

CRETE 2024

The 22nd Conference on Research on Economic Theory and Econometrics
Milos, July 10-14, 2024

Productivity of the EU metropolitan regions: Trends, spatial analysis and convergence

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Motivation of the study

- ✓ Importance of productivity for macroeconomic stability, living standards and well-being.
- ✓ Productivity slowdown due to several factors, which cannot be easily identified and addressed.
- Increasing regional disparities and left-behind regions in the EU, in terms of economic performance over time and relative to other (peer) regions.
- Lack of productivity analysis at the subregional level (lower than that of NUTS-2), such as that of metropolitan (or functional urban) areas.

Scope and objectives of the study

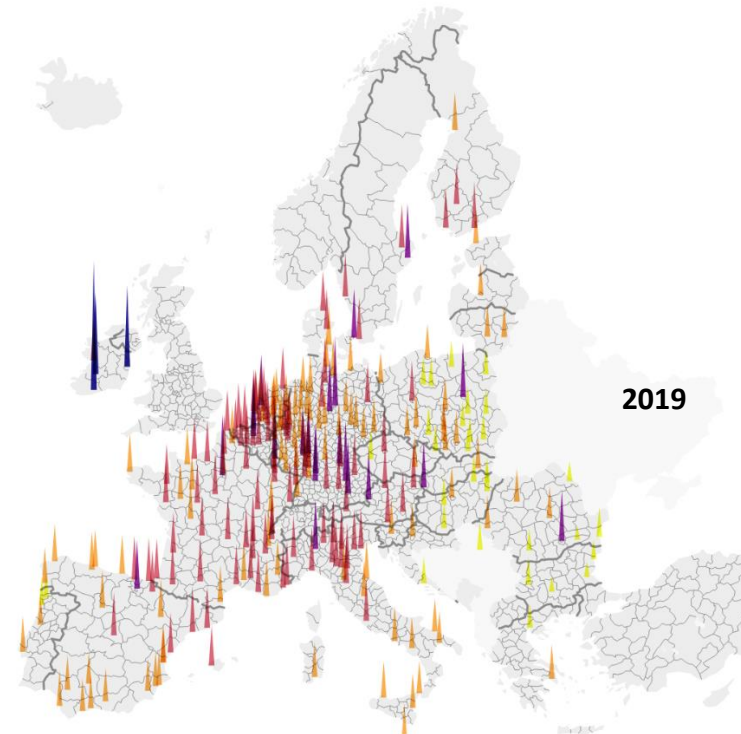
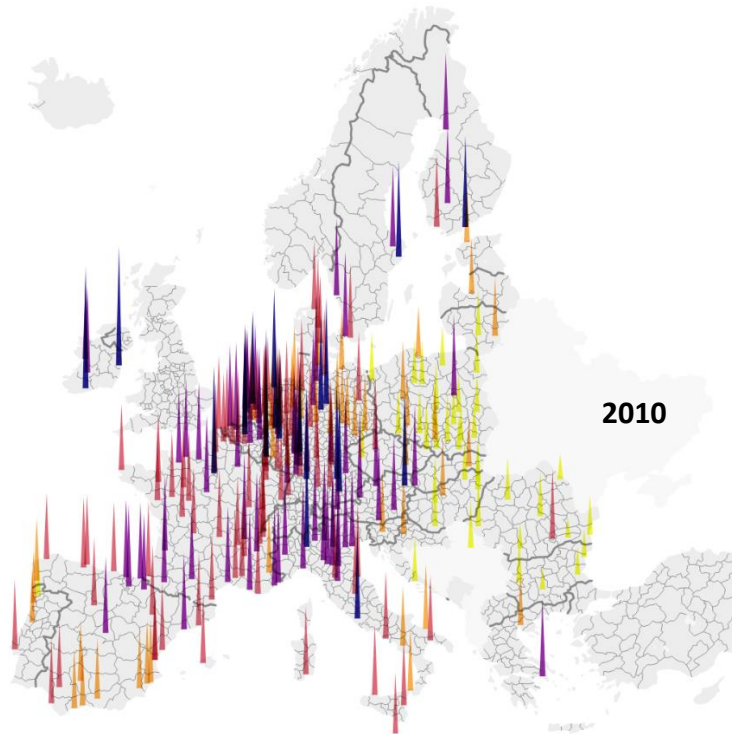
- Identify the productivity frontier and productivity laggard EU metropolitan regions, in terms of 264 Functional Urban Areas (FUAs) in the EU, according to the relevant OECD database, during the decade 2009-2019.
- Examine the conditions of productivity convergence among the EU metropolitan areas.
- Determine several factors influencing the productivity performance and divergence (or left-behindness) of the EU metropolitan areas.
- Make policy recommendations for boosting the productivity and reducing inequalities among the EU metropolitan areas.

Productivity trends in the EU metropolitan regions

Labour productivity (GDP per worker in USD, constant prices, constant PPP, base year 2015) in the EU metropolitan regions

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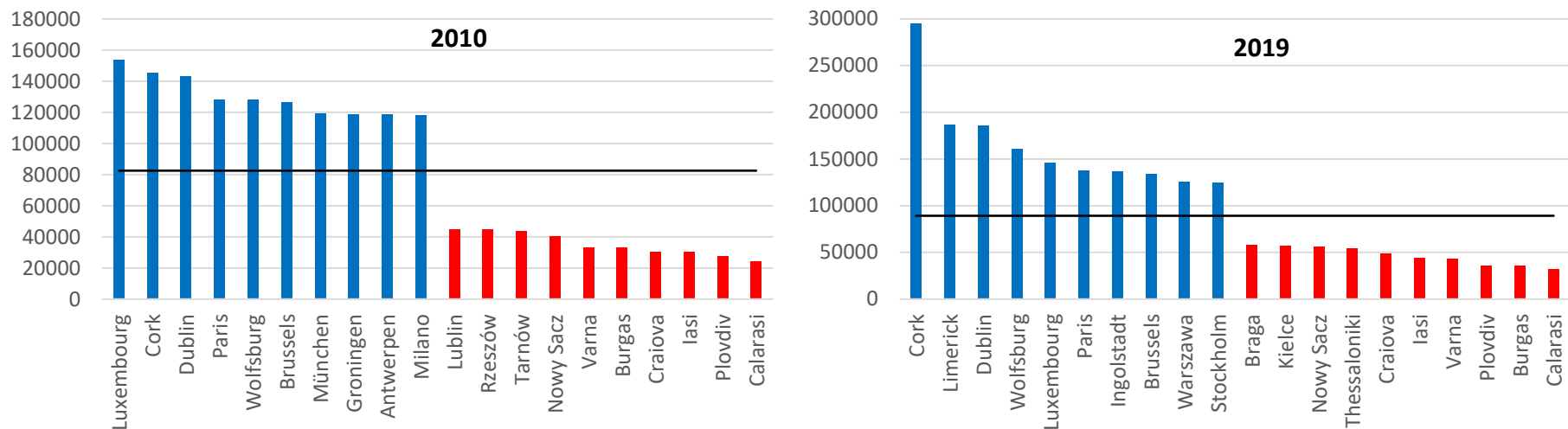
< 69417 69417–88752 88752–109481 109481–185562 ≥ 185562



- (a) Five (5) distinct productivity groups are identified according to the Jenks' cluster optimization method.
- (b) Large and capital metro areas located in central & western Europe (Luxembourg, Dublin, Paris, Brussels, Munich) are the frontier ones while metro areas in the eastern and southern countries are the laggard ones.
- (c) There are also considerable within-country interregional (core-periphery) productivity disparities, mostly observed in France, Poland, and Romania, and increased variations among regions over time.

Frontier and laggard EU metropolitan regions

Top-10 and bottom-10 EU metropolitan regions in labour productivity (GDP per worker in USD, constant prices, constant PPP, base year 2015)



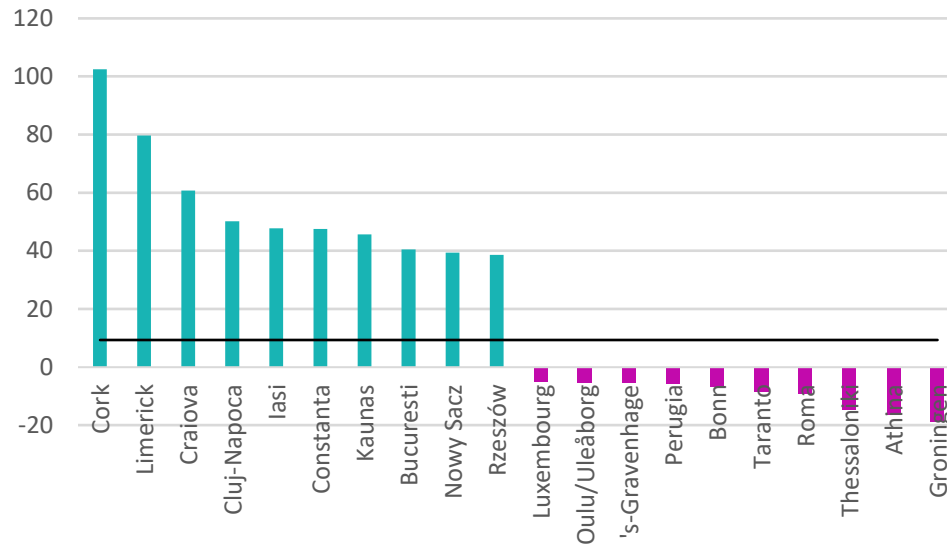
(a) In 2019, metro areas from the northern and eastern EU also appear in the list of the top-10 productive regions, such as Warszawa (Warsaw) and Stockholm.

(b) Several smaller-size metro areas are also included in the most productive ones, such as Cork, Wolfsburg, Groningen (in 2010), Antwerpen (in 2010), Limerick (in 2019) and Ingolstadt (in 2019).

→ Therefore, both the size and the location of metropolitan areas (in the EU, in their own country and nearby other ones) and their structural characteristics may play a significant role in their productivity performance.

Productivity growth of EU metropolitan regions

Top-10 and bottom-10 EU metropolitan regions in labour productivity growth (%), 2010-2019



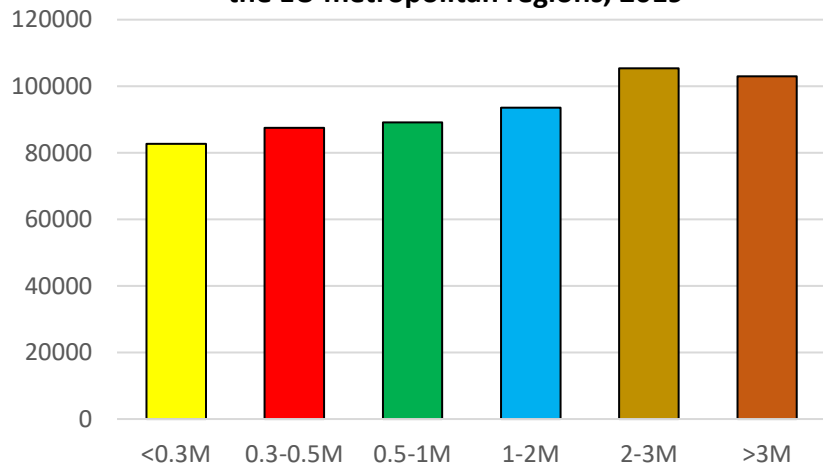
(a) There is a varying regional dynamism in the EU metropolitan regions.

(b) The best performing metro areas in terms of productivity growth (except for Irish regions) are those belonging to the eastern bloc of Europe.

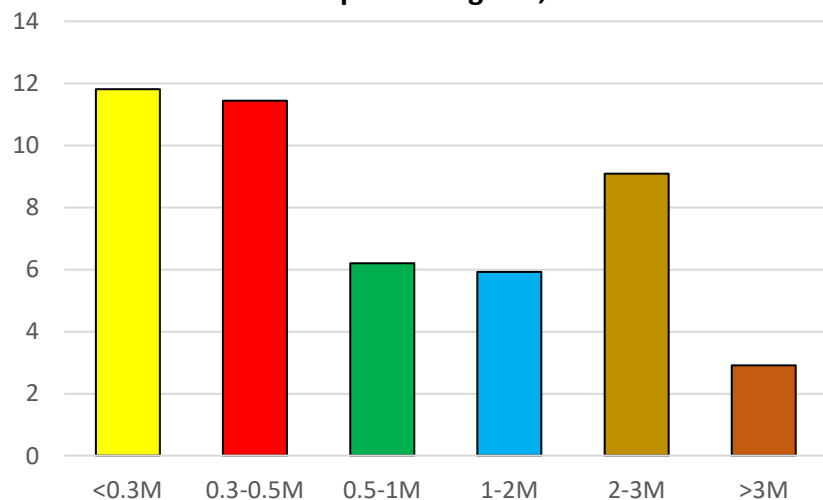
(c) In opposite, the metro areas exhibiting the lowest productivity growth are mostly situated in southern Europe, such as in Greece (Athina, Thessaloniki) and Italy (Perugia, Taranto, Roma), and in central Europe, such as in the Netherlands (Groningen, 's-Gravenhage) and Luxembourg.

Labour productivity by size of metropolitan region

Labour productivity by population size of the EU metropolitan regions, 2019



Labour productivity growth (%) by population size of the EU metropolitan regions, 2010-2019



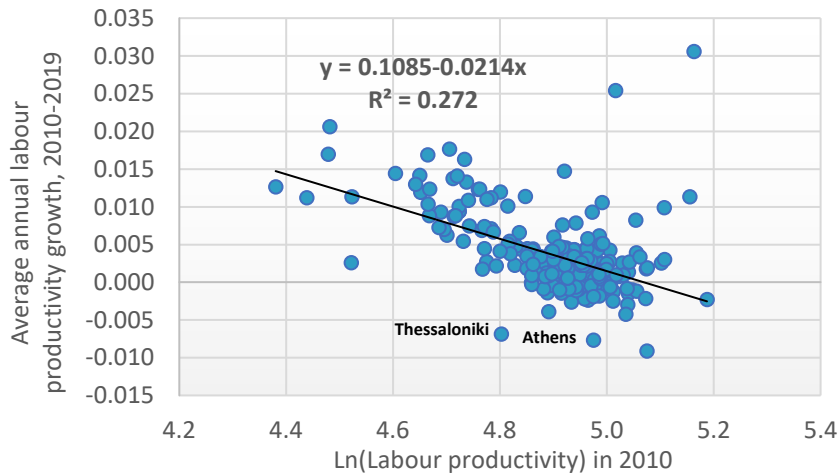
(a) Productivity steadily increases with the size of metropolitan region, until reaching 2 million inhabitants, and then basically remain the same.

(b) In opposite, small (<0.5M inhabitants) and very small (<0.3M inhabitants) metro areas present the highest (>11%) productivity growth, while the very large metropolitan regions (>3M inhabitants) exhibit the lowest (<3%) productivity growth.

→ The impact of agglomeration economies on productivity of large cities is not linear and non-monotonic, due to variable returns to scale, i.e., diseconomies of agglomeration (reduced housing affordability, increased congestion, pollution etc.)

Productivity convergence of the EU metropolitan regions

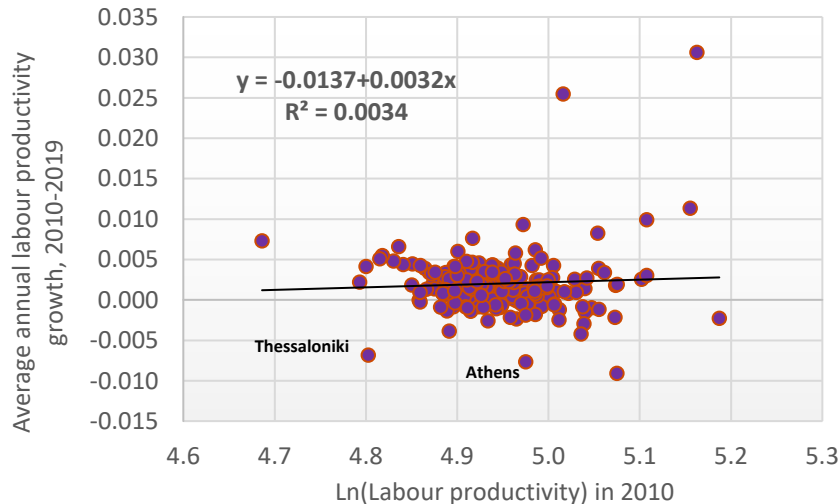
Beta (β) convergence of labour productivity among the EU metropolitan regions, 2010-2019



(a) There is a clear trend of convergence across the entire sample of the EU metro regions (about 36 years to achieve convergence).

(b) When we exclude from the sample the metro regions situated in the eastern bloc of EU countries, the convergence hypothesis is not accepted and is negative, implying divergence.

Beta (β) convergence of labour productivity among the EU metropolitan regions, excluding the eastern ones, 2010-2019

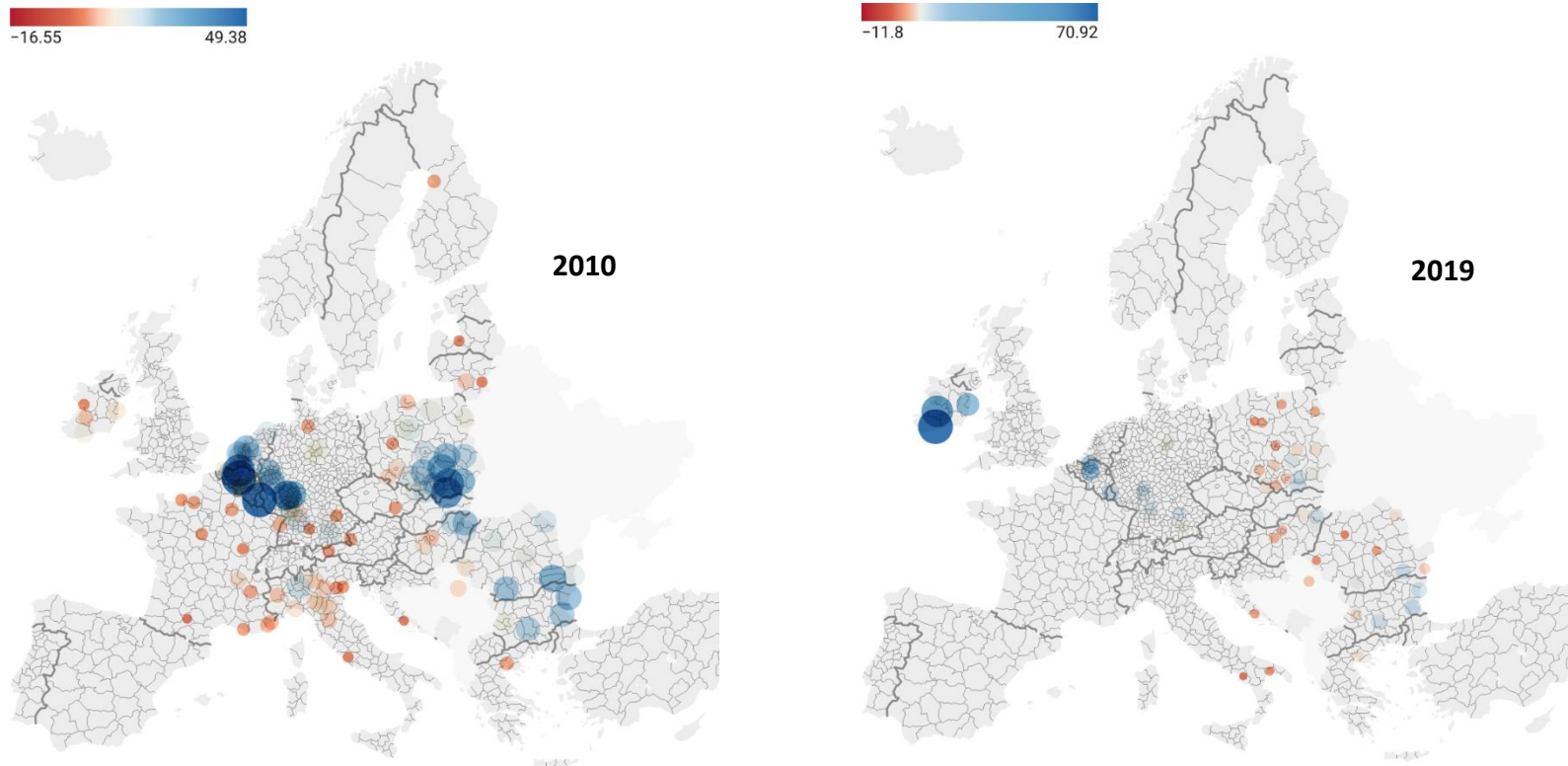


→ The convergence process is essentially driven by the eastern EU metro areas, given also the fact southern European countries lost ground.

→ The metro regions of Athens and Thessaloniki display the most negative productivity growth (-14.6% and -16.2%, respectively).

Spatial autocorrelation among the EU metropolitan regions

Moran's local index of spatial autocorrelation of labour productivity among the EU metropolitan regions

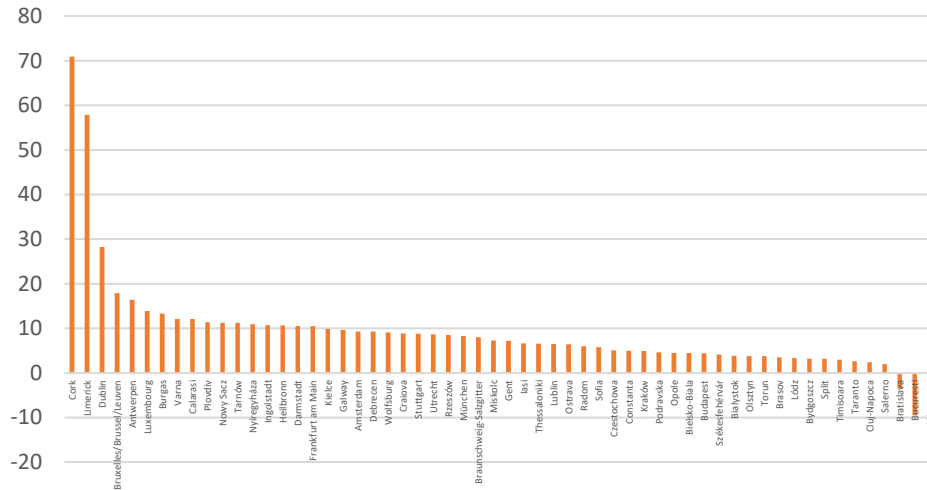


(a) In 2010, a considerable number of metropolitan regions (118 or 45%) present significant spatial autocorrelation effects, the largest and most of which are positive, denoting clustering (agglomeration) patterns, particularly in the central western and the eastern EU metro areas.

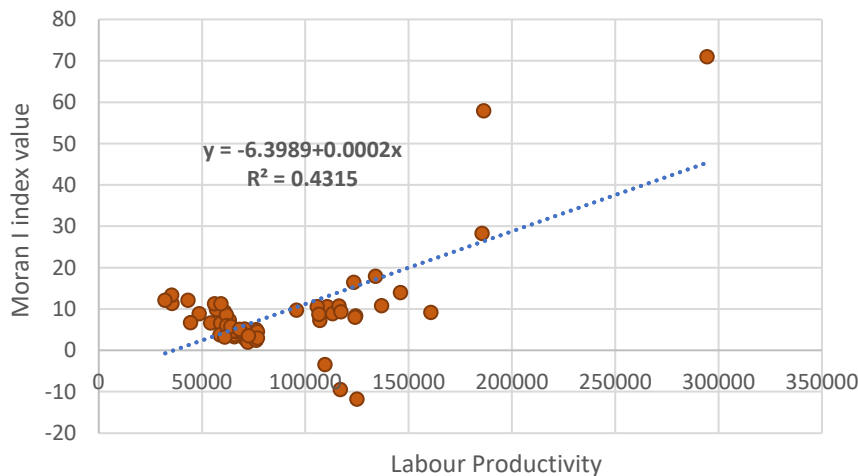
(b) In 2019, the number and magnitude of significant spatial autocorrelation effects is profoundly reduced (56 or 21%) and dispersed over the eastern central and western Europe.

Productivity performance and spatial clustering

Moran's local index of spatial autocorrelation of labour productivity in the EU metropolitan regions, 2019



Labour productivity and Moran's local index of spatial autocorrelation in the EU metropolitan regions, 2019



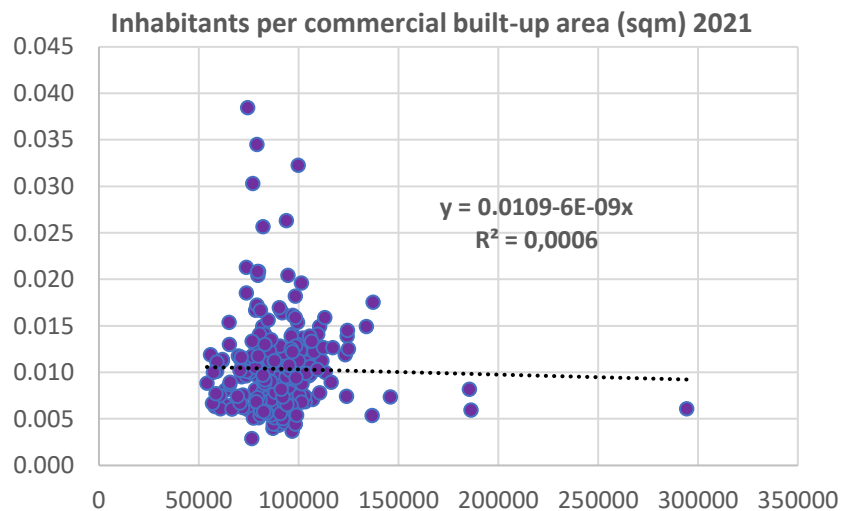
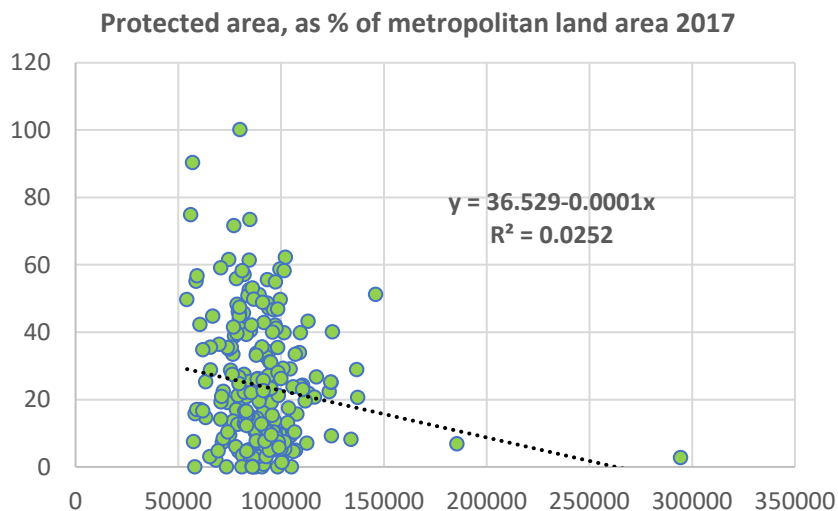
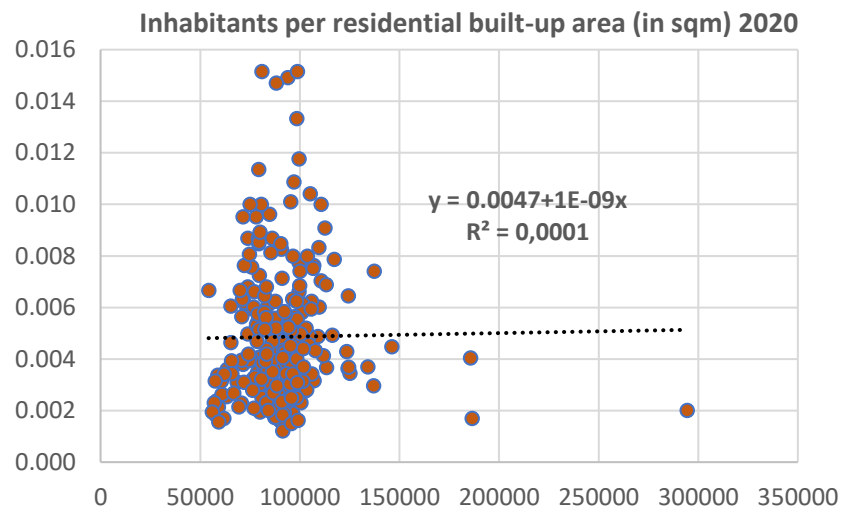
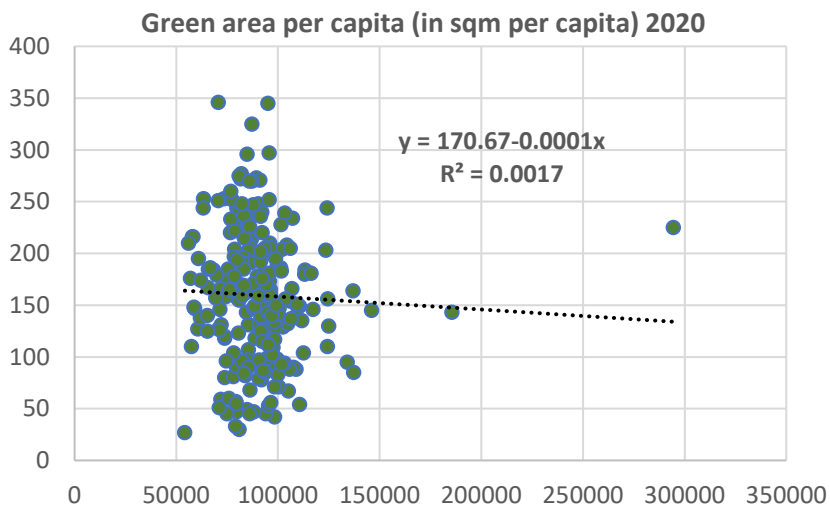
There is a positive and significant relationship between metropolitan productivity and Moran's index of spatial autocorrelation.

➤ The metro areas showing the largest clustering in productivity are situated in Ireland (Cork, Limerick, Dublin), in central Europe (Brussels, Antwerpen, Luxembourg) and in southeastern Europe (Burgas, Varna, Plovdiv, Calarasi).

➤ Only three capital metropolitan regions situated in eastern Europe present significantly negative spatial autocorrelation (dispersion): Warsaw, Bucharest, and Bratislava.

➔ The results verify the positive role of productivity clustering at the subregional level.

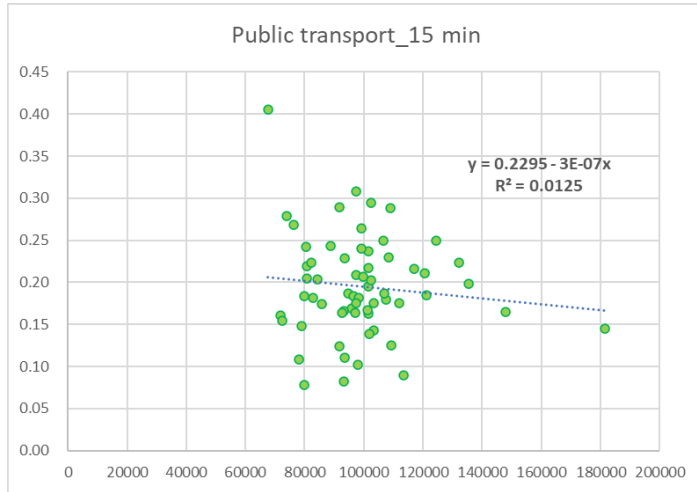
Productivity and sustainable urban development



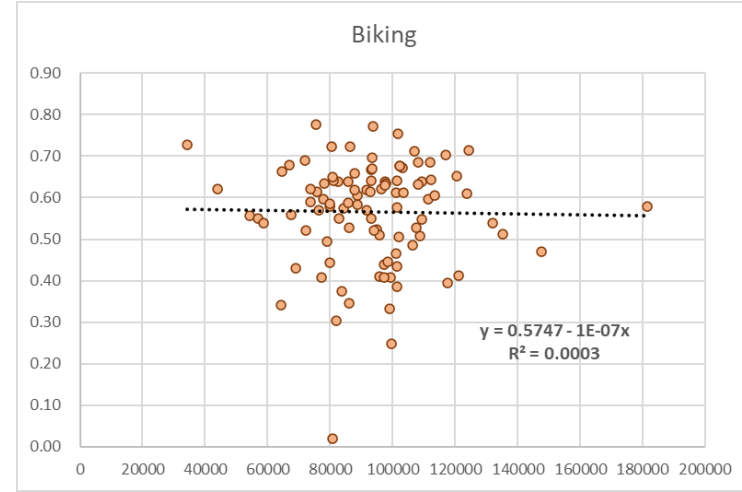
- The 'compact' (less sprawled) and 'green' metropolitan development is not significantly related to productivity.

Productivity and sustainable urban mobility

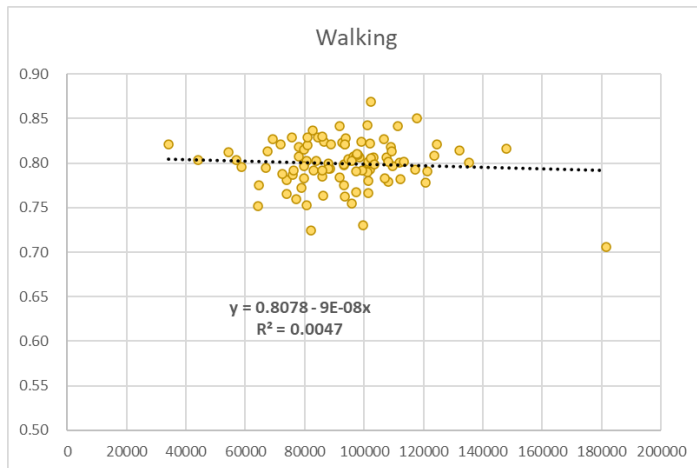
Productivity and urban access to public transport within 15 min



Productivity and urban transport access to biking



Productivity and urban transport access to walking



- Travel patterns related to sustainable urban mobility strategies promoting public transport and active modes of transport (such as those characterising the '15-min city' paradigm) are not found to have any statistically significant relationship with the level of labour productivity in the EU metro areas.

Conclusions

- Existence of considerable interregional (between-country and within-country) productivity disparities in the EU, signifying a multi-speed catching-up process among the EU metro regions, but also divergence of a few others particularly in southern Europe.
- By and large, there is a productivity-enhancing role of metropolitan size, but the EU metro areas have not well performed in generating synergetic (capacity-sharing) effects, exhibiting a limited diffusion of high productivity to nearby regions over time.
- Other metrics of productivity, such as total factor productivity–TFP, and the measurement of within-metropolitan productivity and intraregional inequalities would help to obtain a more holistic view of the trends and determinants of the EU productivity slowdown.

Policy implications

- Shape and/or strengthen **place-based policies** to address the increased heterogeneity, lack of dynamism, amplified productivity gaps and shortage of spillovers and productivity gains in lagging areas.
- Need to emphasise on policies promoting efficiency while tackling regional productivity shortfalls at **various levels of spatial governance** encompassing urban regions of different size.
- **Sustainable urban mobility and built-up containment** policies must be combined with efficient land use management, enhancement of agglomeration economies and reinforcement of the intra- and inter-regional market access.

Thank you for your attention!

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