THE AGEING OF THE POPULATION IN URBAN CONTEXTS: A STUDY ON ITALIAN METROPOLITAN CITIES [1]

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Abstract. Population ageing is a multidimensional phenomenon that involves social, cultural, and economic aspects. It is a global process, although some countries are more affected than others. Among the most developed countries, Italy is notably characterized by the rapid ageing of its residents. The aim of this analysis is to examine the phenomenon of ageing in the 14 Italian metropolitan cities, which are prominent hubs of demographic attraction and regions marked by significant urbanization. The goal is to comprehend the evolution of this phenomenon compared to the past and the next decade, highlighting differences between urban areas and their surrounding regions. Particular emphasis is put on the changes in demographic components, while taking into account the factors influencing the current demographic landscape. Cluster analysis is also utilized in order to facilitate the formation of homogenous territorial groupings and to gain a deeper understanding of this phenomenon.

1. Introduction

The demographic trend of ageing is a global phenomenon with different characteristics among countries. Italy is one of the "oldest" countries in the world, with a much faster ageing process than in the rest of Europe. As early as the 1970s, demographic studies alerted to the social and economic consequences of this phenomenon (Golini, 1997). It is the consequence of multiple causes such as a gradual decline in fertility and in the number of women of childbearing age, that affects birth rates; the achievement of ever-longer survival; and also a contradictory effect of migration. This last aspect consists of a component that emigrates, mostly the young, which intensifies ageing; and a component that enters the country, which contributes to increase the younger cohorts (Reynaud *et al.*,

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2018). In addition, the parallel decline in mortality has contributed to a slowdown in generational turnover. Added to this is the effect on the age structure resulting from the periods of high birth rates, the so-called baby booms, that occurred between the 1960s and 1970s: substantial generations were formed that today represent a significant demographic legacy on the older segments of the population.

The dynamic factors of a population, being functionally related to its age structure, have determined irreversible effects over time. The imbalance in the age structure of the Italian population has increased, leading to a prevalence of the elderly over the young that may represent a risk factor for the sustainability of the country's system (Istat, 2019). On the other hand, over the past two decades, the migration flow has contributed to population growth, partly due to the entry of foreign individuals into the country, thus mitigating the demographic decline. Today, however, fewer foreigners decide to stay permanently in Italy, which represents mainly a transit country, as in the case of asylum seekers and humanitarian protection (Istat, 2020c). Ageing is a complex, multidimensional demographic process involving social, cultural, and economic aspects. It is also the result of the general improvement of living conditions regarding health, hygiene, nutrition, and care (Istat, 2020a). An ageing population requires an adjustment of the social system to ongoing changes and new needs, as well as public policy interventions to plan the proper use of economic resources. Public funds need to be directed more toward services and support networks for the elderly segment of the, especially at the stage when they no longer benefit of autonomy and good health. The effects that the increasing share of the elderly population will have on the sustainability of the social and economic system in Europe have been debated in literature (Kashnitsky *et al.*, 2017), in particular with respect to the negative impact on pension systems (Ediev, 2014), social and health care (Golini *et al.*, 2003), and public and personal transfers to the elderly.

In this framework, the analysis of ageing population is focused on the most urbanised contexts in Italy, namely the 14 metropolitan cities. The rest of the document is organized as follows. In section 2, the spatial domain is introduced, and its internal structures are identified based on a criterion of spatial contiguity (capital cities, municipalities in the first and second belts and other municipalities of metropolitan areas). Section 3 is devoted to a description of data and methods employed. Section 4 is split in two subsections. In the first, a descriptive analysis is performed by means of a set of socio-demographic indicators at municipal level, with the aim to draw a profile of the ageing of the population and to grasp its evolutionary aspects, in both cases with respect to the time dimension, so highlighting the peculiarities and differences between urban contexts and their internal articulations. In the second, a cluster analysis is applied to the selected municipal indicators with the aim of deepening the study and arriving at an

informative synthesis based on significant clusters of municipalities, in order to draw a summary profile and offer further opportunities for interpreting the results. Finally, in section 5 results are briefly discussed, as well as suggestions for further investigations.

2. The territorial domain

The phenomenon of ageing is even more reinforced in urbanized contexts, so it was deemed interesting to analyse it from the perspective of metropolitan territory. Italian metropolitan cities were established by Law No. 56 of April 7, 2014. They are territorial entities resulting from the aggregation of neighbouring municipalities metropolitan Cities replaced provinces in ten urban areas of regions with ordinary statutes, and their territories coincide with those of former provinces: Torino, Milano, Venice, Genova, Bologna, Firenze, Roma, Bari, Napoli, and Reggio Calabria. Four metropolitan cities from special statute regions were later added, after having adapted their internal regulations to the principles of the law: Palermo, Catania, Messina, and Cagliari. Metropolitan cities have three main general institutional purposes: a) to take care of the strategic development of the metropolitan territory; b) to promote and integrate management of the metropolitan city's services, infrastructure, and communication networks; c) to take care of the institutional relations, including those with European cities and metropolitan areas (Camera dei Deputati, 2022). This new level of governance provides the territory with a new instrument of local government and generates new opportunities of development for the citizens. The territories involved have different peculiarities due to their physical conurbation and geographical location, demographic and social conditions and economic potential or disadvantages. The emergence of these areas is the result of a long regulatory path that defined the boundaries from an administrative point of view. At the same time, there are economic and territorial links that influence the definition of such cities. These aspects allow a more precise understanding of the socioeconomic evolution of the territories, since the changes that occur in urban areas are linked to the residential choices of the inhabitants and to the increase of productive settlements in the urban belts. The geography of metropolitan cities offers a direct representation of Italy's major urban centres: the city, a large urban agglomeration of national importance and declined as a pole, stands out surrounded by an aggregate of municipalities gravitating around it (Istat, 2020b). Therefore, the urban territory consisting of the capital municipality and the articulation of urban belts have been identified, allowing the observation of the dynamics of city evolution. Urban belts are identified basing on a criterion of territorial contiguity: the first belt consists of municipalities contiguous to the

capital municipality, that is, sharing its boundary at least at one point; the second belt consists of municipalities contiguous to those in the first belt. The remaining municipalities in the metropolitan area make up the outer ring (Istat, 2020b). In Italy, there are 1,268 municipalities belonging to the 14 metropolitan cities, with 14 capitals, 177 first-belt municipalities, 213 second-belt municipalities, and 864 municipalities in the outermost ring of the territory.

3. Data and methods

Population ageing in metropolitan areas is analysed through a set of indicators describing the main socio-economic characteristics of the population and some aspects of the economic structure. The selected indicators reconstruct the profile of the Italian urban contexts, consisting of the metropolitan cities and their belts, with respect to the most relevant dimensions for the analysis of ageing, such as the structure and demographic dynamics of the population, and other context components closely related to the socio-economic conditions of the population, such as the level of education, labour market participation, and the density of economic activities (Table 1).

Table 1 – *Indicator by territorial sub-domains of metropolitan cities.*

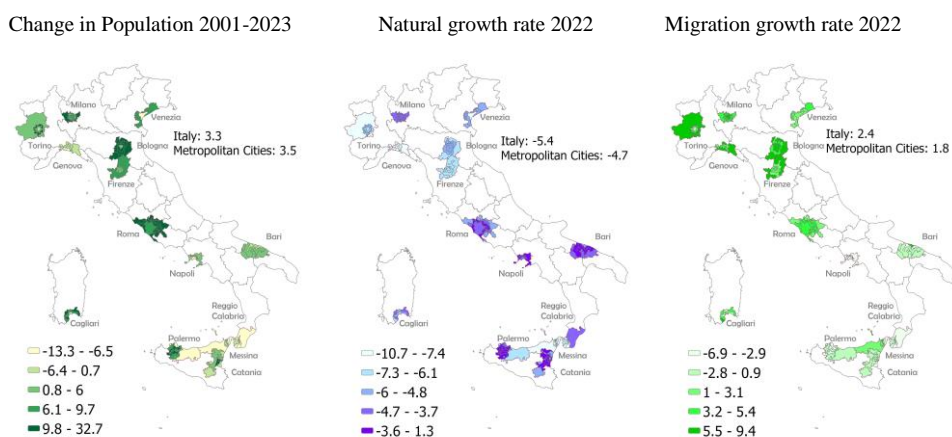| Indicator	Definition	Source	Time
Change in Population	$(Pop._t - Pop._{t-1}) / Pop._{t-1} * 100$	Istat	2001-2031
Old age index	(Population over 64 years / population under 15 years) * 100	Istat	2011, 2023, 2031
Old age dependency index	(Population over 64 years + population under 15 years)/ population 15-64 years * 100	Istat	2011, 2023
Mean age	Mean age of the population	Istat	2023
Birth rate	(Live births in the year / average of population) * 1000	Istat	2011, 2023
Natural growth rate	(Births – deaths in the year) / average of population) *1000	Istat	2011, 2023
Migration growth rate	(Immigrants - Emigrants in the year / average of population * 1000	Istat	2011, 2023
People with tertiary education (25-64 years)	(People aged 25-64 with tertiary education / population) * 100	Istat	2020
Employment rate (25-64 years)	(Employed 25-64 years old / population) * 100	Istat	2019
Density of local unit	(Local unit / population) * 1000	Istat	2020

The indicators are calculated in time series for the four territorial sub-domains of the 14 metropolitan cities (capital municipalities, first and second belt municipalities, and other metropolitan city municipalities) and updated to the municipal boundaries as of 1 January 2023. The territory analysed covers 1,268 municipalities (16% of Italian municipalities) and an area of 46,637 square kilometres (15.4% of the national surface area).

4. Results and methods

4.1. Descriptive analysis

The resident population in the metropolitan areas on 1 January 2023 amounts to approximately 21.3 million and covers a share of just over one-third of the Italian population (36.2%). Almost half of the total population of the metropolitan cities, 43.2%, resides in the 14 capital municipalities, 18.2% in the first belts, 14.3% in the second belts, and 24.3% in the remaining metropolitan territory.

Figure 1 – *Change in Population (%), Natural growth rate and Migration growth rate (‰) in the metropolitan cities.*

Change in Population 2001-2023   Natural growth rate 2022   Migration growth rate 2022

Italy: 3.3 Metropolitan Cities: 3.5

Italy: -5.4 Metropolitan Cities: -4.7

Italy: 2.4 Metropolitan Cities: 1.8

-13.3 - -6.5
-6.4 - 0.7
0.8 - 6
6.1 - 9.7
9.8 - 32.7

-10.7 - -7.4
-7.3 - -6.1
-6 - -4.8
-4.7 - -3.7
-3.6 - 1.3

-6.9 - -2.9
-2.8 - 0.9
1 - 3.1
3.2 - 5.4
5.5 - 9.4

Source: Elaboration on Istat data (Nowcasting system for demographic indicators, Demographic balance and resident population)

In the period between 2001 and 2023, the metropolitan cities overall recorded a slightly higher increase in resident population than the national average (+3.5% against +3.3% for the Italian average, Figure 1). Confirming the high demographic attractiveness of these territories, growth is more significant in the metropolitan cities of the Centre and North, particularly in Roma (+13.8%), Bologna (+10.5%),

and Milano (+9.5%). On the other hand, the population decreased in Genova (-7.3%) and almost all the metropolitan cities in the South, with significant decreases in Messina (-9.5%) and Reggio Calabria (-8.2%), followed by Napoli (-2.9%) and Palermo (-2.8%). The time-series and intra-territorial analysis shows a continuous and generalized loss of population in almost all the capital cities of southern Italy, in favor of the first and second belts and the outer ring (Table 2). Between 2011 and 2021, this trend strengthens compared to the previous decade and also extends to the other capital cities of the Centre-North and the urban belts. The only exceptions are Milano, Bologna and Roma, and the first belt of Firenze, where a positive dynamic continues to be observed throughout the analyzed period.

Table 2 - *Change in Population in the metropolitan cities 2001- 2031 (%).*

Metropolitan Cities	Capital cities			First belts			Second belts			Total MC		
	2011/2001	2021/2011	2031/2023	2011/2001	2021/2011	2031/2023	2011/2001	2021/2011	2031/2023	2011/2001	2021/2011	2031/2023
Torino	2.6	-4.5	-1.3	2.3	-1.2	-3.9	12.8	-1.0	-1.2	5.2	-3.1	-2.4
Genova	-2.5	-5.7	-3.5	1.5	-6.4	-6.0	2.2	-7.4	-5.3	-1.2	-5.7	-3.8
Milano	2.2	5.5	4.9	2.6	2.4	-0.1	6.3	3.2	0.1	5.3	3.9	2.0
Venezia	-2.4	-4.7	-2.3	8.4	-0.0	-0.4	8.6	-0.6	0.4	5.4	-1.9	-0.9
Bologna	1.4	3.1	4.5	9.8	3.9	2.0	16.0	2.8	2.3	7.7	2.5	2.8
Firenze	3.1	-1.5	0.8	4.9	1.4	1.8	9.9	0.1	1.1	6.1	-0.4	1.0
Roma	5.2	2.7	-0.1	24.0	6.8	2.1	25.4	5.3	0.3	10.3	3.2	0.3
Napoli	-4.1	-4.2	-4.8	0.2	-3.9	-3.7	5.3	-1.3	-4.0	0.7	-3.0	-3.7
Bari	0.5	-0.7	-4.2	4.6	-4.4	-3.3	4.2	-2.5	-2.7	3.4	-2.6	-3.2
Reggio Calabria	1.0	-5.1	-6.5	-4.6	-7.8	-8.5	-1.5	-9.5	-8.8	-1.7	-5.7	-5.7
Palermo	-4.2	-3.5	-6.1	18.3	-0.2	-4.4	11.5	-2.6	-3.8	1.5	-3.6	-5.6
Messina	-3.7	-8.8	-6.9	-0.1	-7.4	-9.4	3.1	-7.4	-5.6	-1.3	-7.6	-6.5
Catania	-5.8	2.3	-3.6	11.5	-0.4	-2.8	6.9	-3.4	-4.5	3.8	-1.5	-3.8
Cagliari	-6.9	-2.1	-2.7	8.2	-1.3	-4.6	11.7	4.0	0.3	2.7	-1.0	-3.3
Total	**0.8**	**-0.3**	**-1.0**	**7.7**	**0.6**	**-1.3**	**9.1**	**-0.3**	**-1.8**	**4.5**	**-0.6**	**-1.5**

Source: Elaboration on Istat data (Nowcasting system for demographic indicators, Experimental Statistic-Municipal demographic projections)

Population projections in Italy confirm a progressive decline, even in metropolitan areas. According to the median scenario, between 2023 and 2031, a decrease in resident population of -1.5% is in fact expected, equal to a loss of about 317 thousand residents. The demographic decline will affect almost all metropolitan cities but with significant territorial differences. The decrease will have lower intensities in the metropolitan cities of the North and the Centre. On the other hand, more significant decreases are expected in Messina (-6.5%), Reggio Calabria (-5.7%) and Palermo (-5.6%), while Cagliari and Bari are expected to be less negative. Bologna, Milano and Firenze, on the other hand, are the only metropolitan cities expected to continue growing, with values ranging from 2.8% in Bologna to 1% in Firenze. Over the next decade, only Bologna and Firenze are estimated to experience population growth in all the metropolitan areas, together with the municipality of Milano (+4.9 %) and the first belt of Roma (+2.1 %).

This not favorable demographic dynamic also stems from very different trends in the natural and migratory components. The decrease in population is the result of

a long-standing negative natural movement, which is less and less offset by the positive effects of migratory movements.

Considering the natural component, in 2022 the decrease in the natural balance reaches 4.7 per thousand (-0.25 per thousand in 2011) and is more significant in the capital cities (-5.4 per thousand) than in the first and second belts. The phenomenon, mainly determined by low fertility and birth rates, affects all the metropolitan cities and presents particularly critical values in Genova (-10.2 per thousand), Messina (-7.6 per thousand) and Torino (-7.0 per thousand, Figure 1).

Figure 2 – *Old age index and Old age dependency index (%) – 2023.*

Old age index   Old age dependency index
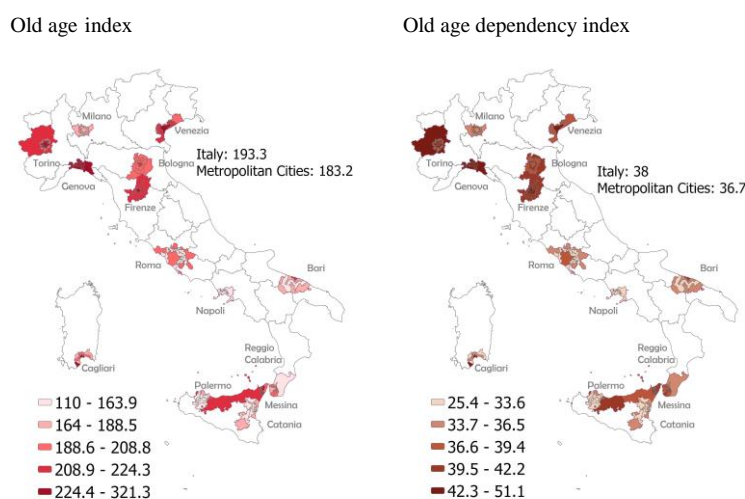
Source: Elaboration on Istat data (Nowcasting system for demographic indicators)

In the same period, the migratory growth rate, determined by internal and external residential mobility processes, remains positive (+1.8 per thousand), although it lessens sharply from that of 2011 (+2.4 per thousand). This positive dynamic is mainly sustained by migration flows from abroad, especially in the capital cities, and shows higher growth rates in the metropolitan cities of the Centre-North that are more attractive to the foreign component, such as Bologna (+6.6 per thousand), Genova (+5.5 per thousand) and Milano (+5.4 per thousand). In almost all the metropolitan cities of Southern Italy, negative growth rates are recorded, with significant decreases in the migration balance in Reggio Calabria (-4.5 per thousand), Napoli (-4.2 per thousand) and Palermo (-3.1 per thousand).

Current demographic trends have an inevitable impact on the age structure of the population, characterized by a significant shrinkage of the young and working age population in favor of the elderly (Figure 2).
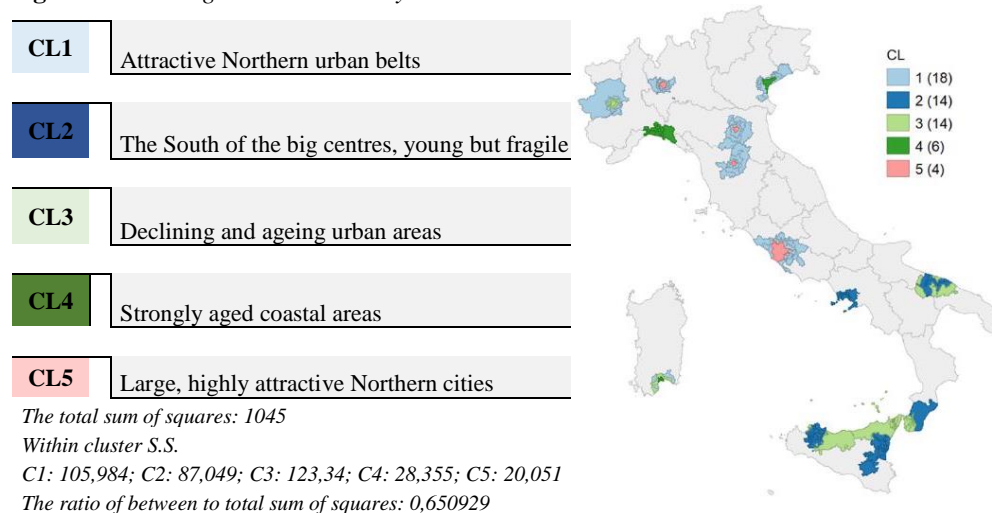
In the metropolitan cities as a whole, the old-age index in 2023 is 183 elderly people per 100 children, increasing continuously from 2011 (142) and with an expected value of 239 in 2031. Higher values of the index are observed in the capital municipalities (197), especially if compared to the second belts (161), where the index remains below the national figure. Among the capital cities, Cagliari holds a negative record (321), followed by Genova (268), while Napoli is confirmed as the youngest city (159). The increasing ageing of the population leads to a continuous growth of the social burden represented by the elderly, measured by the old-age dependency ratio. The indicator, equal to 37 elderly people per 100 people of working age in 2023, shows a dynamic and territorial distribution similar to that of the old age index: it has increased since 2011 (31), especially in the belts, and reaches higher levels in the capitals (38), with the lowest value in the city of Napoli (34) and the highest in Genova and Cagliari (48).

4.2 Cluster analisys

Descriptive analysis conducted on the thematic indicators revealed significant differences between territories in terms of past and future demographic attractiveness, structural characteristics of the population, and socioeconomic conditions. A cluster analysis was applied to the dataset of elementary indicators to draw a synthetic profile of the territories. Variable selection was conducted on an initial matrix of 56 observations (the territories) and 27 indicators representative of the thematic domains. The final 19 variables were identified by combining selection criteria that ensured the representativeness of each indicator in its domain and its non-substitutability (evaluation of the correlation coefficient between indicators). cluster analysis was conducted preliminarily using the hierarchical method to identify the minimum number of groups into which to stratify the observations. Subsequently, the nonhierarchical K-means model was applied, based on a partitional cluster analysis algorithm, which allows for partitioning a set of objects into k groups based on their attributes (De Falco and Fiorentino, 2022) (in this case the 19 selected indicators are considered). The algorithm aims to minimize the total intragroup variance (distance between points within each cluster) and maximize the intergroup variance; each cluster is identified by a centroid or midpoint. Based on this criterion, the k=5 partition was selected. Cluster analysis made it possible to aggregate the territories into similar groups and track the qualitative characteristics of each group. As shown in Figure 3, clusters 1 and 2 have a strong territorial characterization and follow classic Italian North-South axes. They differ in both demographic structure (younger in Cluster 2) and socioeconomic conditions (better in cluster 1). Cluster 3 groups the territories from north to south, which are similar in terms of population growth, but with a

significant natural decline underway. Cluster 4 consists of 6 territories with the highest demographic risk, characterized by inexorable ageing. Cluster 5 gathers the capital cities of the North-Centre, including Roma and excluding Torino, and has a strong urban connotation with high demographic attractiveness and good growth in the future as well. Through the analysis of cluster centres, the characteristics of each cluster can be reconstructed (see Table 3).

Figure 3 – *Findings in Cluster Analysis.*

CL1	Attractive Northern urban belts
CL2	The South of the big centres, young but fragile
CL3	Declining and ageing urban areas
CL4	Strongly aged coastal areas
CL5	Large, highly attractive Northern cities

The total sum of squares: 1045
Within cluster S.S.
C1: 105,984; C2: 87,049; C3: 123,34; C4: 28,355; C5: 20,051
The ratio of between to total sum of squares: 0,650929

CL1: **Attractive Northern urban belts**. This is the cluster with the best demographic attractiveness, where a good future demographic situation is expected. The first decade of the millennium is characterized by an extraordinary increase in population (+12%), the result of a high birth rate and a positive migration component. After 2011, there is a collapse in births and then a natural decline offset by satisfactory migration growth. Employment rate is much higher than average. It is the least urbanized group. It includes 5.3 million people, of whom 33% belong to the municipalities of the 1st belt, 26% to the municipalities of the 2nd belt, and 42% live in the other municipalities, those furthest from the capital.

CL2: **The South of the big centres, young but fragile**. Territories with medium demographic attractiveness and a trend of current and prospective population loss due to both natural decrease (-2.3%) and migration (-2%). In 2011 the population shows a very young structure, which allowed the overall holding of the natural demographic component (among the groups it has the highest birth rate

8.2%), although a rapid ageing process is observed. The productive and socioeconomic environment is poor. There are about 3.2 million residents in cluster, 2,31% of whom live in the large capitals of Napoli, Palermo and Catania.

Table 3 – *Cluster centres.*

Indicators	Years	C1	C2	C3	C4	C5	Total MC	Italy
Change in Population	01-11	11.6	3.9	1.8	-1.1	3.0	*4.5*	*5.5*
	11-21	1.4	-2.6	-5.3	-5.2	2.4	*-0.6*	*-1.8*
	21-23	-0.1	-0.6	-0.7	-0.6	0.0	*-0.3*	*-0.3*
	23-31	0.3	-3.9	-6.0	-3.8	2.5	*-1.5*	*-1.8*
Old age index	2011	143.5	102.6	153.2	234.7	201.3	*142.4*	*148.4*
	2023	192.6	147.6	215.2	284.4	203.7	*183.2*	*193.3*
	2031	258.6	199.7	293.0	349.7	242.2	*239.3*	*251.0*
Old age dependency index	2011	34.0	28.0	27.2	35.0	43.6	*31.2*	*31.2*
	2023	37.8	32.3	40.0	48.8	38.3	*36.7*	*38.0*
Mean age	2023	46.6	43.9	47.1	49.8	46.9	*46.0*	*46.4*
Birth rate	2011	9.5	10.3	8.4	7.1	8.8	*9.4*	*9.1*
	2023	6.3	8.2	6.2	5.2	6.8	*6.9*	*6.7*
Natural growth rate	2011	0.4	1.7	-1.3	-5.8	-2.5	*-0.2*	*-0.8*
	2023	-5.3	-2.3	-6.8	-10.0	-5.4	*-4.7*	*-5.4*
Migration growth rate	2011	6.0	-0.1	-0.1	2.9	10.9	*4.2*	*3.4*
	2023	4.4	-3.2	0.1	4.0	5.7	*1.8*	*2.4*
Employment rate (25-64 years)	2019	72.7	51.1	57.6	71.3	73.9	*64.9*	*66.6*
People with tertiary education (25-64 years)	2020	19.4	17.2	20.0	24.5	37.2	*23.8*	*21.0*
Density of local unit	2020	75.2	60.9	67.2	91.3	121.4	*83.1*	*81.1*

CL3: **Declining and ageing urban areas**. Territories belonging to different sub-domains, distributed (albeit unevenly) throughout the country. They include the municipality of Torino and other large southern capitals (Bari, Reggio di Calabria, and Messina), parts of their urban belts and other municipalities in metropolitan territories (Cagliari belt I and other municipalities in Cagliari and Palermo). This group tends toward current and prospective population loss, mainly due to the decline in the natural population component, while there is substantial resilience in the migration component. The age structure of the population shows a fairly young composition, but tending toward ageing. Also relevant is the fragility of the entire economic system, both in terms of the labor market and the socio-economic conditions of the population. 3.1 million people live habitually in this group, 49% of whom live in the capital, 21% in the first belts and 28% in the municipalities of the other metropolitan cities, that is, in the territories furthest from the capital's borders.

CL4: **Strongly aged coastal areas**. Highly ageing territories include the municipalities of Genova and its belts, Venice and the municipality of Cagliari, which despite being geographically located in the South often shows a pattern of socioeconomic phenomena typical of the Centre-North. This cluster has low

demographic attractiveness and slight growth in the short term but is associated with a prospect of a strong decline. The cluster is characterized by: strong ageing population, high natural decrease and good migration growth, which allows the partial balance of the two components. The basic socio-economic conditions are found to be good. Cluster 4 is the smallest in terms of population, with just over 1.2 million (5.7% of the metropolitan cities' population). It has a strongly urban connotation: the population of the capital is about 80% of the cluster's residents.

CL5: **Large, highly attractive Northern cities.** Large capitals in the North-Centre, including Roma, excluding Torino. The cluster is characterized by good demographic attractiveness (4.4%) even in perspective (1.2%). Note that the migration component, although almost halved in the last decade, still manages to more than offset the natural decline. Socioeconomically, it is the cluster with the best conditions: high employment rates, high levels of college graduates, and a high concentration of local units per 1,000 inhabitants. It is highly urbanized; in fact, the capitals of Roma, Firenze, Bologna, and Milano belong to it. 4.9 million people live in this cluster, accounting for about 23 % of the metropolitan cities' population.

5. Future perspectives

Population ageing has been recognized as one of the four global demographic "megatrends," alongside population growth, international migration, and urbanization, all of which have ongoing and lasting impacts on sustainable development (United Nations, 2019). Societies worldwide, including Italy, are undergoing a longevity revolution. While some are in the early stages, others are already in an advanced state of change. The main causes of this phenomenon are primarily rooted in the structural age imbalances of the population, characterized by a decreasing number of young people and an increasing number of elderly individuals. Generational replacement is not guaranteed due to steadily declining birth and fertility rates, coupled with increasing life expectancy. Population ageing, at whatever level it occurs, necessitates public policies that can adapt to new needs, ensure adequate healthcare services, maintain the sustainability of welfare systems, address labour market issues, and promote social inclusion. Generally, metropolitan areas have a relatively younger population compared to the rest of the country, although significant differences exist among the different areas analysed. Typically, large urban centres and their outskirts are attractive, while the phenomenon of ageing becomes more pronounced as one moves away from the capitals. The significant evidence that has emerged provides a solid foundation for future research insights, paving the way for further investigations and

improvements. It is desirable to deepen the analysis by using new demographic and social indicators, leveraging the recent availability of census data at municipal and sub-municipal levels. Simultaneously, the use of spatial analysis techniques could facilitate the identification of geographic areas where similar phenomena occur in close proximity to each other. Finally, further insights into the elderly population segment could provide a more detailed picture of its specific characteristics and dynamics.

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