This paper aims to map the spatial distribution of economic activity in Italy and its evolution during the last decade. To attain this purpose, we rely on Marcon & Puech's M – a distance measure that allows us to overcome the Modifiable Areal Unit Problem and the related biased featured by conventional measures based on pre-determined geographical units. Indeed, whereas early measures of localization dealt with the relative specialization of particular pre-defined geographical areas (typically administrative partitions of some larger territory of interest), distance measures escape those constraints and produce indices based on distances between pairs of firms or establishments. Therefore, the measurement of localization (or dispersion) becomes some version of the question "for any given firm (or plant), what is the likelihood of finding another firm in the same (or a related) industry within (or at) a certain distance, relative to some counterfactual?" The most commonly employed counterfactual, or null hypothesis, is that the spatial distribution would be the same as the distribution of some broader category of establishments: we might estimate the spatial concentration of employment in shoe manufacturing relative to manufacturing as a whole, or relative to employment as a whole (Tidu, Guy & Usai, 2024). In economic geography, the most widely used distance-based model is that of Duranton & Overman (2005). They propose five characteristics that sound distance measures should have:

1) They should be comparable across industries;
2) They should control for overall agglomeration trends across industries;
3) They should separate spatial concentration from industrial concentration;
4) They should be unbiased with respect to the degree of spatial aggregation;
5) They should provide an indication of the significance of the results.

Duranton and Overman's K_d respects the five criteria they had identified, and which is a function of density of probability of finding a neighbor at a certain distance. Marcon & Puech's (2010) M is, in contrast, a cumulative function: for a given distance from a plant, it answers the question "within a radius r of a representative plant in industry A, can we expect industry A's share of all industry to be greater, or less, than industry A's overall share?".

Marcon & Puech's M has many interesting features: it is a relative measure, its units of analysis can be weighted, and it accounts for both local and overall agglomeration. However, two major drawbacks have limited the usage of such a promising measure: computational intensity and data availability. As concerns the former, the required time is proportional to the squared number of points (Marcon & Puech, 2017), burgeoning to unmanageable numbers when analyzing entire regions, let alone whole countries. Luckily, Tidu, Guy & Usai (2024) have recently demonstrated that approximating the location of observations by a short distance produces almost undistinguishable results and allows to reduce computational intensity by a great deal. Their findings empirically confirm Marcon & Puech's (2017) own intuition that <<*cumulative functions are insensitive to errors at smaller scales than the distance they consider: if the uncertainty is a few hectometers, the number of neighbors up to a few kilometers is known with no error except for the more distant ones, which are a small proportion*>>.

Relying on this method and through a partnership with the Statistical Bureau of Regione Sardegna, we are able to overcome the issue of data availability as well and to work on an extremely detailed and accurate dataset: Frame SBS – Territoriale. This dataset is a part of a larger integrated system of registers on firms and establishments. The informative framework results from integrating the standard register on manufacturing and services establishments (ASIA), the extended register on economic variables at firm-level (Frame SBS) and structural and economic information on establishments originating from national surveys on large firms (IULGI). Frame SBS Territoriale censes every establishment in Italy, providing information about geographical location, industry, added value, revenue, costs, employment and export propensity, amounting to almost five million establishments and over 17 million workers for each available year. Notably, Frame SBS Territoriale is not limited to manufacturing activities, but also covers service industries which are often left out of the picture for lack of data. Indeed, as reported by Barlet, Briant & Crusson (2013, p. 339), <<*the service industry plays an increasing role in terms of employment and added-value in modern economies*>>, but <<*the literature has almost exclusively dealt with the location patterns of manufacturing industries*>>.

We believe that a comprehensive quantitative study in such sense is lacking, and we are also deeply convinced that its development through distance-based methods provides much more meaningful results than more conventional measures would.

Below, we provide some results that show how M rightly captures the level of spatial concentration and dispersion of individual industries.

ATECO three-digit industry (listed from most to least spatially concentrated)	M (15 km)
INLAND PASSENGER WATER TRANSPORT	84,95
SPINNING, WEAVING AND FINISHING OF TEXTILES	26,32
MANUFACTURE OF CLAY BUILDING MATERIALS	23,82
MANUFACTURE OF WEAPONS AND AMMUNITION	23,32
MANUFACTURE OF MUSICAL INSTRUMENTS	20,56
PASSENGER AIR TRANSPORT	20,43
MANUFACTURE OF FOOTWEAR	19,16
MANUFACTURE OF JEWELLERY, BIJOUTERIE AND RELATED ARTICLES	17,91
MANUFACTURE OF OTHER PORCELAIN AND CERAMIC PRODUCTS	15,42
PROCESSING AND PRESERVING OF FISH, CRUSTACEANS AND MOLLUSCS	10,94
WEAVING OF TEXTILES	10,68
MINING AND QUARRYING N.E.C.	10,65
TANNING AND DRESSING OF LEATHER; MANUFACTURE OF LUGGAGE; HANDBAGS; SADDLERY AND HARNESS; DRESSING AND DYEING OF FUR	10,41
MANUFACTURE OF MOTOR VEHICLES	8,40
FINISHING OF TEXTILES	8,40
MANUFACTURE OF KNITTED AND CROCHETED APPAREL	8,02
MANUFACTURE OF DOMESTIC APPLIANCES	7,94
BUILDING OF SHIPS AND BOATS	7,37
CAMPING GROUNDS, RECREATIONAL VEHICLE PARKS AND TRAILER PARKS	6,72
MANUFACTURE OF PULP, PAPER AND PAPERBOARD	6,65

...

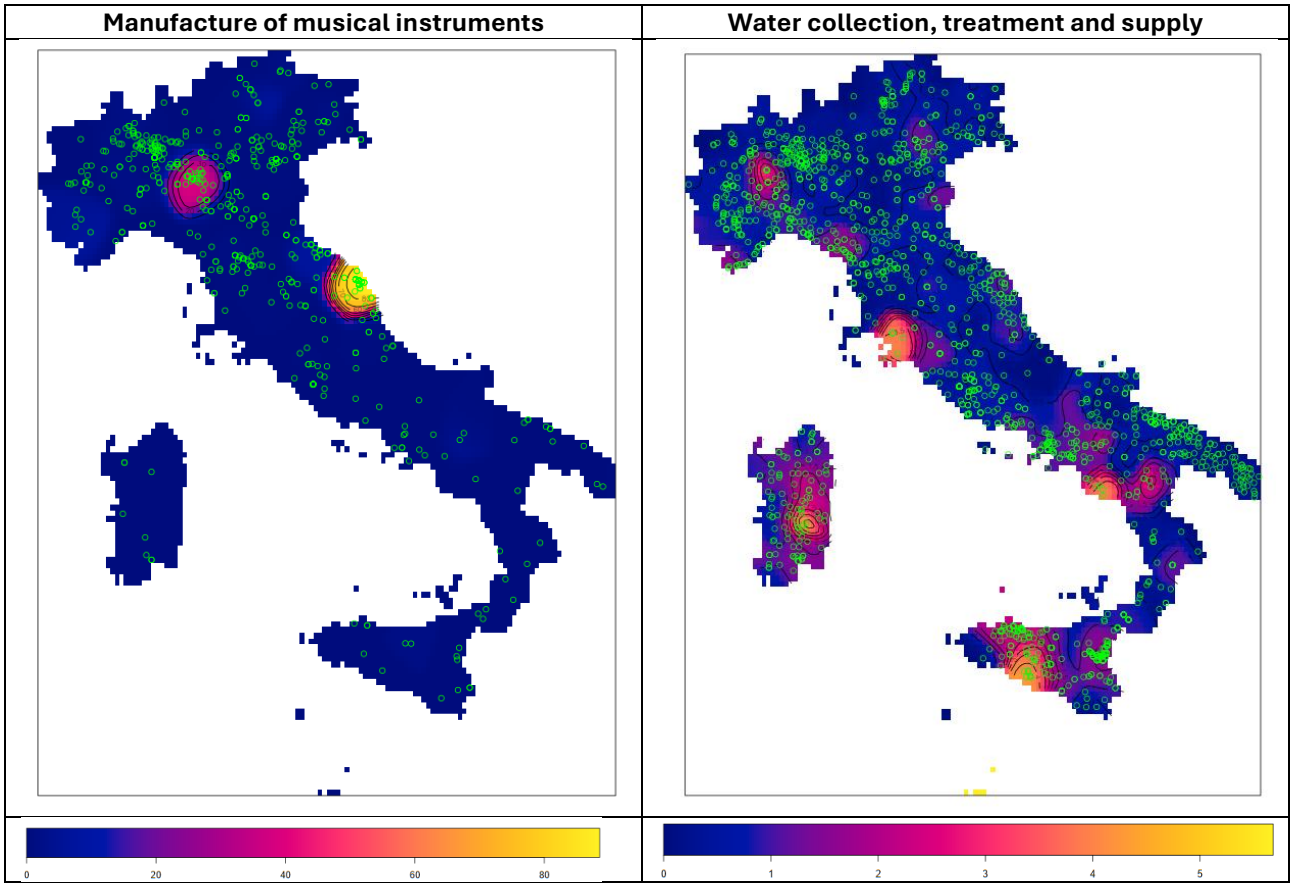
OTHER PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES N.E.C.	1,06
ARCHITECTURAL AND ENGINEERING ACTIVITIES AND RELATED TECHNICAL CONSULTANCY	1,05
PHOTOGRAPHIC ACTIVITIES	1,05
ELECTRICAL, PLUMBING AND OTHER CONSTRUCTION INSTALLATION ACTIVITIES	1,05
RETAIL SALE OF CULTURAL AND RECREATION GOODS IN SPECIALIZED STORES	1,05
DATA PROCESSING, HOSTING AND RELATED ACTIVITIES; WEB PORTALS	1,04
ACCOUNTING, BOOKKEEPING AND AUDITING ACTIVITIES; TAX CONSULTANCY	1,04
OTHER PERSONAL SERVICE ACTIVITIES	1,04
CLEANING ACTIVITIES	1,03
EVENT CATERING AND OTHER FOOD SERVICE ACTIVITIES	1,03

By looking at those results, it is apparently clear that our measure is working correctly, since the industries that appear as most spatially concentrated are indeed those that we would have expected: they range from those that are dependent on geographical features (mining and quarrying, but also inland water transport, mostly located in Venice) to those that traditionally display agglomerating tendencies (textiles, building of ships and boats); historical Italian industrial districts are of course represented as well: clay building materials, musical instruments, footwear, jewellery, domestic appliances, motor vehicles. On the other hand, the bottom of this list consists of those industries that expectedly do not exhibit such concentration patterns, because they follow either economic activity in general or even population distribution: examples are cleaning activities, plumbers and professionals such as accountants or architects.

The availability of a quantitative measurement of agglomeration for Italy is by and of itself a significant attainment, but an even more interesting results is the opportunity to understand how geographic patterns are changing and what is driving them. Indeed, our computations do not produce only figures and numbers, but also maps that graphically show how different territories are contributing to the industry overall level of spatial concentration.

An example is provided by the following two maps, which contrast an industry that shows strong agglomeration patterns with another one that features spatial dispersion, also showing where plants are located through small green circles. The first one – Manufacture of musical instruments – is notably concentrated around Cremona in Northern Italy and Recanati on the Adriatic coast. The map shows that our index is not only capable of identifying those two strongholds, but also captures how a strong presence of plants belonging to that industry does not necessarily signifies that an agglomeration is in place: there might be a large number of firms involved in the production of musical instruments around Milan, but that is only because almost every industry is necessarily represented in Italy's economic powerhouse. The second maps – Water collection, treatment and supply – rightly captures the dispersion of an industry whose spatial distribution is independent not only from economic patterns but in a certain sense, even demographic ones: water needs to be collected, treated and supplied everywhere and a large city does not need proportionally more plants or more workers in respect to a smaller one. Indeed spatial concentration patterns are very loose (the yellow color here represents a level of five, in contrast with over 80 in

the first map) and are mostly a result of weak population and economic presence in such areas, as Maremma, Southern Sicily or Central Sardinia.



A more precise measurement of agglomeration shall not be considered a mere academic exercise, but rather represents a significant help for those in charge of legislating economic and social matters. A strong component behind economic performance does not depend on entrepreneurial skills, but is a consequence of location and forces that are external to the firm. In this sense, several authors have stressed the opportunity for governments to tax agglomeration rents (Jofre-Monseny, 2013): in a world where capital mobility is limiting the possibility for governments to increase corporate tax rates, the availability of agglomeration rents allows jurisdictions to impose higher taxes without suffering immediate capital outflow (Koh, Riedel & Böhm, 2013). Indeed, whereas, on average, high corporate income taxes constitute a deterrent for new firms, such a relationship has been proven significantly weaker in the most spatially concentrated industries (Brülhart, Jametti and Schmidheiny, 2012) and districts (Crabbé & De Bruyne, 2013). On the other hand, agglomeration also comes with some social costs, ranging from pecuniary diseconomies - such as high land rents - to traffic congestion and pollution (Richardson, 1995): these diseconomies have a negative social and economic impact and shall be taken into consideration and dealt with through appropriate policies.

All in all, we believe that assessing the spatial distribution of economic activity and its patterns of change – especially through a peculiar period characterized by disruptions originating from the COVID-19 pandemic and the war in Ukraine - is very helpful. This is particularly true for a country, such as Italy, historically endowed with a wide array of industrial districts that have been notably undergoing significant transformation (e.g.: the globalization-driven reduction of districts' firm population; the diversification of the local production structure and the change in its relationship with the social structure; the weakening of relations between firms), with the consequence of dismantling <<*the Marshallian model that once characterized*>> them (De Marchi & Grandinetti, 2014).