

The Urban Life Cycle in the Italian Demographic Winter. An Analysis on Metropolitan Cities

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Abstract. Since their foundations, cities configured themselves as places of innovation, where flows of people, goods, services, ideas, culture, met and, through interaction allowed spreading of new ideas, solutions, applications. The traditional, spontaneous, way of spreading of innovation has recently left the pace to more structured systems. To-date, innovation is part of structured and prepared business models in enterprises, and it is very often rooted into policies of local, regional, and national development. Cities are not an exception to that, and investment on innovative systems and methods can make the difference in the success or failure of cities. Following the literature on urban geography dealing with the urban life cycle, covering also the most recent evolutions, summarized, as a matter of example, in Florida's 'New Urban Crisis', the present work aims at observing the most recent urban dynamics between spatial, urban demographic changes in view of the 'demographic winter' that Italy, together with many industrialized and more mature economies, is experimenting. The work analyses the Italian urban system, considering the urban dynamics in terms of population change, in its different administrative and functional aggregations, observing their characteristics and evolutions in recent times (2019–2023, pre and post Covid-19 pandemics), highlighting the formation of urban 'champions' and proposing a spatial analysis observing and evaluating their characteristics in terms of population dynamics.

Keywords: Cities · Demographic Transition · Urban Planning · Regional Planning

1 Introduction

From the very beginning of times in which humans started to settle in fixed locations, cities were developed as a consequence of a massive innovation as the introduction of agriculture, what brought with it an entire set of innovative by-products, as, as a matter of instance, the organization of an urban society, with well-defined ranks and

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roles; the introduction of writing and mapping, for storage and warehousing purposes, the realization of ad-hoc buildings for the different purposes and functions played by the new organization of society and economy. The innovations in cities of course are wider than those mentioned above, however, from the very beginning of their existence, and from the dawn of time, cities have become important places of interaction, where flows of people, goods, ideas and, more generally, novelties - these including conflicts, wars, epidemics - easily met, helped by the nature of cities themselves to concentrate these elements in a relatively limited amount of space. Density and interaction therefore characterize cities heavily as human made artifacts and as an important physical and socio-economical expression and footprint of civilizations [1–3].

The research is aimed at analyzing the population dynamics in the main Italian metropolitan cities (in administrative terms) and areas (in functional ones), examining as well as the performances in the recent pre and post pandemic (2019–2023) years. The research has the aim to mapping the dynamics of the urban population in Italy, forced between depopulation, ageing of the population and urban sprawl, correlated to the increase in accessibility and property value.

The rest of the paper is organized as it follows. Paragraph 2 provides a conceptual review of the urban lifecycle and the demographic aspects related to that. Paragraph 3 describes the study area analyzed (Italy), the data (population and innovation indicators) and the methods (the application of the urban life cycle model together with a local analysis based on spatial autocorrelation techniques among elements of innovation). In Paragraph 4 results and discussion are presented, while Conclusions in Paragraph 5 provides a general overview of the main findings of the paper, shading light to the next research agenda to be implemented.

2 The Urban Lifecycle and Demography. A Review

From the dawn of time, cities have been important places of interaction, exchange of flows of people, goods, ideas, culture, and, more generally, and in geographical terms, innovation. In this sense innovation represents ‘something new’, not present before. Still in geographical terms, innovation can be either something coming out from the process of interaction among places, i.e., moving from one place of origin to a set of destinations, and therefore part of the differences in places in terms of the peculiarities characterizing single locations in space, or as the outcome of a local process of interaction. Being cities dense environments, in which the above-mentioned elements as people, goods, ideas and culture meet, they always represented a fertile environment for the development of creativity and innovations [4, 5].

In literature, the observation of the evolution of cities in their relationship with the related region-territory, has led scholars to model the so-called ‘Urban Life Cycle’ [6, 7]. In this sense, the urban life cycle model can be useful in understanding the basics of the core-periphery – or core-ring – relationship and to understand urban population dynamics [8–10]. The standard well-established model foreseen different steps that cities are likely to follow during their existence. In such a sense the model considers different parts a city consists of, as its core and its ring, or inner periphery. Furthermore, the model in its evolution considers the metropolitan city as a whole. Extra-elements as the urban

extra-peripheral fringes can be considered. According to Van den Berg et al. [7] a city passes through an organism through an urban life cycle that follows four different stages, regarding the two main components of a city: its core and its fringe (or ring). The urban life cycle is not an obliged path a city must follow, but a possible model a city could take, in different five stages not necessarily determined (Fig. 1a).

The first stage of urbanization regards a concentration in the core and reduction of density in the ring. This is the early stage of creation and growth of cities as relevant settlements with increasing levels of agglomeration. This is also the stage in which density is increasing, both in the core and, in a second substage, in the ring.

The second stage is that of suburbanization and is characterized by a slower increase in the core and an increase of agglomeration in the ring, but with a decreasing pace in the second substage in both areas. This is the stage that industrialized countries experimented with the introduction of cars and private transport that rapidly helped the increase in size of the city in its extension, thus reducing density and the presence of resident people in the city center, this latter becoming an area dedicated today /working-time activities and with the presence of city users. This process is also generally coupled with an increase of urban rent in the center, which helps the centrifugal relocation of residents in the suburbs in the ring.

The third stage is that of disurbanization and is characterized by an agglomeration decreases in both the core and in the ring; overall the city and its first ring of suburbs reduce their population and density. Disurbanization can occur for different reasons, as the loss of role of the main city - as it did occur to many industrial city because of deindustrialization - Detroit being the most fitting example -, the overall decrease of the population in the area for natural cases - as for an overall decrease of the population of the entire area if not of the country -, and, still, for a further centrifugal jump of the population towards farther neighborhoods, suburbs or satellite cities in the 'second ring'. According to the different patterns, disurbanization can be either observed together with important increases of urban rent - and therefore a further relocation of people farther from the center or, on the contrary, a reduction of rents due to a 'lack of desire' for central locations, in cases in which a city lose its main function and attractiveness.

The four stage is that of reurbanization and is characterized by of the process of going back to the city center - back to downtown or back to the core - as the effect of a rediscover of the city centers, initially by a creative class - as initially theorized by Florida [11] - gradually substituted by - generally - more affluent residents.

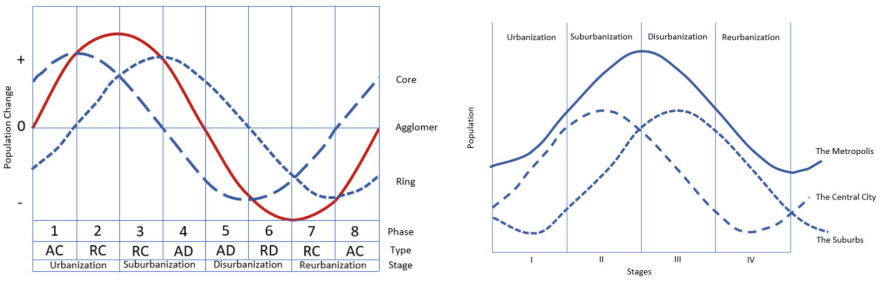


Fig. 1. a) The urban life cycle, b) The urban life cycle in a metropolitan area. Source: [7, 12]

The urban lifecycle paradox is that of the spreading of the urban lifestyle over a wider and wider area - if we not consider just agglomeration but the overall population distribution on what can be defined as 'urban' (Fig. 1b) - together with a gradual and constant reduction of one of the main character of the city itself, as its density, or agglomeration, or, still, concentration of people, buildings and activities that characterize the functions and reasons of existence of the city itself. Such a reduction of the residential population density, however, is coupled with an increase of the flows and interactions - particularly in the sense of commuting of city-workers from farther destinations to the city centers - as well as an overall mix of residents and city users in the core [13–16].

3 The Study Area, Data and Method

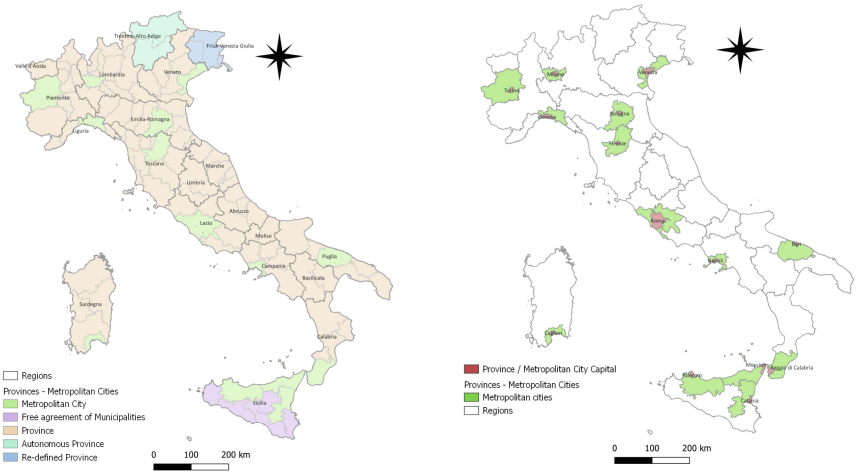
3.1 The Study Area

The analysis is performed considering Italy as the study area. The attention is particularly drawn over the administrative and statistical subdivision of Provinces and similar - i.e., Metropolitan cities, where they are present in the administrative layout - and the capital municipalities of these units. Furthermore, the analysis is performed considering the FUAs - Functional Urban Areas - related to the metropolitan Cities to consider both the administrative and the functional principles of metropolises [17, 18].

From the administrative and statistical point of view, Italy is organized in three different levels, these corresponding to macro, intermediate and micro levels of administrations, corresponding to Regions, Provinces / Metropolitan cities / aggregations of Municipalities, and Municipalities. Regions hold a high level of autonomy, delegated from the central state to issue laws particularly on matters related to health, transport and spatial planning selected aspects, in a form of loose federal state. Municipalities oversee regulating laws on local taxation, economic activities, and planning, in line with the national and regional laws and orientations. Provinces acted as the intermediate administrative level in the past, and more recently their role has become mainly as that of an intermediate strategic planning to be harmonized with the lower and upper levels, with several differences between the different regional frameworks in which provinces are inserted. The main change in the intermediate level took place after 2014 (law 7 April 2014, n. 56, so-called 'Delrio law') with the transformation of the provinces centered around the main urban municipalities into metropolitan cities.

These units in most of the cases - Cagliari represents an exception - occupy the same areas of the former provinces, holding, therefore, more administrative meanings than a functional one. Fourteen metropolitan cities were defined by the national reform law, allowing, however, the Italian five autonomous regions (Sicily, Sardinia, Val D'Aosta, Trentino Alto Adige with the Autonomous Provinces of Trento and Bolzano, and Friuli Venezia Giulia) the possibility of defining regional metropolitan cities on their own, thanks to the autonomy granted in terms of spatial planning and internal administrative organization (Fig. 2). A vast literature has been produced through the years analyzing and commenting the Italian political geography of its administrative units, from their basic foundations and characteristics [19–21], examining the relationships between the different levels of administration and the roles, powers and planning tools assigned to them [22, 23] particularly in light of the most recent evolutions of the intermediate level

of administration and revision towards the metropolitan cities [24–27]. The metropolitan cities were considered also in terms of their functional areas (FUAs) and the municipalities included into the core and ring areas of these latter units (Fig. 3, [28, 29]). The debate among the consideration of metropolitan cities and areas has been and is wide and deep, covering, with reference to the Italian case, the functional aspects [21, 22, 30–33].



a) b)

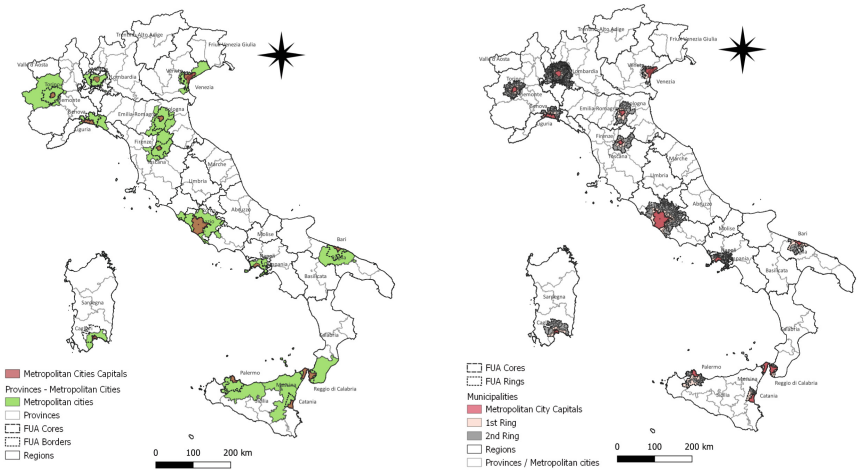
Fig. 2. a) Administrative divisions: Regions, Metropolitan Cities and Provinces; b) Regions, Metropolitan Cities and their Capital Municipalities; Author: G Borruso, data from ISTAT [35].

3.2 Data

The data considered in this analysis were taken from different sources and particularly referred to major categories, these belonging to demographic elements, through their evolution in time, as highlighted in Table 1.

The analysis has been carried on considering the Italian administrative divisions in Provinces and Municipalities. Population data were attributed to Municipalities, these latter considered with references to metropolitan cities and areas. We considered a comparison over a 5-year period, between 2019 and 2023. This timeframe was considered to observe changes over a narrow period and well distant from the national census of 2011 and 2021. Data were obtained from Italian National Statistic Institute (ISTAT) in the different years [33, 34], together with geographical data for administrative units (municipalities, provinces / metropolitan cities / intermediate units, regions [35]).

Population data at Municipal level were made uniform to the administrative divisions of 2023. The administrative geography of Italy has in fact changed during the recent years, with municipalities alternatively merging or splitting, or changing their provincial belonging. Also, the intermediate level of Provinces, in recent years considered more for statistical purposes than for administrative ones, passed through several



a) b)

Fig. 3. a) FUAs: Metropolitan Cities and their FUAs; b) Metropolitan cities' FUAs and their municipalities. Author: G. Borruso, data from ISTAT [35], OECD and Copernicus [36].

Table 1. The data used.

Data	Indicators	Spatial Units	Source
Population	Population density Population change (2019–2023)	Municipalities; Provinces/ Metropolitan Cities FUAs	ISTAT; OECD; Copernicus

reforms and reconfigurations, very often varying their borders. In such a framework, population data in 2019 were reconfigured and attributed to the 2023 administrative units. Doing so allowed us to compare the two different periods easily and correctly. FUAs were obtained from Copernicus Data and according to the OECD methods proposed for defining homogeneous metropolitan areas at international level, based on a minimal dimension (50,000 inhabitants), population density and commuting [28, 29]. Data attributed to municipalities were aggregated considering different belongings to FUA's cores and rings to attribute population data to such non-statistical and administrative units.

Demographic data were particularly considered for an analysis on population and the changes occurred within metropolitan and urban areas.

3.3 Methods

The analysis has been performed considering the urban life cycle model applied to Italian cities, considering the spatial variation of population over a 5-years period (2019–23) in the Italian Municipalities, with particular reference to those belonging to the main urban

areas (metropolitan cities and areas).To analyze the urban pattern and changes occurring in the period, the population in the two years analyzed was attributed to municipalities in their 2023 configuration to monitor the changes occurred in the period considered. Furthermore, the analysis was performed with reference to the Italian metropolitan cities and their areas. As the areas covered by the metropolitan cities are generally following an administrative principle and logic, it was decided to integrate such spatial units with their related data with the FUAs, as defined by OECD - EU and derived from the Copernicus database [18, 36, 37].

4 Results and Discussion

The analysis was performed on the fourteen Metropolitan Cities as officially recognized from an administrative point of view by Italian law. These cities were analyzed in different terms from the point of view of the population changes. With reference to these 'metropolises', we considered their population dynamics, considering different official statistical units. In particular, the following assumptions and steps were followed.

When considering population data, we referred to Metropolitan Cities and Functional Urban Areas (FUAs).

The Metropolitan City capitals were considered as the 'central' municipalities of the Metropolitan City areas.

When considering the Metropolitan Cities, the homonymous administrative and statistical areas were considered.

When considering the Metropolitan Areas in functional terms, we considered the FUAs' areas and the municipalities belonging to them.

For each Metropolitan City, we considered its homologous FUA.

The external borders of FUAs were chosen to collect all the municipalities belonging to a certain Metropolitan City / Area.

The analysis on the core/ring was done considering two different situations (in both cases:

1. Based on administrative divisions: Metropolitan Capital, First Ring Municipalities (adjacent to the Metropolitan Capital), Second Ring Municipalities - adjacent to the First Ring Municipalities.
2. Based on the FUA's definition method: Urban Core - 'central' municipalities, including Metropolitan Capital; Ring - other Municipalities, external from the Core and within the FUA's border.

An initial consideration to be done regards the delimitation of the Metropolitan Cities as in the Italian law and its (lack of) relationship with their functions in metropolitan terms [38]. The 14 cities considered are the biggest in Italy, nonetheless the delimitation of their 'catchment areas' follow administrative principles rather than functional ones. Nonetheless they represent an important share of the Italian population. The municipalities of the fourteen Metropolitan Capitals together count for 9.2 million people over a total of 59 million people living in Italy in 2023, while their Metropolitan City areas count for 21.3 million people [33]. The administrative-based system of definition of

the Italian Metropolitan City areas was therefore integrated with the functional one, developed for the definition of European Functional Urban Areas.

In absolute terms, the population involved in the two systems is quite similar – 21.3 million people in metropolitan cities; 20.4 million people in FUAs in 2023 - although their spatial pattern is quite dissimilar. Examples of that can be noticed in Fig. 4, with a sample of the major Metropolitan cities and areas considered. In some cases - i.e., Rome, Naples - the functional and administrative dimensions are quite similar. On the contrary, in the case of Milan the Metropolitan City is just part of the central core of the FUA, while in the case of Bari the Metropolitan City area is much bigger than the functional one. In most cases, the Municipality of the Metropolitan City Capital is also the core of the FUA, apart from the cases of Milan and Naples, where the urban core includes other municipalities than the Metropolitan City Capital.

The analysis required, as mentioned, a data harmonization between 2019 and 2023 in terms of the population attributed to municipalities and their provinces/metropolitan cities. Furthermore, spatial analyses were performed to obtain the municipalities enclosed within the FUAs and derive their belonging to the first and second rings of proximity (Fig. 4, areas in pink and grey) and their belonging to the core (dashed black line) or external FUA's borders (dotted black line).

The analysis on the population data on the two selected years displays an overall decrease of Italian population from 2019 to 2023 of −1.37%. Metro cities (administrative

Table 2. Population changes 2019–2023 (based on Municipalities data). Author: G Borruso, elaboration from ISTAT Data [33, 34] and OECD Data [36].

Metro Name	Metro City	Capital City	1st Ring	2nd Ring	FUA Core	FUA Ring	FUA Total
Torino	−1.52	−1.56	−1.75	−0.77	−1.56	−1.23	−1.39
Genova	−1.75	−1.40	−3.17	−3.41	−1.40	−3.29	−1.74
Milano	−0.68	−2.69	0.66	0.74	−0.66	0.62	−0.20
Venezia	−1.78	−3.48	−0.38	−1.23	−3.48	−0.61	−2.08
Bologna	−0.34	−1.03	0.46	0.93	−1.03	0.70	−0.20
Firenze	−1.08	−1.93	−0.24	−0.84	−1.93	−0.53	−1.22
Roma	−0.86	−2.30	2.79	1.42	−2.30	2.08	−0.77
Napoli	−2.23	−3.86	−1.42	−1.20	−2.25	−1.27	−1.99
Bari	−0.81	0.08	−1.33	−1.16	0.08	−1.26	−0.68
Reggio di Calabria	−3.32	−2.90	−4.71	−6.14	−2.90	−4.78	−3.22
Palermo	−2.23	−3.10	1.48	0.21	−3.10	0.68	−1.77
Messina	−3.00	−4.31	−2.67	−3.51	−4.31	−2.97	−4.14
Catania	−0.26	0.66	0.62	2.43	0.66	1.30	1.00
Cagliari	−0.88	−2.12	−0.40	−1.14	−2.12	−0.67	−1.12

areas) displayed a similar decrease of −1.32%, while metro areas (FUAs) represented lower figures (−1.01%). Quite different are the internal dynamics of the metro cities and areas (Table 2).

All the metropolitan cities and areas in total decrease their population. Most of the metropolitan cities and areas present an overall decrease of the center (metro capital in administrative terms) and the first and second rings of municipalities, as well in the functional separation of core area and ring area (Turin, Genoa, Venice, Florence, Naples, Reggio di Calabria, Messina, and Cagliari).

Milan, Bologna, Rome, and Palermo present an important decrease of the central municipalities and functional cores and an increase of the first and second rings, as well as of the functional ring areas. Bari, in Southern Italy, presents a slight increase of the central municipality and core, and a decrease of the external rings. Catania, albeit decreasing its overall metro population, witnesses an increase of the central municipality and of the rings. In functional terms, it is the only metro area to increase its population.

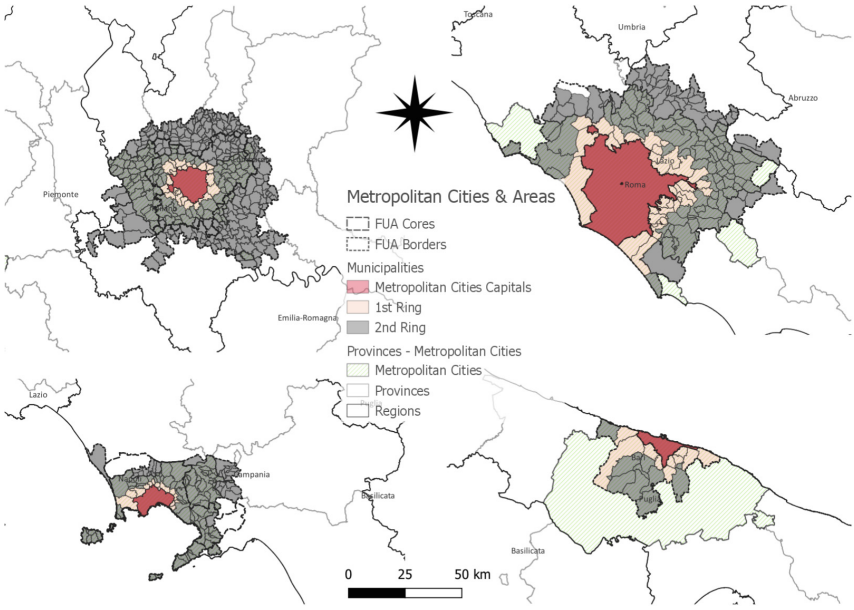


Fig. 4. Overview of a selected set of Metropolitan Cities and their FUAs. From Left to right, upper corner to lower corner: Milan, Rome, Naples, Bari. Author: G Borruso, elaboration from ISTAT Data [33, 34] and OECD Data [36].

It is worth stressing again that there is a difference in the shapes and areas of FUAs and metropolitan cities. As a matter of example, the metropolitan cities of Turin, Palermo, Catania, Messina, Reggio di Calabria, and Bari are considerably bigger than those of their FUAs. In such a sense, many Italian metropolitan cities cover not only the cores and rings, but also municipalities external to such areas. On the contrary, cities such as Milan - as the center of the Po Valley Megalopolis - and Cagliari - most important center

of Sardinia Island and region - are characterized by metropolitan cities smaller in size with respect to their FUAs.

Synthetizing data with reference to the urban life cycle scheme, Italian metropolitan areas can be observed as being mainly in the stages of disurbanization (third stage), apart from the two cities of Milan and Bologna, being still considerable in the latest fringes of suburbanization, and Bari and Catania, in a reurbanization (fourth stage) (Table 3).

Table 3. Urbanization, urban life cycle and Italian metropolitan cities & areas (2019–2023). Author: G Borruso, data from ISTAT Data [33, 34] and OECD Data [36] and Van den Berg et al. [7].

Stage	Sub-stage	Core	Ring	Agglomeration	City
Urbanization	1) absolute concentration	++	−	+	
	2) relative concentration	++	+	+++	
Suburbanization	3) relative deconcentration	+	++	+++	
	4) absolute deconcentration	−	++	+	Milan, Bologna
Disurbanization	5) absolute deconcentration	−−	+	−	Rome, Palermo
	6) relative deconcentration	−−	−	−−−	Turin, Venice, Genoa, Florence, Reggio Calabria, Messina, Cagliari
Reurbanization	7) relative concentration	−	−−	−−−	
	8) absolute concentration	+	−−	−	Bari, Catania

5 Conclusions

The analysis carried out in the present paper displays some interesting trends and characters of the main Italian urban areas. These spans from considerations about the on-going depopulation in the country, through to the difficulties of defining and delimiting urban areas in administrative and functional terms, through to the dubitative consideration of innovation as a driver in cities' performances and - therefore - as a driver of attraction.

One consideration must be referred to the relationship between the administrative and urban level of metropolitan cities and areas. The 14 metropolitan cities identified by the Italian law, with little exception follow their respective older provinces' borders, and are very different in terms of the surface covered. If the total amount of population

living in metropolitan cities is very close to that of their functional urban areas, important differences can be spotted. In cities like Milan and Cagliari, the metropolitan cities' areas - defined from the administrative point of view - are smaller than the Functional Urban Areas, that correspond to the metropolitan areas particularly from the commuting point of view. Many other metropolitan cities cover areas much wider than those covered by the FUAs, de facto including municipalities not strictly functionally related to the capital cities themselves.

This happens in Northwestern Italian metro cities like Turin and Genoa, as well as in the Southern ones such as Palermo, Catania, Messina, and Reggio di Calabria. The effect is twofold. On one side 'natural' metropolitan areas - as Milan and Cagliari - are underestimated in their administrative definition, while in other ones, the metropolitan cities govern over non strictly urban areas, playing therefore a role as 'micro regions', albeit in the Italian administrative framework the governance level is weaker if compared to those of Regions and Municipalities. Some reflections should therefore arise in terms of the more effective spatial design and pattern drawn by the administrative and functional levels.

The population dynamics present different behaviors and patterns in the selected period. In summary, the metropolitan cities and areas present peculiarities considering the urban life cycle and considering the issue of depopulation at present affecting Italy in particular. Albeit metropolitan cities present overall a similar trend in population decrease, their FUAs limit this if compared to the national values. Most of the cities considered can be at present considered spanning through the latest stages of suburbanization and those of disurbanization, particularly with a general decrease in the core municipalities, an increase in the rings in the suburbanizing ones - Milan and Bologna - and decrease in the disurbanizing ones. Few cities present a situation of reurbanization - Bari and Catania.

The research is therefore still open and requires in-depth analysis on various aspects for future research. On the one hand, the analysis of the geo-spatial distribution of the population poses a new question, namely what role innovation plays on demographic dynamics. An in-depth analysis should therefore be carried out on this to complete the analysis concluded so far. On the other hand, the role of intervening factors can be important in better understanding the phenomenon. Delving into the aspect of innovation could help to better understand the more complex dynamics and possible evolutionary paths that cities will probably follow in the years to come [39–42].

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