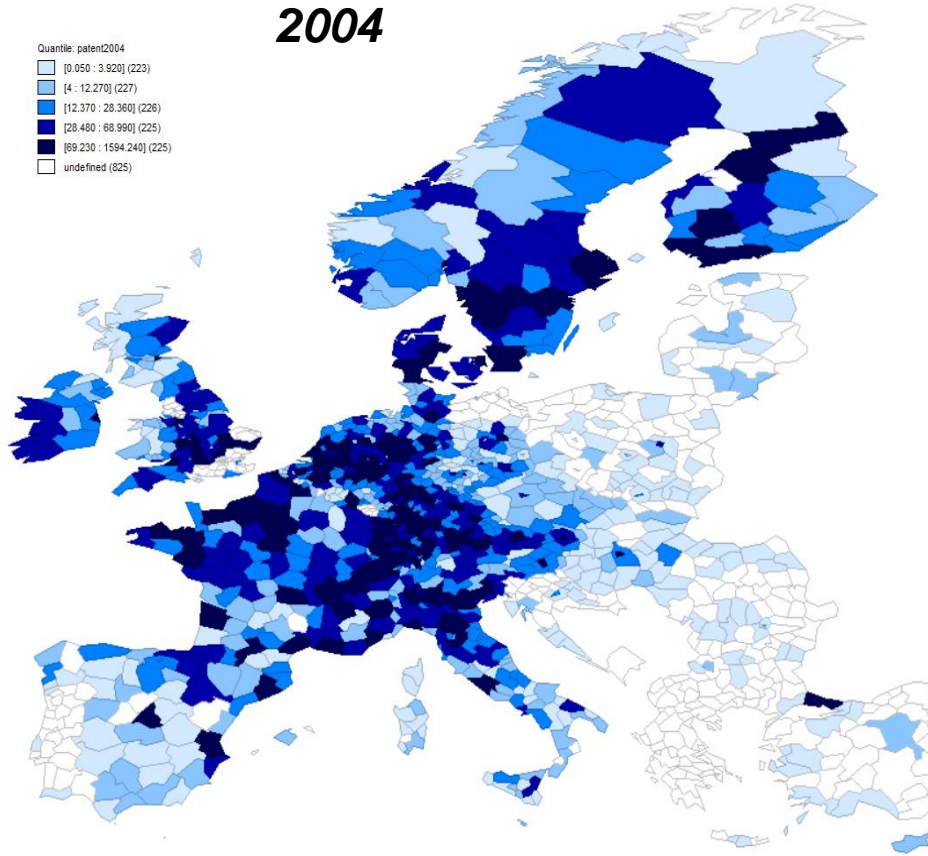
DISPARITIES OF PATENT APPLICATION ACROSS THE EU (NUTS3) – 2004, 2012

SOURCE: OWN COMPILATION BASED ON EUROSTAT DATA

2004

Quantile: patent2004

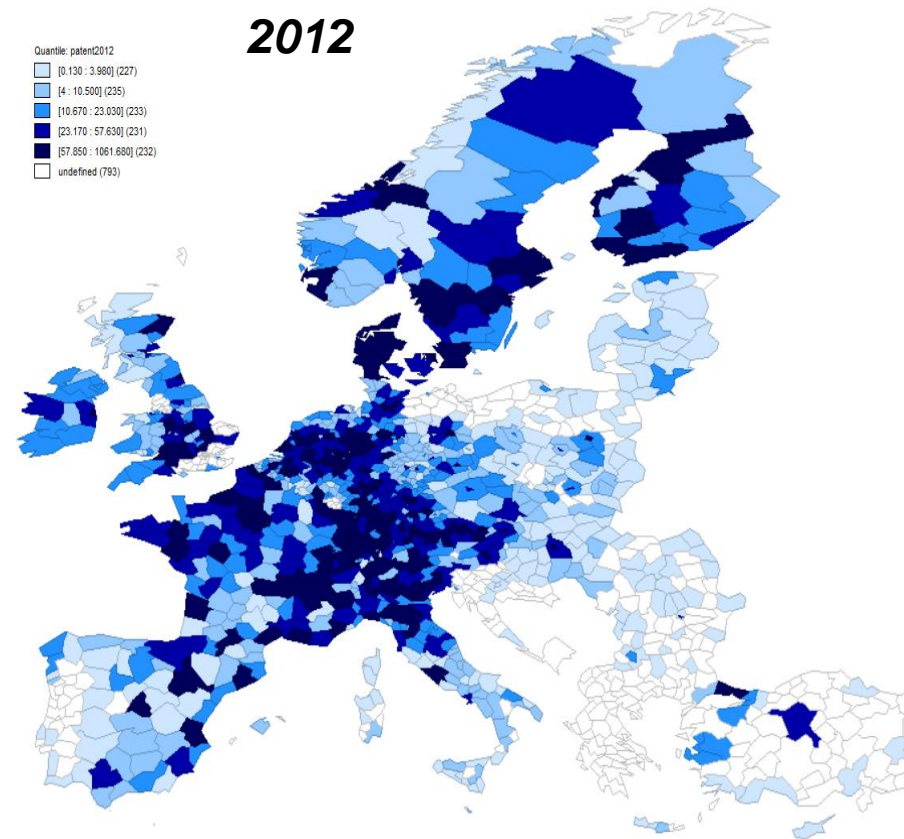
[0.050 : 3.920] (223)
[4 : 12.270] (227)
[12.370 : 28.360] (226)
[28.480 : 68.990] (225)
[69.230 : 1594.240] (225)
undefined (825)



2012

Quantile: patent2012

[0.130 : 3.980] (227)
[4 : 10.500] (235)
[10.670 : 23.030] (233)
[23.170 : 67.630] (231)
[67.850 : 1061.680] (232)
undefined (793)



- Minor changes in the dispersion
- CEE: more hot spots, increasing patent activity
- Blue banana

- Hot spots: Benelux states, southern Germany, northern Italy
- Cold spot: GRE, BLR, ROM

Central European boomerang, red octopus (Meer), blue star

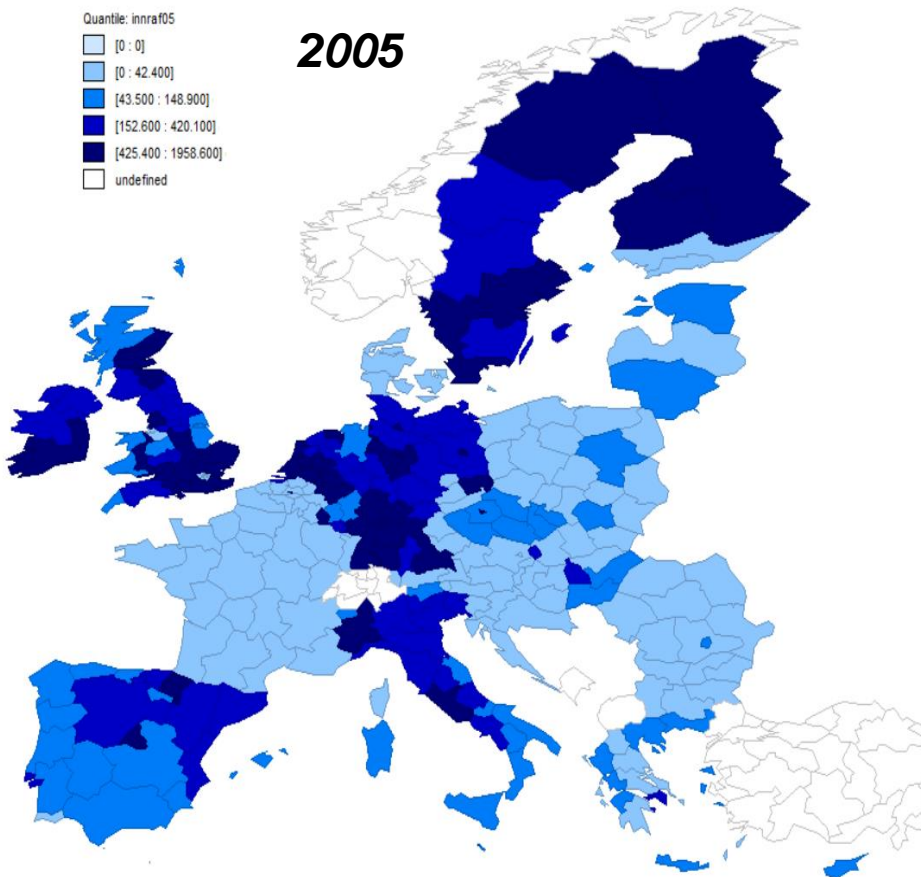
DISPARITIES OF R&D EXPENDITURES ACROSS THE EU (NUTS2) – 2005, 2013

SOURCE: OWN COMPILATION BASED ON EUROSTAT DATA

Quantile: innraf05

[0 : 0]
[0 : 42.400]
[43.500 : 148.900]
[152.600 : 420.100]
[425.400 : 1958.600]
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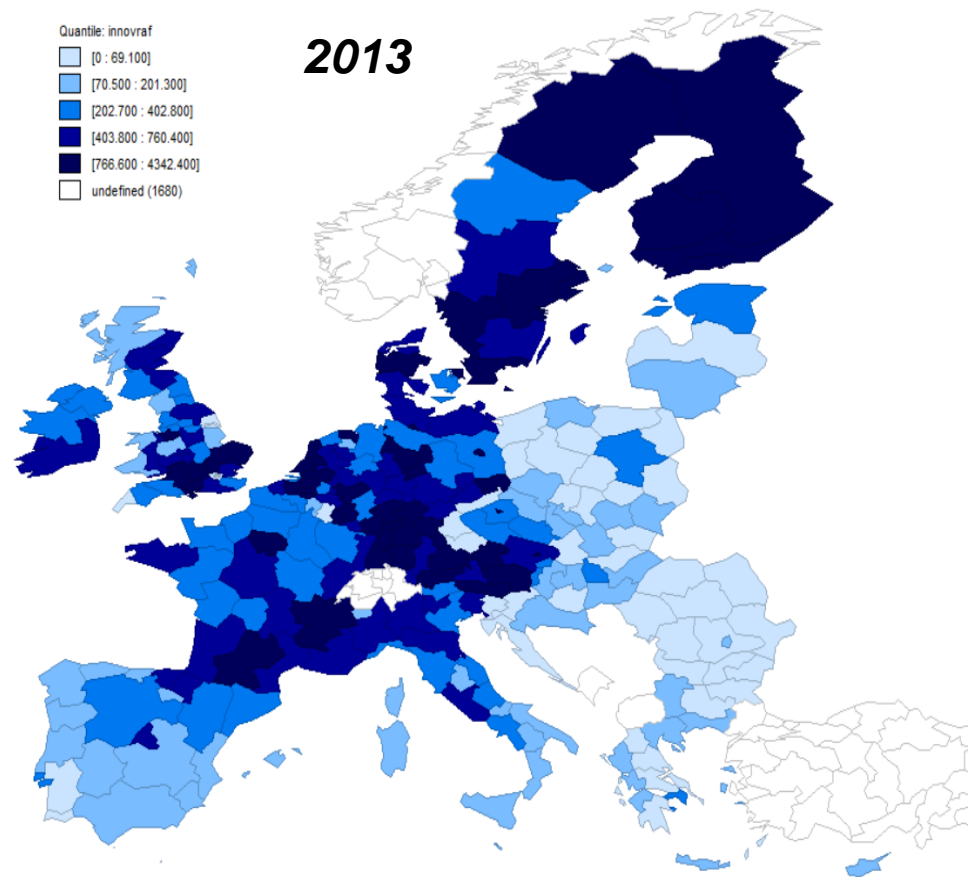
2005



Quantile: innoraf

[0 : 69.100]
[70.500 : 201.300]
[202.700 : 402.800]
[403.600 : 760.400]
[766.600 : 4342.400]
undefined (1680)

2013



- Increasing expenditures across the EU
- increasing activity in France, Austria and CEE
- Biggest hot spots in south Germany and northern countries

- CEE: beside the capital regions also other hot spots
- Sunbelt zone highly developed

SPATIAL AUTOCORRELATION

- Moran's I index (1950)

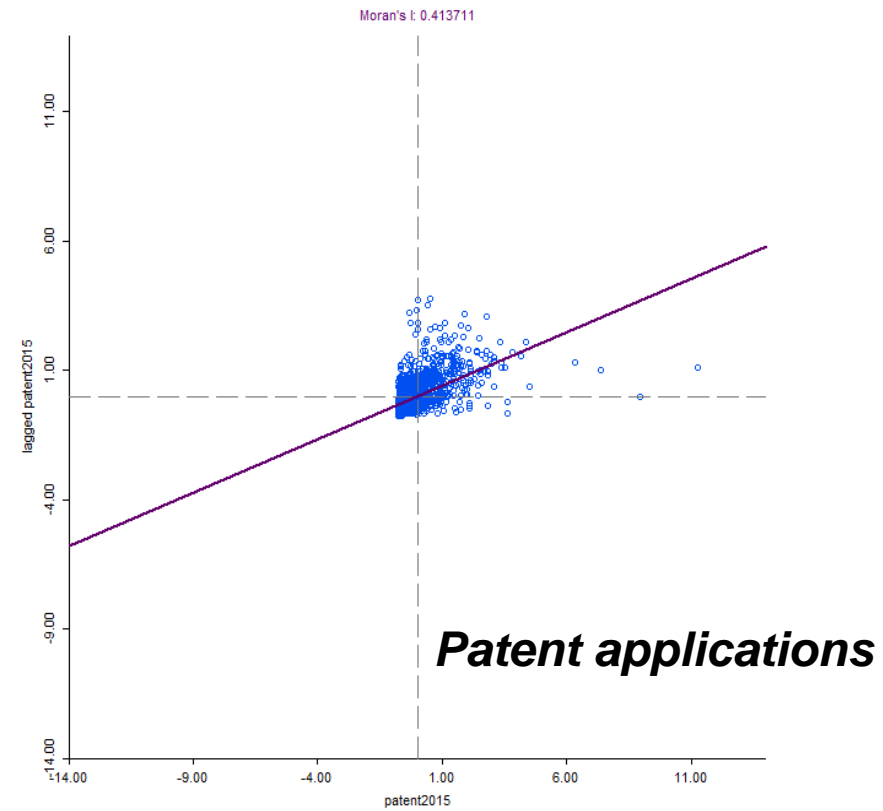
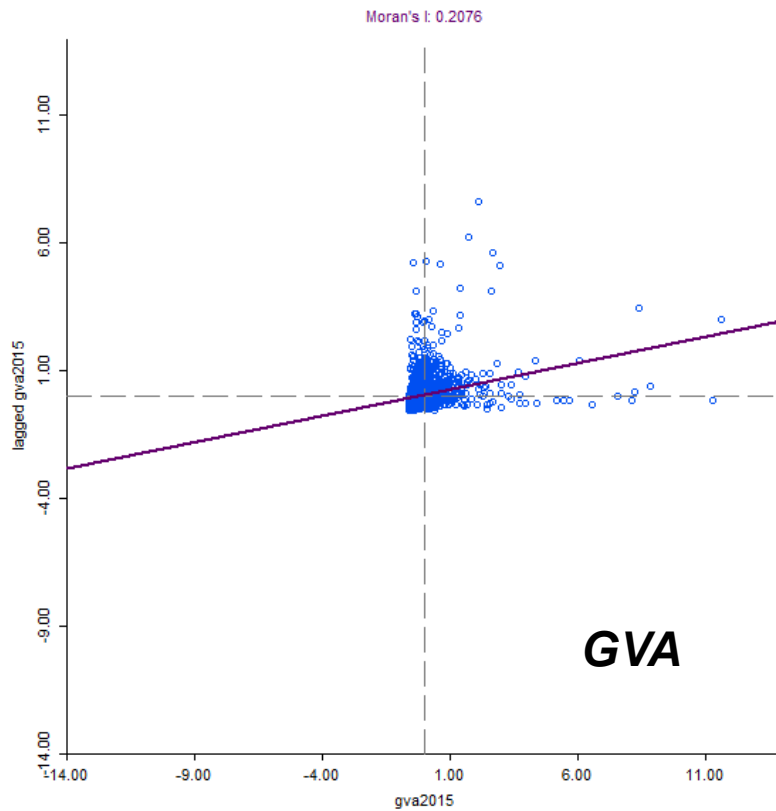
$$I = \left(\frac{N}{\sum D_{ij}} \right) * \sum \sum (x_i - \bar{x}) * (x_j - \bar{x}) * \frac{D_{ij}}{\sum (x_i - \bar{x})^2}$$

- where $(x_i - \bar{x}) * (x_j - \bar{x})$ is the product of the regions values and the difference of the means.
- D_{ij} is the contiguity matrix and N is the number of territories.
- maximum: 1; minimum: zero.
- If $I > -1/N - 1$, then there is a positive and if $I < -1/N - 1$, then there is a negative spatial autocorrelation.

LOCAL G_i^* INDICATOR

- Local spatial autocorrelation: whether the spatial distribution of the data is stochastic or there are kinds of patterns in the space.
- The main analysis tool of this research: Getis–Ord (1992) Local G_i^* indicator
- Hot spots: in the area and neighbourhood the given economic activity is more frequent
- Cold spots: in the area and neighbourhood the given economic activity is more scarce

MORAN I INDEX

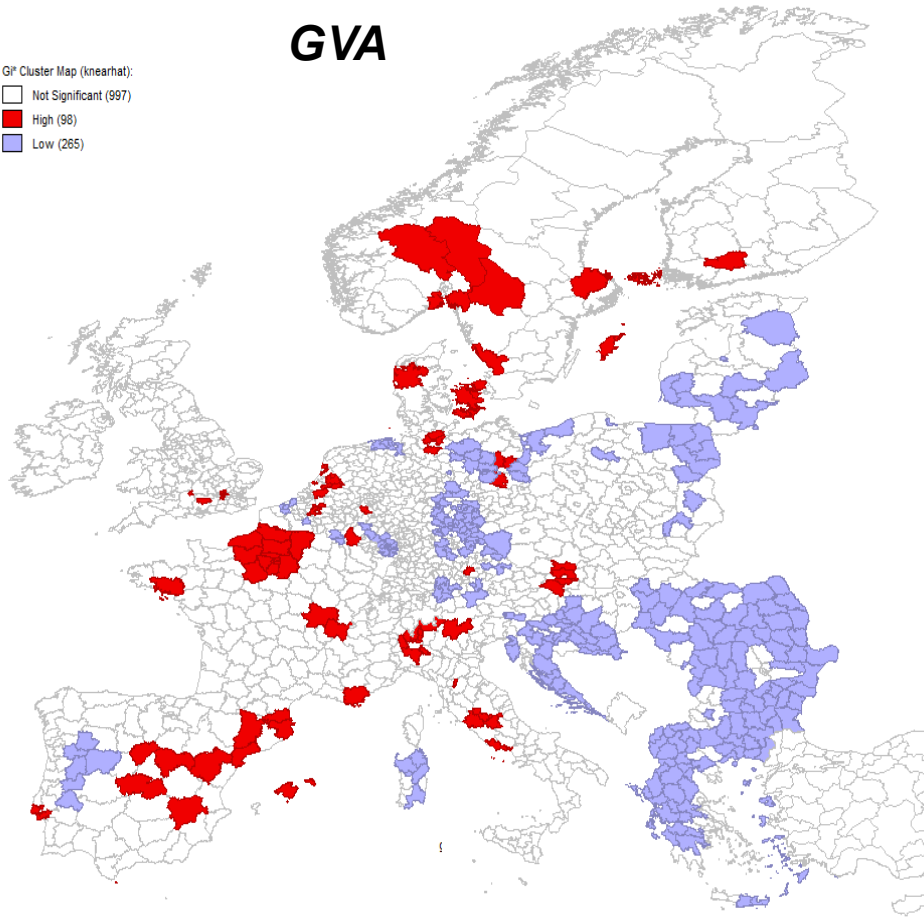


Source: compiled by the author

LOCAL G_i^* CLUSTERS (2015)

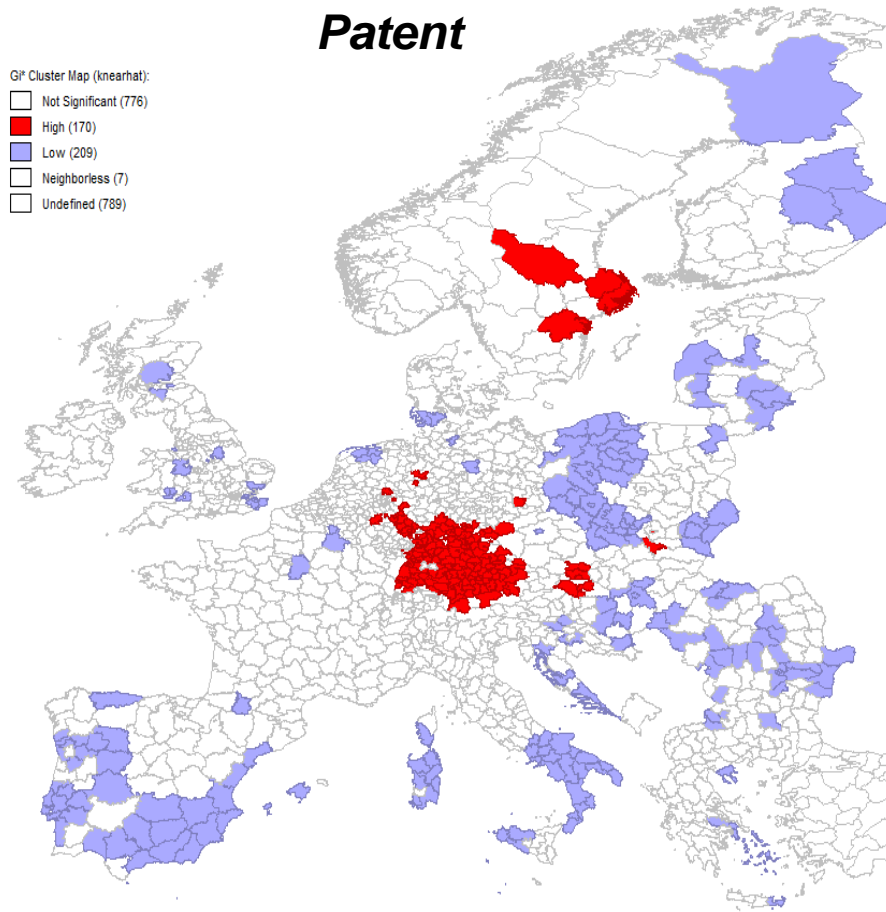
GVA

GI* Cluster Map (knearhat):
□ Not Significant (997)
■ High (98)
■ Low (265)



Patent

GI* Cluster Map (knearhat):
□ Not Significant (776)
■ High (170)
■ Low (209)
□ Neighborless (7)
□ Undefined (789)



Source: own compilation based on Eurostat data

About nearly 35 and 40% of the metropolitan areas of Europe can be ruled into the significant clusters of local spatial autocorrelation in the case of the GVA and patent applications.

METROPOLITAN REGIONS (EUROSTAT TYPOLOGY)

- NUTS 3 regions or a combination of NUTS 3 regions which represent all agglomerations of at least 250 000 inhabitants.
- These agglomerations were identified using the Urban Audit's Functional Urban Area (FUA).

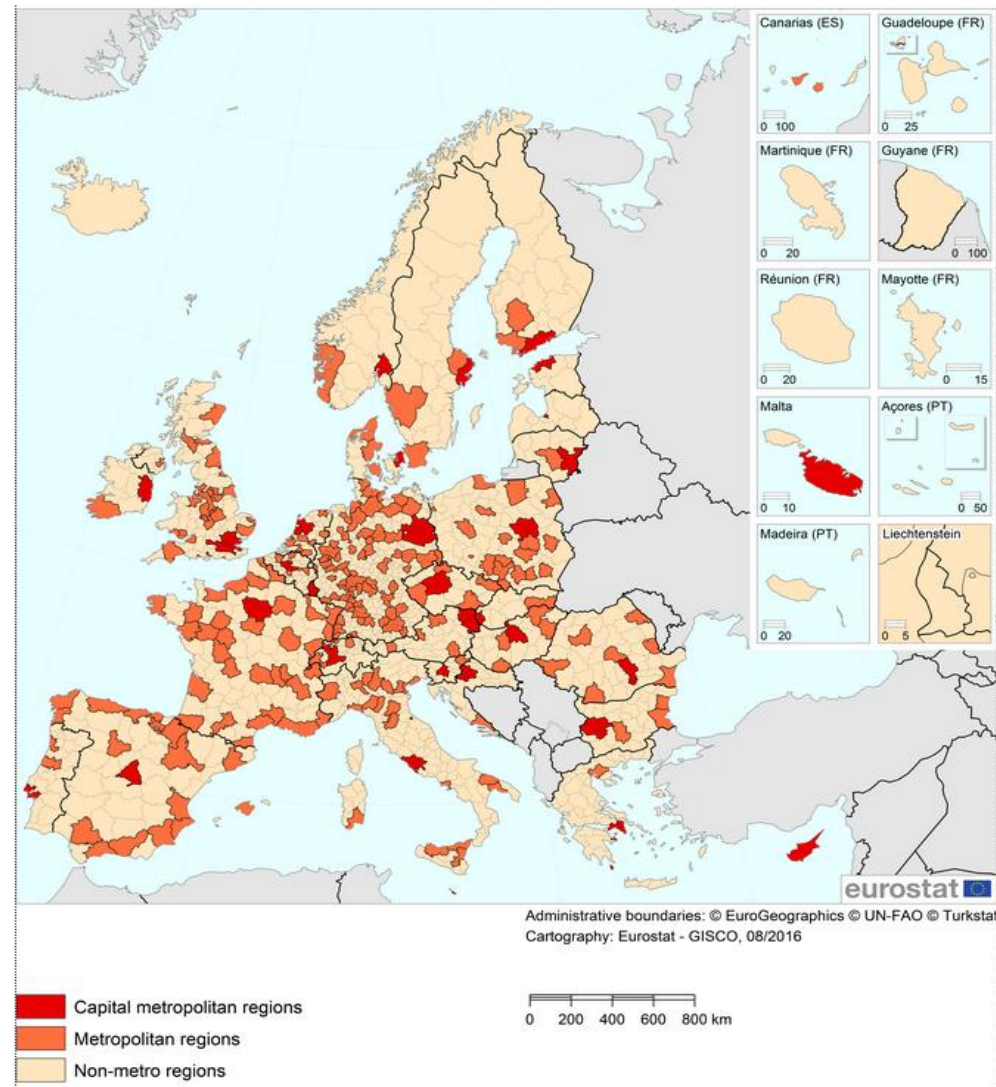
HUN: Budapest, Miskolc, Pécs, Debrecen, Székesfehérvár

SVK: Bratislava, Kosice

CZE: Praha, Brno, Ostrava, Plzen, Liberec

POL: Warszawa, Łódź, Kraków, Wrocław, Poznań, Gdansk, Szczecin, Bydgoszcz – Toruń, Lublin, Katowice, Białystok, Kielce, Olsztyn, Rzeszów, Opole, Częstochowa, Radom, Bielsko-Biala, Tarnów

Source: <https://ec.europa.eu/eurostat/web/metropolitan-regions/background>



SHARE/ ROLE OF METROPOLITAN REGIONS IN SOME INDICATORS

		European Union	Metro regions	Share (%)
GVA (million Euro)	2004	9 966 551.8	6 571 468.68	65.9
	2008	11 737 012.0	7 760 879.31	66.1
	2012	12 060 224.7	8 022 409.02	66.5
	2015	13 246 377.0	8 702 128	65.7
industrial GVA	2004	2 022 906.2	1 159 450.46	57.3
	2008	2 325 358.8	1 323 885.79	56.9
	2012	2 329 477.3	1 333 848.35	57.3
	2015	2 573 679.8	1 417 102.45	55.1
Population	2004	492 555 798	270 223 402	54.9
	2008	500 297 033	281 415 770	56.2
	2012	504 047 964	290 377 482	57.6
	2015	508 540 103	294 582 078	57.9
Patent applications	2004	55 479.68	39 214.1	70.7
	2008	57 049.74	40 013.37	70.1
	2012	56 771.67	32 424.88	57.1
	2014	56 752.99	n/a	n/a

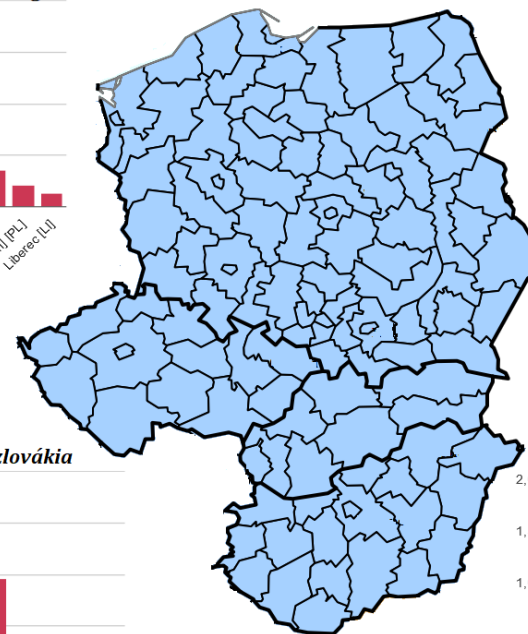
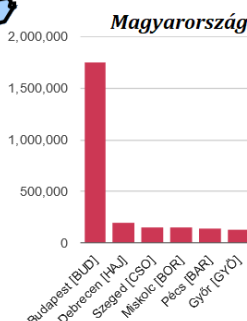
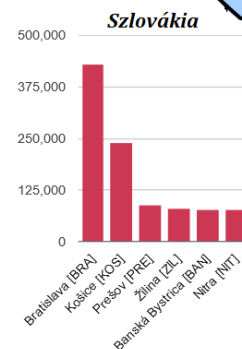
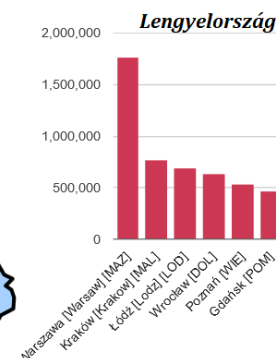
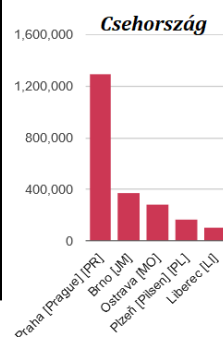
Increasing role of cities. Metropolitan regions have significant contribution to the GVA and patent applications of the European Union.

2015: 65.7% of all GVA, and 57.1% of all patent applications is concentrating in the metropolitan regions of Europe

Source: own compilation based on Eurostat data

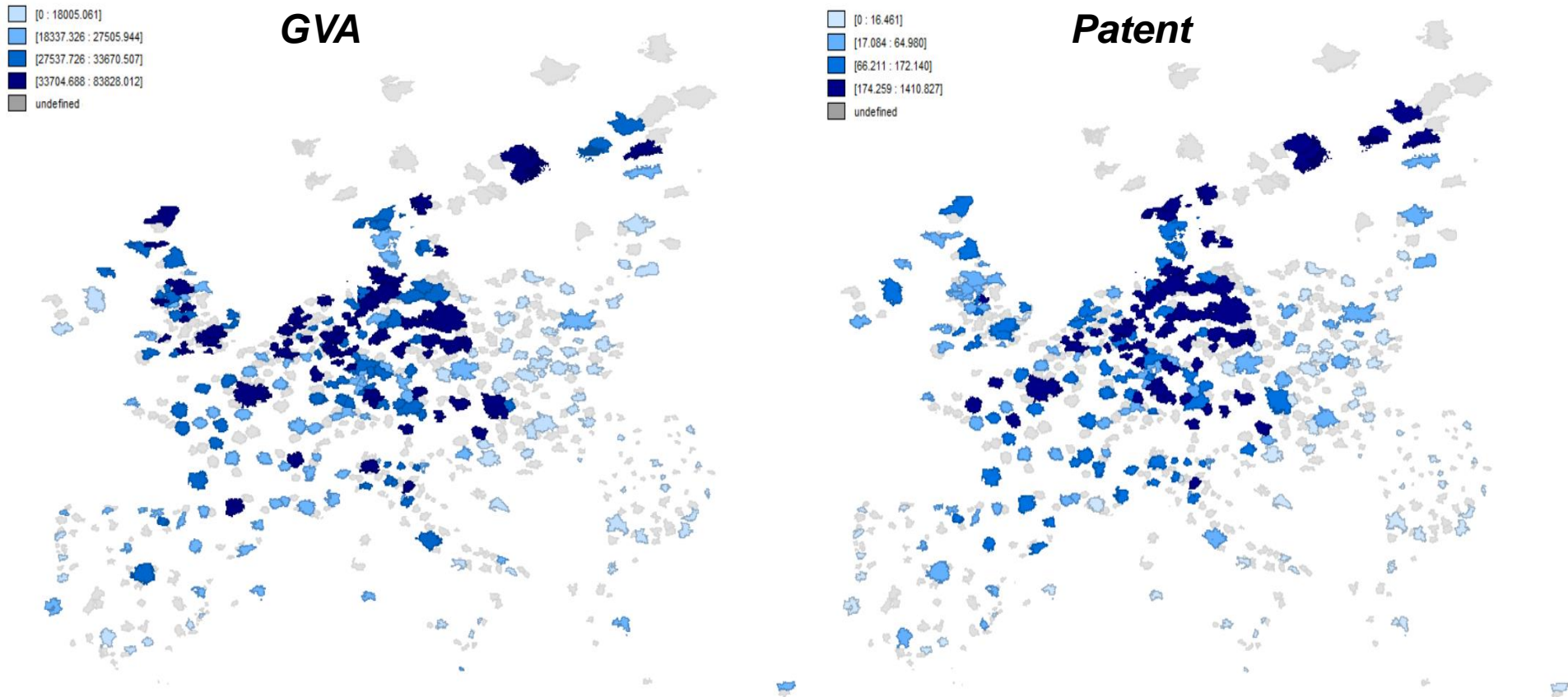
		Czech Republic	Hungary	Poland	Slovakia
GVA (million Euro)	2004	63,3	60,9	60,3	37,8
	2008	64,7	63,1	60,7	38,1
	2012	64,7	63,2	61,0	38,8
	2015	65,3	62,1	61,5	40,0
industrial GVA	2004	55,9	54,5	55,4	27,9
	2008	56,9	52,7	54,4	28,8
	2012	57,2	53,1	53,2	30,1
	2015	56,6	50,0	54,1	30,9
Populati on	2004	55,5	48,9	47,7	25,4
	2008	55,9	49,5	47,8	25,6
	2012	56,4	50,1	49,5	25,9
	2015	56,7	50,5	49,7	26,2
Patent	2004	61,2	86,2	61,7	43,4
	2008	59,4	75,2	75,4	62,1
	2012	46,7	61,8	68,0	18,6
	2014				

Source: own compilation based on Eurostat data



In CEE, the situation is a bit different, in the Czech Republic, Hungary and Poland the metropolitan regions show similar values as the European average, while in Romania, Slovakia or Slovenia they represent lower values.

PATTERNS OF GVA AND PATENT APPLICATIONS ACROSS THE METRO REGIONS (2015)



Source: own compilation based on Eurostat data

Similar hot and cold spots as by the regional level.
Western-eastern and northern-southern differences.

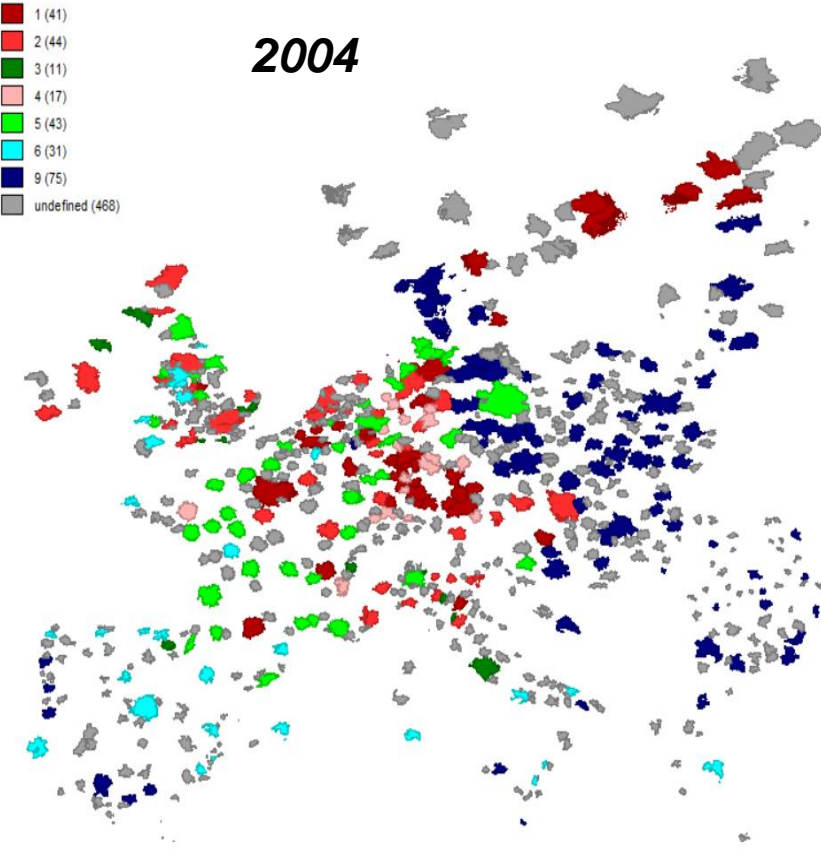
CATEGORIES OF METROPOLITAN AREAS BASED ON THEIR INNOVATION ACTIVITY

- Based on two indicators: GVA/capita and patent applications per capita
- Three categories: high, medium, low
- High – 2
- Medium – 1
- Low – 0

Category	Code
(2) (2)	1
(2) (1)	2
(2) (0)	3
(1) (2)	4
(1) (1)	5
(1) (0)	6
(0) (2)	7
(0) (1)	8
(0) (0)	9

CHANGE IN THE PATTERN OF METRO REGIONS

2004



2015



Source: own compilation based on Eurostat data

- Western-eastern differences
- Northern-southern differences
- South-Germany: best positions
- Peripheral situation of CEE

CONCLUSION

- Huge territorial differences across the EU – significant role of innovation in the convergence of peripheries
- NUTS3: Western-Eastern differences
 - Increasing patent activity of CEE
 - Identifiable spatial patterns: blue banana, red octopus, blue star or the Central European boomerang
 - R&D: highly developed sunbelt zone
 - Significant spatial autocorrelation of patent and GVA
- Metropolitan regions: significant contribution to GVA, patent
- The complex index show great Western-eastern, Northern-southern differences, while South-Germany is in the best positions, and the peripheral situation of CEE metro regions can be verified.

THANK YOU FOR YOUR KIND ATTENTION!

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