

// INSIGHT #01_2021

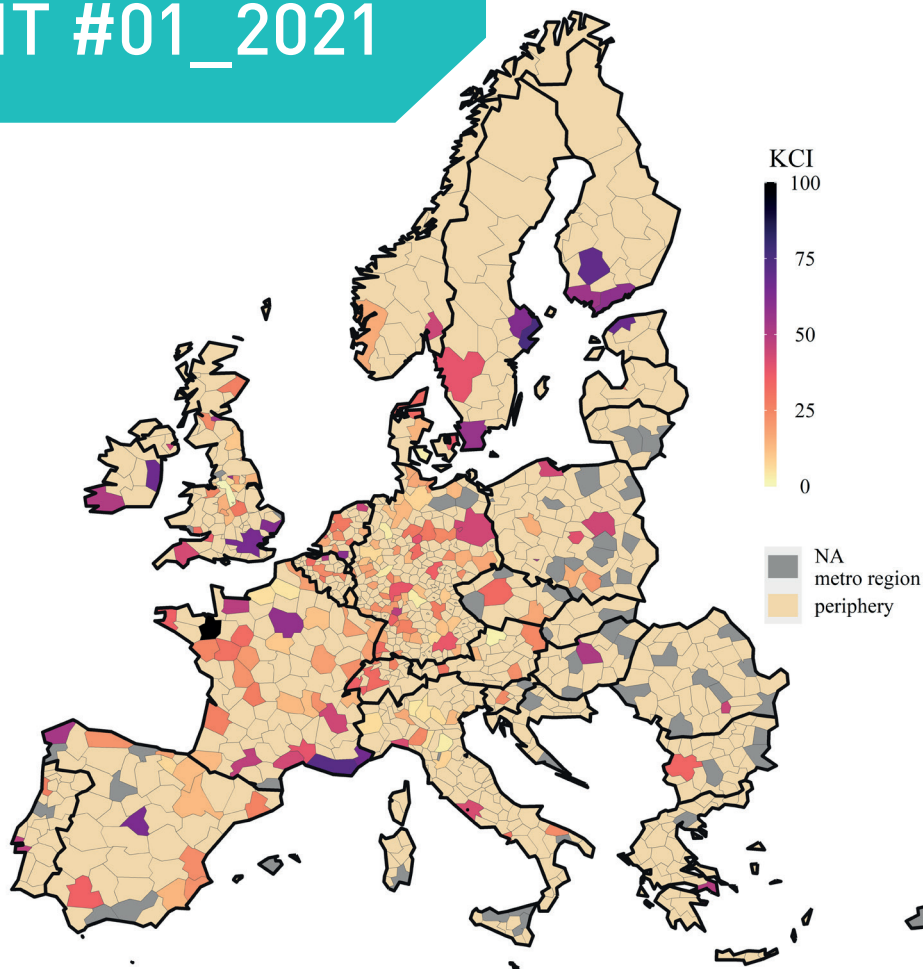


Figure 1: Spatial distribution of regional knowledge complexity, 2010-2014

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THE COMPLEX NATURE OF REGIONAL KNOWLEDGE PRODUCTION

EVIDENCE ON EUROPEAN METROPOLITAN REGIONS

Knowledge creation is widely considered as the central driver for innovation, and accordingly, for creating competitive advantage. However, most measurement approaches have so far mainly focused on the quantitative dimension of knowledge creation, neglecting that not all knowledge has the same value. In this context, the notion of knowledge complexity has come into use as an attempt to grasp the quality of new knowledge in terms of its uniqueness and its replicability.

AIM

We aim to advance measures for regional knowledge complexity & to apply them to European metropolitan regions. Further, we establish an empirical relation between the ability to produce complex knowledge and economic growth and demonstrate the usefulness of the concept to inform regional innovation policies.

APPROACH

We proxy the creation of complex knowledge with a knowledge complexity index (KCI) based on regional patent citation data of European metropolitan regions. A region's knowledge complexity is understood as the ability to develop specific technological knowledge that is both relatively hard to produce but still



impactful in technological development that followed its publication. As a consequence, the index relies on the technological diversity of a region's patent portfolio, on the one hand, and its ubiquity within a network of technologies recorded in patents, on the other hand.

The relation of knowledge complexity to growth is explored by a spatial econometric model, while in combination with the principle of technological relatedness it is used to inform smart specialisation policy debates.

RESULTS & IMPACT

The results demonstrate that the KCI is a highly interesting metric to capture inherent qualitative differences in regional knowledge production not observable by existing measures. With the application to European metropolitan regions, we identify clusters of complex knowledge, and show that regions with highest knowledge complexity scores do not necessarily belong to the traditional industrial core. Top ranked regions, like Rennes or Stockholm, are specialised in technologies identified as most complex, such as digital communication or computer technologies.

A look at dynamic changes of regional knowledge complexity rankings reveals that some regions managed to show a remarkable increase in their relative ranking in the last decade, while other regions declined significantly. Further, the modelling results show that knowledge complexity is not only an abstract index but is statistically associated with future regional economic growth. Finally, a practical application of regional knowledge complexity measures classifies regions according to their potential to diversify into complex technological fields and their expected ease of realising this endeavour. This underlines the usability of knowledge complexity in a policy context.

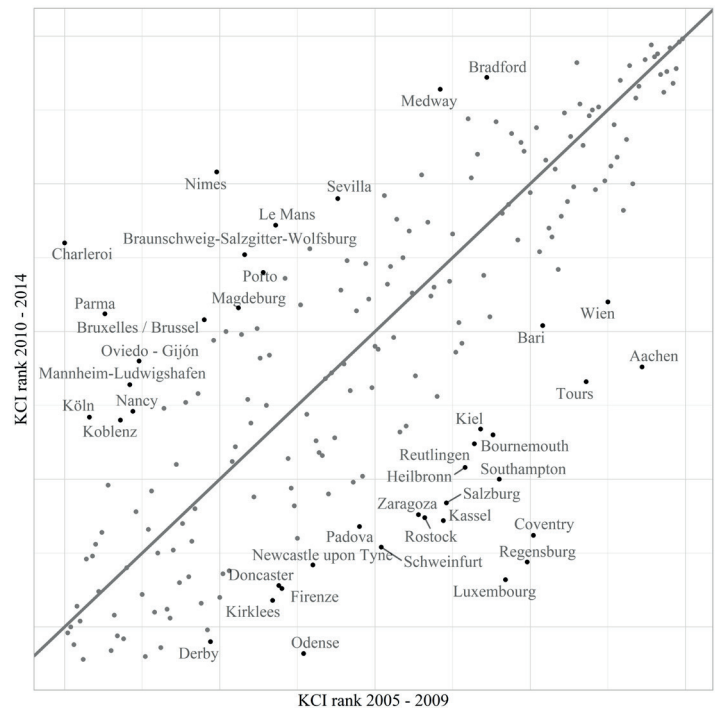


Figure 2: Changes of KCI rankings.

OUTLOOK

Given the basic characteristics of the index, applications in a regional policy context have a great potential, in particular by informing scholars and policy analysts dealing with smart specialisation. Further, it will be crucial to identify factors that facilitate and hinder regional diversification into more complex technologies in future research. This will also provide further important insights into the mobility of complex knowledge in geographical space. Most importantly, future work should also focus on characterising the relationships between knowledge complexity and regional total-factor productivity, assuming that regions with a higher knowledge complexity show higher productivity gains in the long run.

PAPER

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LINK YOUTUBE VIDEO INSIGHT 01_21

Watch our youtube video about the complexity of regional knowledge production

<https://youtu.be/wPxkhMfq66U>



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