The impact of regional industrial structure on employment growth: measurement issues and challenges ahead

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1 Motivation

This paper addresses the sectoral patterns of regional industrial compositions to identify the impact of heterogeneous economic structures on regional economic growth in Europe. The ultimate goal is to understand the relationship between empirically observed structural change trajectories and regional economic performance. Regional development traps studies in Europe have identified regional paths of persistent low economic growth in terms of GDP, productivity and employment [7] and new approaches have reframed the analysis, identifying the role played by regional industrial structures in predicting employment and wage growth differentials across European regions [2]. These studies rely upon aggregate indicators to capture the average level of complementarity and advancement of regional industrial compositions, but do not explicitly take advantage of information on the sectoral dimension, overlooking the heterogeneous impact of different sectoral compositions on economic growth. Still, the sectoral dimension plays an important role in shaping the trajectories of countries economic development and their long run performance [8] [6] [5]. Reconciling the sectoral dimension of economic analysis to economic performance at the regional level could help to identify different growth paths within regions based on their different initial conditions, opening up a new dimension of economic performance in regional economic analysis.

2 Data and Methods

This analysis is based on the Eurostat Structural Business Statistics dataset covering 270 European regions from 2010 to 2020, for a total of 201,960 observations. The strategy employed to detect different groups of regions in the network is the following:

- **Constructing the Region Network**: We use Revealed Comparative Advantages data of regions in industries to construct a Region-Region

network. [10] [4].

- **Graph and Community Detection Techniques**: We apply a Configuration Null Model to clean this network from non-significant linkages, apply community detection algorithms and evaluate their performance using partition quality indicators [3] [9] [4]
- **Visualization of Communities on the Industry Space**: We construct the industry network space, using a novel machine learning approach to predict sectors relatedness [1] to track communities specialization on that space.

3 Preliminary Results

The analysis revealed that the region network is highly fragmented and after the filtering only a small portion of linkages are mantained (1,5% for 5% significance). We identified the optimal algorithm and distance measure that lead to best performance and in the final partition we obtained 17 communities and we are working to summarize the results on sectoral compositions of specific communities. The next steps consist in:

1. Summarizing descriptive evidence to interpret the results of the community detection analysis
2. Mapping the communities into regional development traps groups and track communities sectoral composition evolution from 2010 to 2020.
3. Testing the robustness of Complexity and Relatedness metrics and their related econometric framework across communities.

References

[1] Giambattista Albora, Luciano Pietronero, Andrea Tacchella, and Andrea Zaccaria. Product progression: a machine learning approach to forecasting industrial upgrading. *Scientific Reports*, 13(1):1481, 2023.

[2] Pierre-Alex Balland and Ron Boschma. An evolutionary approach to regional development traps in european regions. *Papers in Evolutionary Economic Geography*, (24.20), 2024.

[3] B Bollobás. Random graphs, cambridge university press. *Cambridge, UK*, 2001.

[4] Guido Caldarelli, Matthieu Cristelli, Andrea Gabrielli, Luciano Pietronero, Antonio Scala, and Andrea Tacchella. A network analysis of countries' export flows: firm grounds for the building blocks of the economy. 2012.

[5] Lorenzo Cresti, Giovanni Dosi, and Giorgio Fagiolo. Technological interdependencies and employment changes in european industries. *Structural Change and Economic Dynamics*, 64:41–57, 2023.

[6] Lorenzo Cresti and Maria Enrica Virgillito. Strategic sectors and essential jobs: a new taxonomy based on employment multipliers. *Available at SSRN 4215798*, 2022.

[7] Andreas Diemer, Simona Iammarino, Andrés Rodríguez-Pose, and Michael Storper. The regional development trap in europe. *Economic Geography*, 98(5):487–509, 2022.

[8] Giovanni Dosi, Federico Riccio, and Maria Enrica Virgillito. Specialize or diversify? and in what? trade composition, quality of specialization, and persistent growth. *Industrial and Corporate Change*, 31(2):301–337, 2022.

[9] Filippo Radicchi, José J Ramasco, and Santo Fortunato. Information filtering in complex weighted networks. *Physical Review E—Statistical, Nonlinear, and Soft Matter Physics*, 83(4):046101, 2011.

[10] Cédric Villani et al. *Optimal transport: old and new*, volume 338. Springer, 2009.