TITLE: Innovative geospatial accessibility KPIs for assessing regional infrastructure endowment

Authors: Bergantino A., Costa V., Delponte I., Ferrari C., Intini M., Tei A.

Introduction

Accessibility is one of the key parameters for improving socio-economic development of different local areas (e.g. Chen et al., 2015). Several international bodies (e.g. UNCTAD, 2024; ESPON, 2024) have defined indicators linking connectivity and accessibility of regions with different income levels and related environmental performance of industrial sectors. Such elements have been intensively studied by literature (e.g. Bottasso et al., 2018; Rodríguez-Pose et al., 2020) and have been integrated in some economic policies (e.g. European Commission, 2016) even though not in an extensive way (e.g. Connecting Europe Facilities funding, Cohesion Funds).

In this direction, several approaches have been defined to address accessibility assessment and measurement, thus insisting on local infrastructural endowment, activities' territorial location or utility functions (Handy and Niemeier, 1997; Geurs and Eck, 2001; Silva, 2008). Nevertheless, a shared policy perspective is far from being met.

All past projects have been built on existing statistics mixing up econometric assessment with general infrastructure endowment statistics. In some European countries, regional and transport statistics are not systematically gathered, making comparisons and assessment quite seldom. Moreover, other issues refer to the inconsistency in data collection techniques – or maintenance of related database over time – generating potential problems in terms of robustness of estimations as well as the possibility to properly compare local data and estimations.

In Italy, for instance, the infrastructure database (managed by the National Institute for Statistics [ISTAT, 2024]) is the major source of homogenized data. This database links together data collected through different studies, but it is subject to ageing of the presented values and inconsistencies – for instance in terms of timeframes available – among the different variables presented. As such, evaluations are difficult to be used as benchmark over time and to be systematically integrated into policies and planning (e.g. Veretennik and Yudkevich, 2023) with risks to create biases in ex-ante, ongoing, and ex-post evaluations (e.g. Combes and Lafourcade, 2005; World Bank, 2005). Moreover, economic statistics are usually collected and presented aside from geographical and social variables, creating issues in properly representing local geo-physical elements that allows for differentiation in the quality of the service provided by different infrastructure.

Building upon past studies, current research filled in the potential gap by elaborating assessment methods and indexes – as well as monitoring tools – for evaluating regional economic discrepancies. Such solutions will be based on a regional database that mix-up public available economic data with geographical and social information.

Moreover, the chosen methodology aims at defining an hybrid approach towards the regional effects of local accessibility through the integration of infrastructure-based and activity-based measures, thus targeting a more comprehensive evaluation of territorial and transport informative layers.

In order to achieve its aim, the study will contribute to current knowledge by re-creating a geodatabase on Italian NUTS-3 regions and linking network and service indicators – from transport and energy point of view – with current accessibility and percolation indexes. This information will be then linked to regional geographical and social characteristics in order to assess if economic and industrial patterns differ only because of infrastructure endowment / connectivity level or if specific social (e.g. demographic) and geographical (e.g. direct access to specific areas) explain more the current regional differences than other economic variables usually present in literature.

The final goal is to define if economic sector growth rates and local specialization level depends on different infrastructure endowment and service recorded as well as if current accessibility and percolation levels is linked to previous local infrastructure endowment, independently from the current transport service statistics.

Methodology

In order to achieve its aim, the research will use a mix-approach, linking together economic evaluation, network analysis, and new economic geographical approaches.

First, primary and secondary data will be collected for characterizing NUTS2 regions from an economic (e.g. employment per sector, GDP), social (e.g. demographic), and environmental (e.g. energy consumption, pollution) point of view. Similarly network characteristics (e.g. infrastructure endowment, connectivity and related services) will be linked and georeferenced. Such operation will aim at creating a novel database, currently not present in Italian statistics.

The rationale for constituting a geodatabase is that it will allow to integrate, store, and manage both spatial and non-spatial data within a unified framework. This integration facilitates advanced spatial queries, geostatistical modeling, and visualization, thereby enhancing the precision of regional economic assessments. By incorporating geographic information system (GIS) tools, geodatabases improve traditional methodologies by supporting complex analyses. The geodatabase will also allow to compute connectivity as well as percolation indexes for improving regional assessments.

From the information included in the geodatabase, an econometric analysis linking together the different variables will be developed.

Research Questions

Key research questions will be the following ones:

- Are economic growth rates depending on either connectivity or percolation indexes?
- Is there a correlation between infrastructure-based accessibility, activities territorial location and regional economic structure/specialization?
- How can geodatabase be used for economic policies?

Expected Results

Results will be then used for i) suggesting novel monitoring tools through the developed geo-database with elements for better improving current regional data maintenance systems used for economic policies (e.g. ISTAT database) and ii) outcomes of the developed assessment will be used for improving current understanding on how infrastructure could create path dependence

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