

# Clusters of regions in the innovative development of the European Union

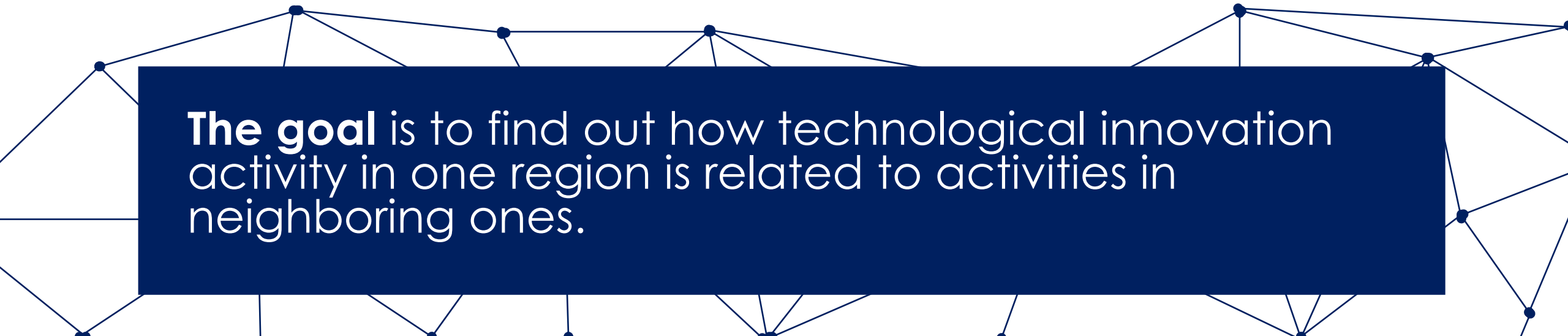
**Svetlana Rastvortseva, Ekaterina Panina**

MOSCOW

HSE University (Higher School of Economics)

# Introduction

- Science and innovation are still key factors contributing to the development of technological and business condition.
- The innovation engine in the spatial context is formed under the influence of technological, economic, and geographical factors not only within the region, but also outside its area.



**The goal** is to find out how technological innovation activity in one region is related to activities in neighboring ones.

# Theoretical framework

Innovative development cannot exist in isolation. It is formed through mutual influence, personal contacts or external effects.	Moreno et al. (2005), Enkel et al. (2009)
The relationship between economic growth, urbanization and technology development is significant.	Baldwin and Martin (2004), Chen et al. (2020)
Innovation activity is even more prone to concentration than industry, and the concentration of technology companies is observed in large cities or near them.	Audretsch and Feldman (1996)
Urban development through secondary (not primary) dissemination of knowledge contributes to the creation of new innovative behaviors.	Rosenthal and Strange (2004), Wang and Sun (2009)
Spatial agglomerations contribute to more effective innovative behavior.	Krugman (1991), Fujita (1994)
In the regional economy and in international business, there is an increase in the number of inter-firm technological alliances.	Nooteboom et al. (2007)

# Methodology

The degree of territorial innovation interdependence can be estimated due to spatial autocorrelation, **Global Moran's I**.

**The sample is** 14 countries of the European Union и 169 regions.

This study is based on **the information** of the European Patent Office (EPO).

**The main indicator is** patent applications.

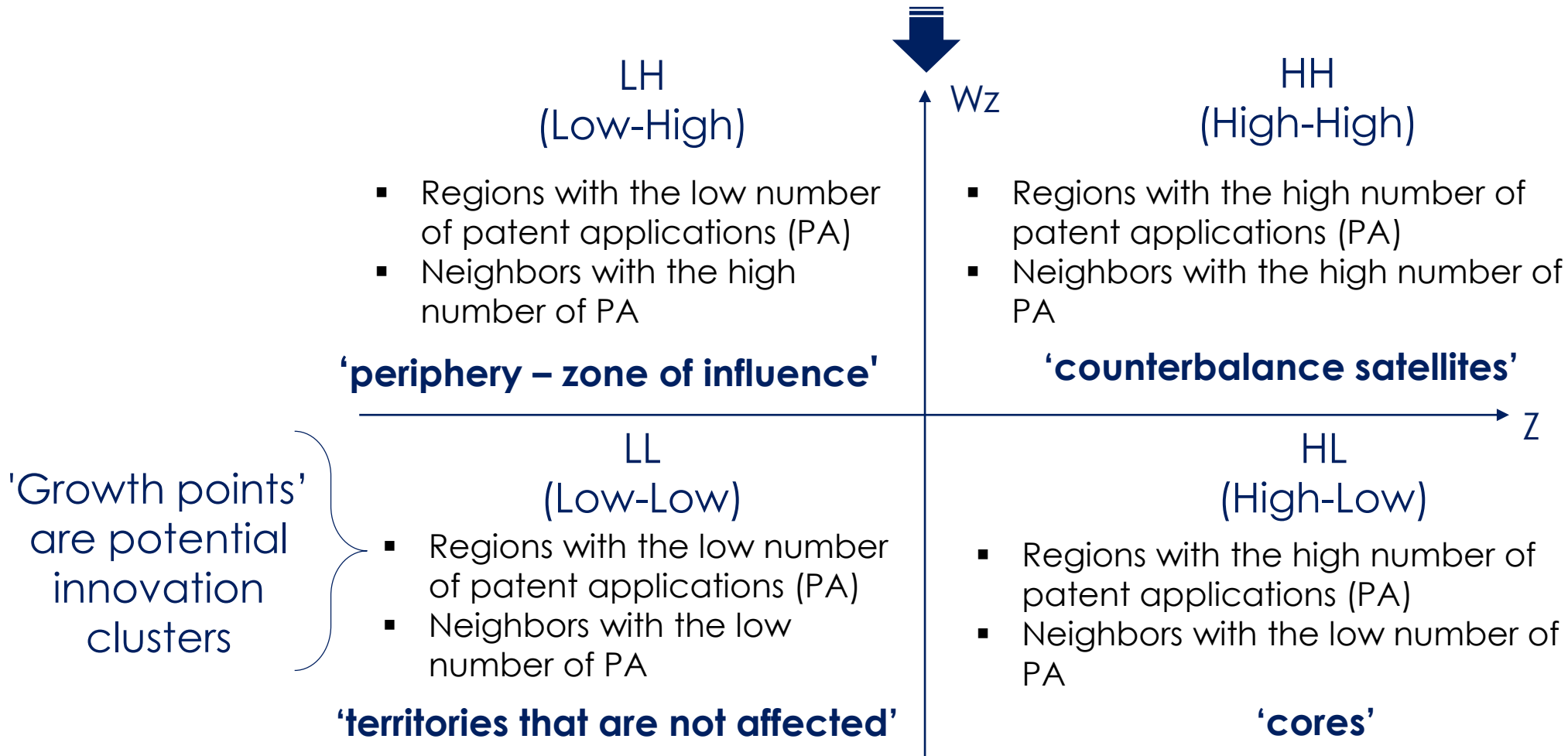
**The studied period is** 2018-2021.

$$I = \frac{N}{S_0} \frac{\sum_i^N \sum_j^N w_{ij} (x_i - \bar{x})(x_j - \bar{x})}{\sum_{i=1}^N (x_i - \bar{x})^2}$$

where  $x_i$  and  $x_j$  are the number of patent applications in regions  $i$  and  $j$ ,  $\bar{x}$  is the average number of applications,  $N$  is the number of selected regions,  $S_0 = \sum_i \sum_j w_{ij}$  is a standardized value – a matrix of spatial weights.

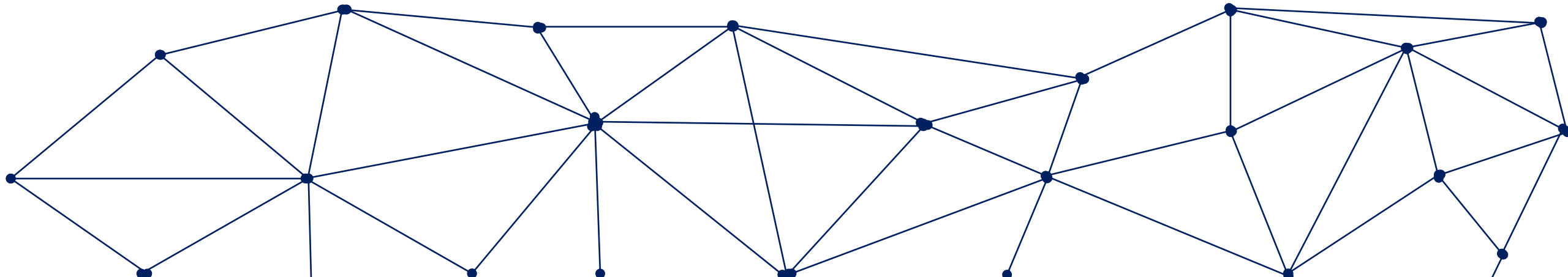
# Methodology

To assess the mutual influence, the scattering map in 169 regions and its changes during the 4 years were also analyzed.



# Global Moran's I

- The analysis revealed positive spatial autocorrelation in 2018, 2019, 2020 and 2021: with  $E(I) = -0.005952$  and  $I = 0.7704, 0.6564, 0.2544$  and  $0.2273$ , respectively.
- It is clearly seen that the global Moran I index has decreased over 4 years, which indicates a divergence trend.

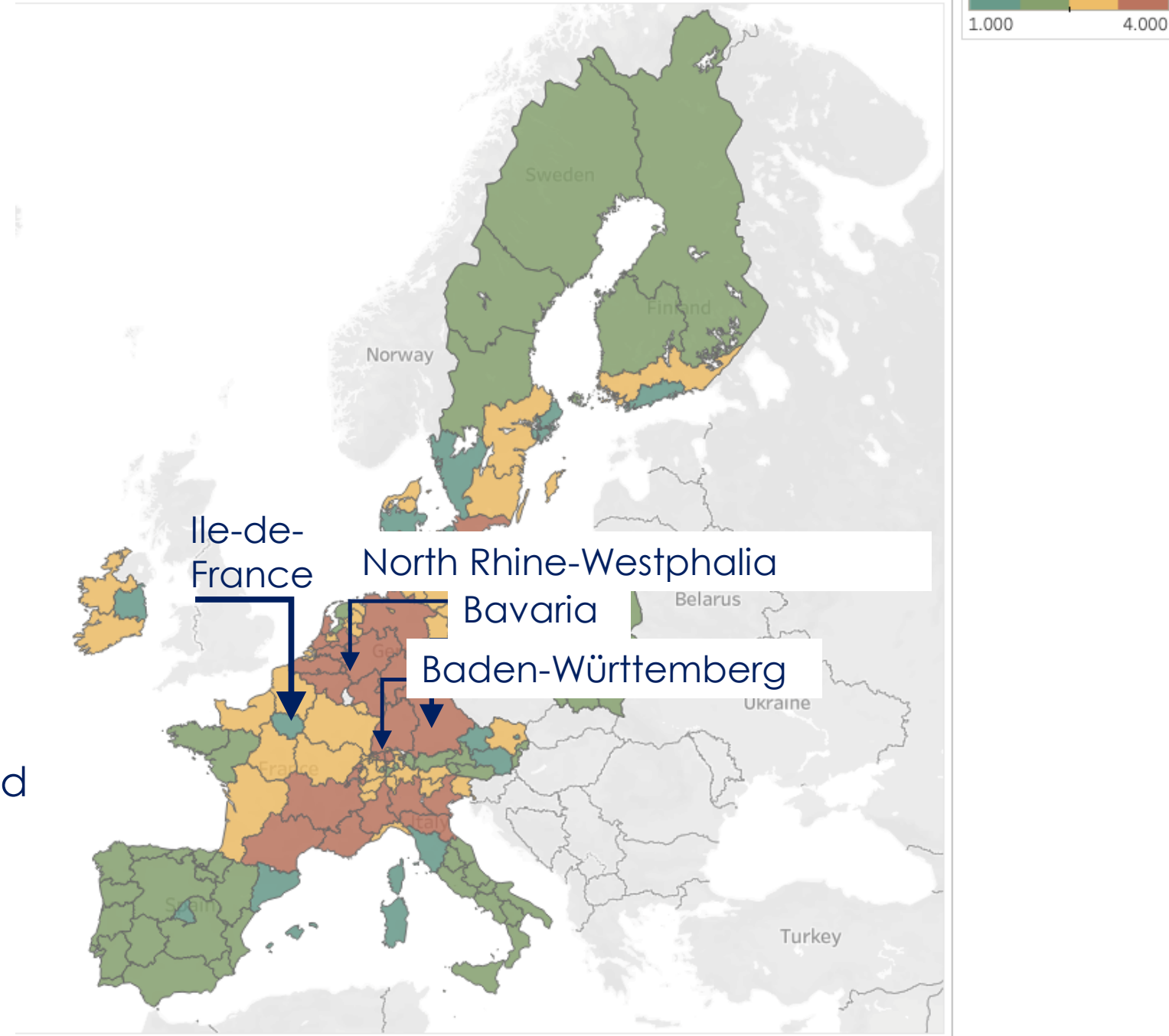


# Results in 2018

- 11 'cores' – the centers of innovation clusters;
- 33 regions – 'counterbalance satellites';
- 42 regions – 'periphery-zone of influence';
- 66 regions – 'territories that are not affected'



**'Growth points':** Spanish regions (Castile-Leon, Castile-La Mancha and Extremadura ) и Polish regions (Masovian, Greater Poland, Świętokrzyskie, Lodz, Kuyavian-Pomeranian voivodeships).



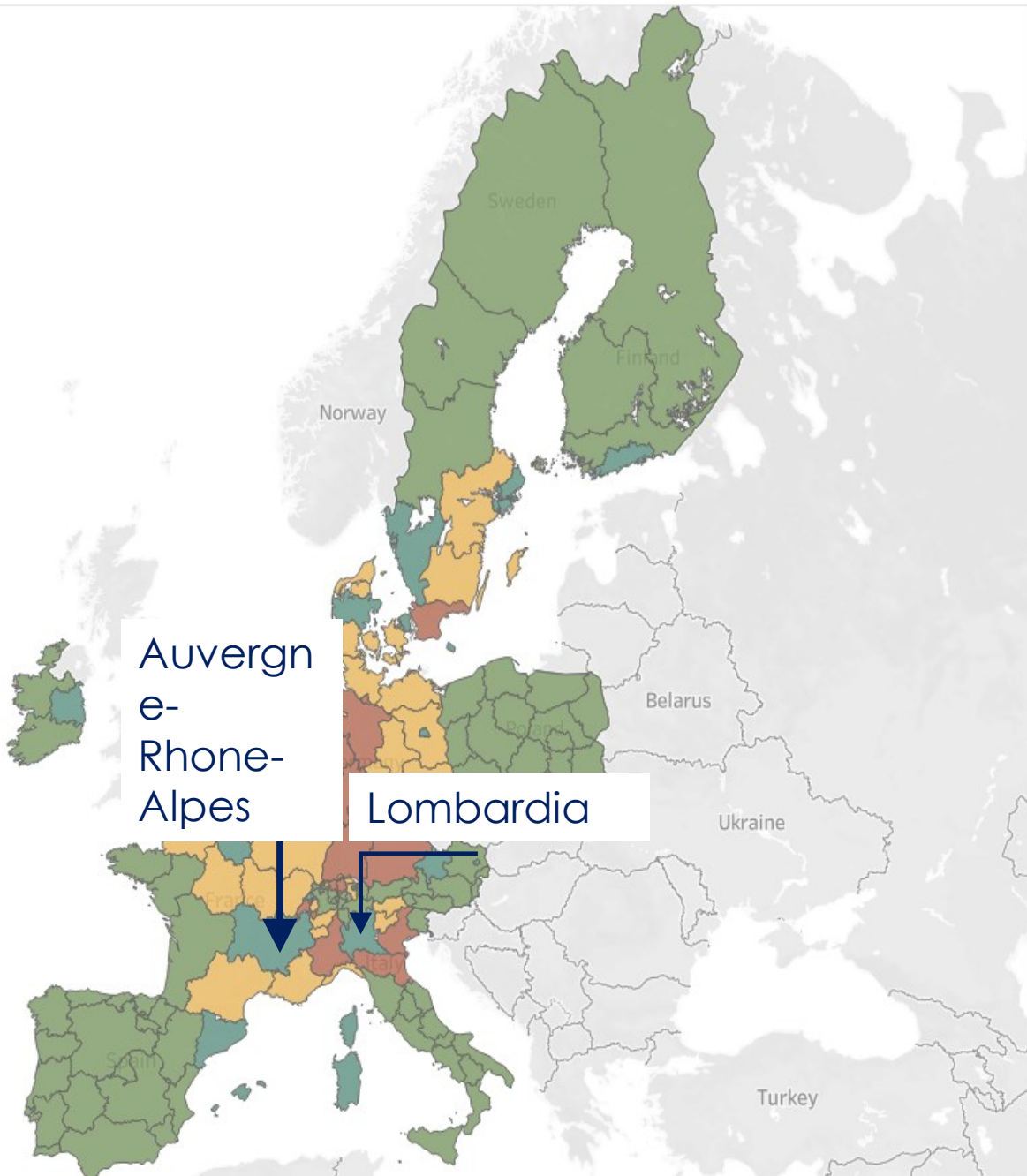


# Results in 2019

-  15 'cores' – the centers of innovation clusters;
-  22 regions – 'counterbalance satellites';
-  36 regions – 'periphery-zone of influence';
-  82 regions – 'territories that are not affected'



**'Growth points':** Spanish regions (Castile-Leon, Castile-La Mancha and Extremadura ) и Polish regions (Masovian, Greater Poland, Świętokrzyskie, Lodz, Kuyavian-Pomeranian voivodeships).





# Results in 2020

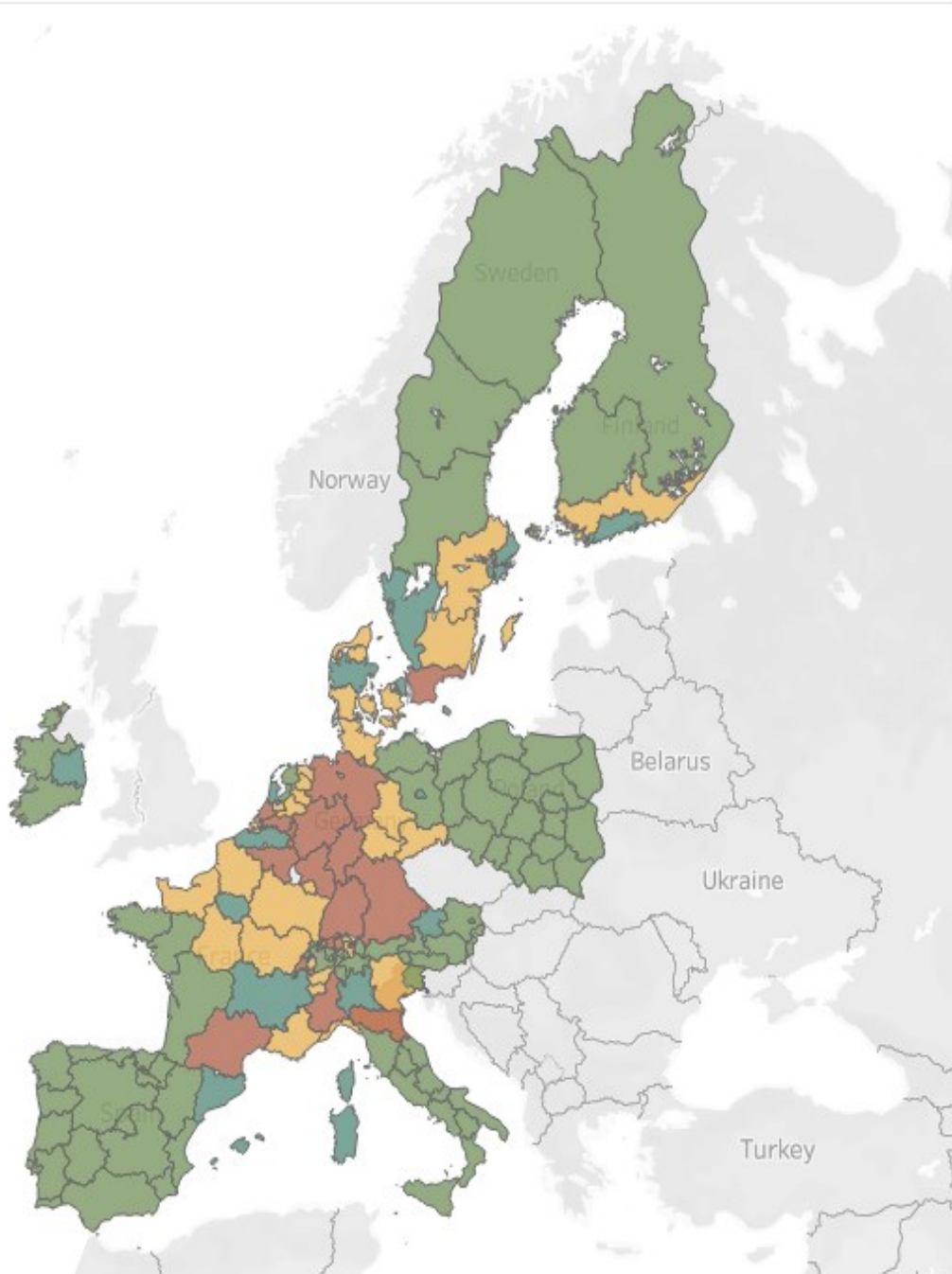
- 15 'cores' – the centers of innovation clusters;
- 23 regions – 'counterbalance satellites';
- 37 regions – 'periphery-zone of influence';
- 80 regions – 'territories that are not affected'



**'Growth points':** Spanish regions (Castile-Leon, Castile-La Mancha and Extremadura ) и Polish regions (Masovian, Greater Poland, Świętokrzyskie, Lodz, Kuyavian-Pomeranian voivodeships).



SUM(Группа Региона)  
1.000 4.000



# Results in 2021

- 16 'cores' – the centers of innovation clusters;
- 22 regions – 'counterbalance satellites';
- 34 regions – 'periphery-zone of influence';
- 83 regions – 'territories that are not affected'



**'Growth points':** Spanish regions (Castile-Leon, Castile-La Mancha and Extremadura ) и Polish regions (Masovian, Greater Poland, Świętokrzyskie, Lodz, Kuyavian-Pomeranian voivodeships).

# Companies located in 'growth points' regions

## Castile-Leon (Spain)

- the University of Valladolid

## Mazovian voivodeship (Poland)

- The transport company «BABIK SP. Z O.O.»
- the supplier of audio and video equipment «HEM SP. Z O.O.»

## Kuyavian- Pomeranian voivodeship (Poland)

- «MATERIALOWOP ATRUNKOWYCH SPOLKA AKCYJNA»
- the agro-industrial company «ANWIL S.A.»
- the cosmetic company «LA RIVE SPOLKA AKCYJNA»

## Lodz voivodeship (Poland)

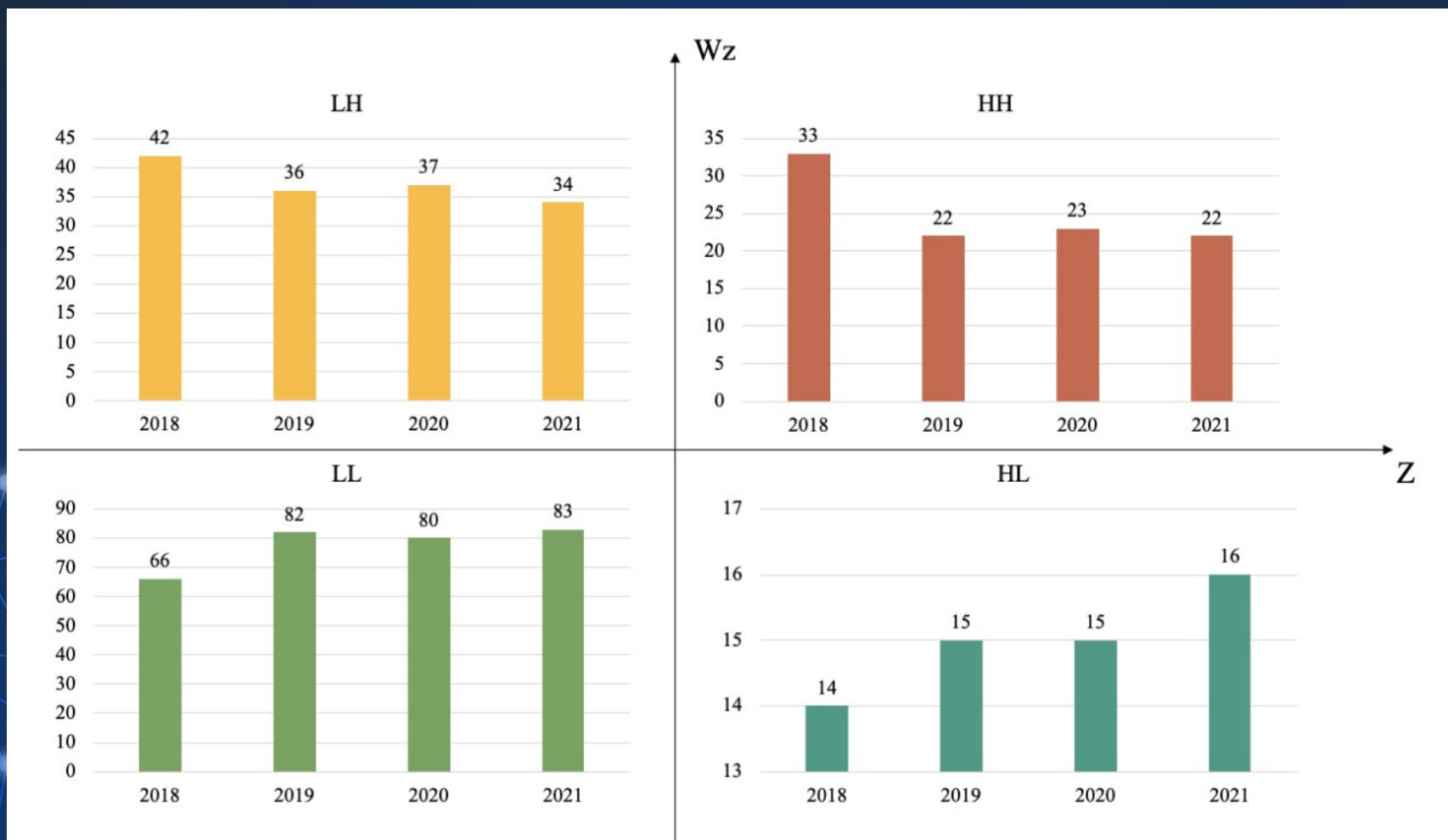
- the pharmaceutical company «AFLOFARM FARMACJA POLSKA SP. Z O.O.»

## Velikopolsky vovivodeship (Poland)

- the Pepco Poland SP. Z O.O. trading network

# Conclusion

- Most regions of Europe have low innovation activity.



# References

1. Pavlov Yu. V., Koroleva E. N (2014). Spatial interactions: assessment based on global and local Moran indices. *Spatial Economics*, 3, 95-110.
2. Kolesnikova, I. (2012). The problems of development of national innovation system. *Nierówności społeczne a wzrost gospodarczy*, 26, 107-121.
3. Leijten, J. (2019). Innovation policy and international relations: directions for EU diplomacy. *European Journal of Futures Research*, 7(1), 4.
4. Moreno R., Paci R., & Usai S. (2005). Geographical and sectoral clusters of innovation in Europe. *The Annals of Regional Science*, 39(4), 715-739.
5. Rosario, C., Costa, A. A., & da Silva, A. L. (2019). The impact of information and communication technologies on countries economic growth. *Economic and Social Development: Book of Proceedings*, 413-521.