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Moving towards repolarisation? The population trajectories of medium-sized towns in Lower Lombardy, Italy (2010–2020)

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Abstract

Although medium-sized towns are key components in the polycentric structuring of regional spaces, their evolutionary pathways are less clear than those of cities. This paper considers a set of four medium-sized towns with provincial capital status located in the southern zone of Lombardy, on the fringes of a densely urbanised area dominated by Milan. The population trajectories of these towns and their agglomerations (first- and second-belt municipalities) are investigated in the decade from 2010 to 2020, with a descriptive analysis. The research resulted in three main findings: 1) even in a challenging economic climate, the population trends of the towns considered were affected by proximity to the vibrant Milan metropolitan area; 2) all the towns have gone down the route of reurbanisation, but the suburbanisation process is still ongoing and very intense, especially for the Italian population; 3) there are gaps between cores and belts in terms of population distribution by age group and land take intensity, resulting in differing drives for population concentration or deconcentration.

Highlights for public administration, management and planning:

- Medium-sized towns that are more able to "work together as part of a network" enjoy greater population vitality.
- Medium-sized towns are not a unitary group: even in an area featuring similar structural characteristics, their evolutionary dynamics differ, calling for place-based policies.
- A drive for population deconcentration is under way in agglomerations linked to medium-sized towns, powered by certain population groups, which could adversely affect the quest for a sustainable development model.

Keywords

Medium-sized towns, Urban network, Population trend, Reurbanisation, Suburbanisation, Lower Lombardy

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1 Introduction

Medium-sized towns (MSTs) play a vital role for the polycentricity of regional spaces and in ensuring a balanced urban/rural relationship (UN Habitat 2015). Despite this, they are a niche topic in territorial studies, which are "obsessed with big cities" (Bell & Jayne 2009, p. 684). This is also the case in Italy. Even back in the 1980s, some geographers had already grasped the importance of MSTs in settlement networks (Cori 1986), and yet they have never become a robust category of study, or a tool for interpreting territorial dynamics. Metropolitan areas, epicentres of the country's economic development, have attracted all the attention. The same goes for inland areas, stricken by depopulation, which became a national matter addressed by means of a dedicated policy (National strategy for inland areas), using the 2014–2020 European cohesion funds.

Caught between these two focus points of interest, MSTs have been neglected. In Italy, as elsewhere, they are often likened to small urban centres, or thought of as cities in the making. However, this means using the interpretive schemes adopted for the outer segments of the urban structure, and therefore denying the specific characteristics of MSTs. Yet their size – neither big nor small – influences the profiles and growth of these towns: dimensionally and qualitatively speaking, they find themselves "in a state of urbanisation suspended

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between a 'no longer' and a 'not yet' condition, which is essentially permanent and brings with it a series of side effects, within it, in its relationship with the region and with other similar cities" (Dicecca 2019, p. 33).

The intermediate size is now generally considered to be a strength, as it is associated with "people-oriented, liveable" cities characterised by a high quality of life that are more sustainable and socially cohesive than the "hellish" cities (Knox & Mayer 2013; Kresl & Ietri 2016). However, MSTs could be in trouble in the globalised economy: they lack the agglomeration economies typical of metropolitan areas, which, according to New Economic Geography, foster innovation and competitiveness. MSTs often have less young and qualified human capital than metropolises and are out of reach of large investors on the global stage. These limitations can be overcome through the creation of networks between towns, a mechanism that has enabled many European regions, despite not having large urban centres, to perform well even during the Great Recession (Dijkstra et al. 2013; Camagni et al. 2015; Frick & Rodríguez-Pose 2018; Rodríguez-Pose & Griffiths 2021).

This paper investigates MSTs, studying them from the perspective of demographic change and land take over the 2010–2020 period. The issue links back to the wider debate on reurbanisation, i.e. the renewed lure of the city after an often very intense and prolonged decline. Studies on the subject mainly focus on the large urban agglomerations (Dembski et al. 2021). What has occurred in MSTs is less clear. What happens in cities is not necessarily reproduced on a small scaler in these towns. Reurbanisation takes on specific connotations depending on the local context, and MSTs could follow different evolutionary trajectories from cities in terms of intensity, timing and the population groups involved (Bonifazi & Heins 2003; Rérat 2012).

In view of this, we will analyse the population dynamics of Lower Lombardy's four provincial capitals: Pavia, Lodi, Cremona and Mantua. These are four MSTs, as classified by Lemmi (2012) on the basis of functional aspects (presence of administrative, health, school, financial and commercial services). The smallest town is Lodi (with 44928 inhabitants in 2020), and the largest is Cremona (72399 inhabitants). In terms of population size, the cities studied fall within the 20000–200000 inhabitant range, which, according to Kunzmann (2010), is the typical size range of MSTs in Europe. Lower Lombardy is an interesting case study: while it is affected by the vibrant Milan metropolitan area, it still has large agricultural areas, a network-based settlement pattern and a low population density, unlike the rest of the region.

The decade from 2010–2020 marked a turning point for the MSTs selected: the resident population, which had been declining since 1971, began to grow again. This complete reversal happened later than in Milan and the other Lombard capitals. We will study this process by addressing three issues. The first concerns the link between the intensity of population recovery in the MSTs and their position in the settlement network. This is an important issue, as different linkages in regional spaces are a key factor influencing the performance of MSTs (Kunzmann 2010; ESPON 2014). The second issue concerns the population dynamics of agglomerations linked to the MSTs, made up of the first- and second-belt municipalities. We will pay some attention to the redistribution of the population by age group. This is one of the most significant factors in defining the divides between cities and suburban areas (Cividino et al. 2020a). Moreover, being able to count on a young population is crucial for the socio-economic vitality of the territories. This issue is crucial for Italy (and more generally the EU), where the severely ageing population has a strong impact on the equilibrium of the labour market and on the provision of services (public and private) that meet the needs of individuals (Goujon et al. 2021). The third and final issue concerns land take in the MSTs and surrounding municipalities. With reurbanisation, real estate investments should be concentrated in the main cores, but this is not always the case. No matter how much the appeal of the cores has increased, there are still population groups (and businesses) that are sensitive to the diseconomies of urbanisation (especially the high urban rents) and continue to be driven back into the suburbs. The picture is even more complex in intermediate areas – such as Lower Lombardy – where the pressures from MSTs are combined with those from a large metropolitan area. This fuels land take, with repercussions on sustainable development, a priority objective on the European political agenda (EC 2019). Addressing these three issues is important in order to understand how MSTs are repositioning themselves within settlement networks at various scales.

This paper is divided into three parts. In the first (section 2), we will reflect on the need to devote special attention to MSTs, given their importance in the settlement system, and we will outline the reference framework with respect to the points described above. We will then examine the population dynamics of Lower Lombardy in the 2010–2020 period, highlighting the discontinuities from the previous decade (section 3). Lastly, we will look at the

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agglomerations of the four MSTs selected, analysing the different behaviours of the cores and of the municipalities located in the belt in terms of population trajectories (section 4), division of the population by age group (section 5) and land take (section 6).

2 Theoretical framework

2.1 A large, diverse group of towns

MSTs and smaller towns make up a significant proportion of the settlement system of many countries: they are ordinary towns, places that are home to much of the population. This is especially evident in Europe, where roughly half of the total population is concentrated in agglomerations with fewer than 500000 inhabitants, a much higher percentage than on other continents (UN 2019). Specifically, tight networks of small and medium-sized towns are a distinctive feature of countries in Western Europe. With this in mind, the lack of attention to these towns is surprising. The "metrocentric" perspective prevails. Wagner and Growe (2021) have noted a recent increase in research on MSTs internationally. However, the two authors believe that there is no doubt that these towns are still being neglected in urban studies. This has also been reiterated in other reviews (Bellet & Llop 2004; Demazière 2017). United Cities and Local Governments (UCLG 2017) pays special attention to MSTs, pointing out that they have different characteristics and problems from cities and small towns. This is also stated in the Cuenca Declaration (UN Habitat 2015).

In the EU, especially following the Green paper on territorial cohesion (EC 2008), the diversity of settlement systems is recognised as a strength (to be preserved) in the international framework. Linked to this is a rising interest in small and medium-sized towns, whose role as essential pawns for a balanced (polycentric) spatial pattern has been extensively stressed. Research on a European scale has enriched the knowledge framework about this group of towns, by investigating their settlement types, socioeconomic profiles and evolutionary trajectories (ESPON 2006, 2014). Special attention has been paid to rural regions, where MSTs offer jobs and useful services, thus minimising depopulation dynamics and commuting to large urban areas (Mayfield et al. 2005; Vaishar & Zapletalová 2009; Ferry & Hoed 2020). The Riga Declaration (2015) contains an appeal not to neglect towns lying outside of big cities in the European urban agenda (2015)[1]. The aforesaid document highlights the presence of 8350 SMUAs (Small and medium urban areas)[2] and highlights their many values. The pilot actions launched with the Territorial Agenda 2030 (EC 2020) also involve many MSTs (and small towns) in intermediate and rural areas, recognising the key role they play in territorial cohesion and the meeting of the Green Deal goals (EC 2019).

MSTs form a heterogeneous club. Size creates basic unity, but the fate of these towns depends on the interplay of at least three major factors: economic functions "constructed" in the long-term, local policies and linkages in more or less dynamic regions. The TOWN study (ESPON 2014; Servillo et al. 2017) gave great importance, to the latter aspect, maintaining that MSTs (and small towns) are not "free electrons" and that their socioeconomic performance depends on the vitality of the regions to which they belong and on the ability to "work together" in the territorial networks. We no longer speak of "medium-sized" towns, but of "intermediate" towns: we avoid referring merely to size, and instead examine how these towns fit into the settlement networks and how they are connected at different scales (Nadou 2010; UCLG 2017; Llop et al. 2019). While MSTs do not have the "territorial capitals" of cities, they can be just as dynamic, by actively creating networks with other towns, however near or far away these may be (Knox & Mayer 2013).

If we examine the position of MSTs within the settlement system, it is clear that there are a myriad of situations. A basic distinction can be made between towns located in metropolitan, rural and coastal areas (Roberts 2014). The first two categories are also recognised in the TOWN study (ESPON 2014; Sýkora & Mulíček 2017), which also identifies the polycentric network typology in areas with low levels of urbanisation or, generally speaking, areas lying outside of big urban agglomerations. Kunzmann (2010), on the other hand, identified four settlement situations: 1) towns located in metropolitan areas; 2) towns between metropolitan areas; 3) isolated towns in rural peripheral areas; 4) towns located in areas on borders. More clearly than other authors, Kunzmann highlights the close link between the location of MSTs, their economic functions and their potential for growth. Several authors have introduced classifications that focus on the links between MSTs and cities: these categories span from one extreme to the other, ranging from towns that are highly integrated with a metropolitan area, but without a labour market of their own, to isolated towns in rural areas, which are strong with respect to their reference regions (Nadou 2010; Bolton & Hildreth 2013; Cox &

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Longlands 2016). The socioeconomic performance of MSTs is influenced by their position within settlement networks. According to some authors, this aspect is even more important than local public policies (Erickcek & McKinney 2006). In particular, towns located in metropolitan regions (or on their edges) are generally more dynamic than isolated towns located in rural areas or far from big infrastructural corridors (Adam 2006; Sohn 2012; Runge 2016; Hamdouch et al. 2017; Meili & Mayer 2017; Escudero Gómez et al. 2019). Moreover, these towns boast a prime location for attracting residents and businesses decentralised from the metropolitan centres. A location such as this allows for exploitation of the "borrowed size" mechanism, which generates an over-allocation of functions in relation to the status of the towns, as well as better performance in terms of population dynamics and jobs (Phelps et al. 2001; Meijers et al. 2016; Malý 2016; Meijers & Burger 2017). However, this vitality leads to severe pressures in terms of land take.

2.2 Population dynamics and land take

The "city life cycle" model developed by Van der Berg et al. (1982) is a basic reference for studying population dynamics. It involves four successive phases – urbanisation, suburbanisation, deurbanisation and re-urbanisation – defined by different population trends in the core and ring of an urban system. There are alternating drives for population concentration and population deconcentration. The model has mainly been applied to large metropolitan areas, in order to confirm the assumed sequence and the start of a reurbanisation process, characterised by the renewed appeal of the cores after a long phase of decline (Cheshire 1995; Champion 2001; Klusáček et al. 2009; Kabisch & Haase 2011; Morelli et al. 2014; Cividino et al. 2020b; Dembski et al. 2021). It is more unusual to find studies that extend the scope to urban systems linked to small and medium-sized towns (Rérat 2012, 2019; Wolff 2018). A strength of the model is that it views urban centres and their belts as interactive environments. However, there are also a few critical issues regarding the methods for defining the boundaries of these areas and the fact that only one evolutionary trajectory is assumed, which is not always confirmed in practice (Nyström 1992; Dembski et al. 2021). What is more, reference is made to monocentric urban systems. According to Humer et al. (2021), the model does not adequately describe the situation of polycentric areas, where "syncurbanisation" is often at play, with cores and belts following a similar trend for long periods of time.

Over recent years, many urban centres have regained inhabitants, but municipalities in the belt have not stopped growing. Rather, there is a mixture of reurbanisation and suburbanisation (Razin et al. 2007; Keil 2018). The latter involves increasingly extensive areas, forming "horizontal metropolises" characterised by a flattening of the centre/periphery gradient (Balducci et al. 2017). Suburban areas continue to be extremely dynamic and are somewhat variegated in terms of evolutionary trajectories, social patterns and physical landscapes (Antrop 2004; Ouředníček 2007; Phelps 2017; Hesse & Siedentop 2018).

In addition to the quantitative aspects, the behaviours of the various population segments need to be investigated: not everyone, everywhere behaves the same way. In view of this, the age of the individuals is one of the most important factors to consider. Young people and older people are attracted by different places and have a different level of residential mobility (Plane et al. 2005; Booi & Boterman 2020). We often think on a macroscale (nation, region), overlooking the restructuring of the population by age groups in local contexts (Kroll & Kabisch 2012; Kurek et al. 2017; Goujon et al. 2021). In the past, however, age was one of the most determining factors of the divides within urban agglomerations, between cores and belts. With suburbanisation, a stark contrast developed between centres (with an older population) and surrounding municipalities (with a young population). If we also take a look at the variability of fertility rates along the urban/rural gradient, it is clear how the suburban areas have very high values, associated with a young population and natural population increase (Kulu et al. 2009). With reurbanisation, driven by young individuals (Buzar et al. 2007; Haase et al. 2010; Gans 2017; Moos et al. 2019; Rérat 2019), the picture has changed, but it is unclear how this impacts on the divides between cores and belts. According to some authors, the impact is ambiguous (Kurek et al. 2017), while others believe that a new phase has begun, characterised by rejuvenation of cores and ageing of suburban areas, narrowing the previous gaps (Siedentop et al. 2018; Egidi & Salvati 2020). However, the suburbs are still very appealing for the young population (Gurrutxaga 2021). These reflections are based on large urban areas. Understanding what has happen values, MSTs is important, if nothing else, because they are often seen as places of high social cohesion and this should also apply to the age structure of the population.

In theory, the switch to reurbanisation should result in a reduction in (stop to) land take (Rérat 2012). This is rarely the case in reality, especially where

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there is a high level of administrative fragmentation, with a host of small municipalities that rely on urbanisation fees for their survival (Siedentop & Fina 2012; Salvati & Carlucci 2016). As such, land take continues to be of concern to policymakers, not least because of its relationship with climate change (EEA 2006; Couch et al. 2007; EEA-FOEN 2016; OECD 2018). In the cities, we are seeing the densification of settlements and the creation of new parks to improve environmental quality (Teller 2021). The situation is different in smaller towns, where land take is still high. These towns justifiably offer a privileged vantage point when defining a methodology for measuring urban sprawl (Bunting et al. 2007; Olivier & Thomas 2014; Lagarias & Sayas 2018; Liu et al. 2018; Cebrián Abellán & Sánchez Ondoño 2019; López & González González 2019). In many agglomerations linked to MSTs, especially in Mediterranean countries, there is a strong drive for urbanisation, even in places where the population is stable or in decline (Caselli et al. 2020; ESPON 2020).

Land take is a crucial issue for MSTs, which aspire to be places where environmental sustainability is cultivated, using this image to attract new residents. As Dicecca (2019) points out, maintaining a compact urban form, with a clear boundary between city and countryside, is closely linked to the identity of MSTs: it is a key factor that differentiates them from cities, where processes of conurbation are now widespread.

3 The case of Lower Lombardy: overview and recent population dynamics

The territorial area to the south of Lombardy is a section of the "green heart" of the Po Valley megalopolis (Turri 2000). It is a flat area – with the exception of the Oltrepò Pavese and Alto Mantovano areas – with a population of around 1.5 million inhabitants in 2020 (15.3% of the regional total: see Table 1). With its many tributaries, the river Po lends environmental unity to Lower Lombardy, but the local identities are historically very diverse. Agriculture and industry create more added value here than they do on a regional scale. A distinctive feature of the area is its limited population density: the province of Lodi has the highest density (290.4 inhabitants/km^2), but this is well below the regional figure and equal to one seventh of the peak values recorded in the provinces of Milan and Monza-Brianza, which stand at around 2000 inhabitants/km^2. Most of the 423 municipalities in Lower Lombardy are below the 5000 inhabitant mark. There are ten cities with more than 20000 inhabitants (four capitals plus six other municipalities), attracting 28.7% of the area's population. The trend of added value in the 2000–2019 period shows modest growth compared to the region. Although performance was inhomogeneous from province to province, Lower Lombardy lost weight in the region, most noticeably following the economic crisis of 2008–2014. With regard to commuting flows, all the provinces had a net in-/out-commuting loss. Moreover, the provinces of Pavia and Lodi are more closely interlinked with Milan than the others.

Table 1 Lower Lombardy: general data, 2020

Indicators	Lower Lombardy provinces				Total	Lombardy
	Pavia	Lodi	Cremona	Mantua		
No. of municipalities	186	60	113	64	423	1,507
Resident population	540376	227412	355908	406919	1530615	10027602
Territorial surface area (kmq)	2968.6	783.0	1770.4	2341.4	7863.3	23863.1
Inhabitants/sq km	182.0	290.4	201.0	173.8	194.7	420.2
% municipalities 5000 inhabitants	87.1	86.7	89.4	54.7	82.7	68.8
Added value (million Euro)[1]	12448.0	5740.6	10456.9	11791.4	40436.9	356475.1
% Agriculture	2.4	3.4	4.9	5.8	4.2	1.1
% Industry	27.9	28.1	33.2	34.3	31.1	26.6
% Tertiary	69.7	68.5	61.9	59.9	64.7	72.3
Variation 2000–2019 (2000 = 100)	126.3	144.3	129.0	140.3	133.2	153.1
% Commuters to the province of Milan[2]	75.2	71.4	38.7	1.4	53.8	–
OECD regional typology	Intermediate	Intermediate	Intermediate	Intermediate	–	–

(Source: ISTAT data, our elaborations)
[1] In 2019, current prices
[2] In 2011

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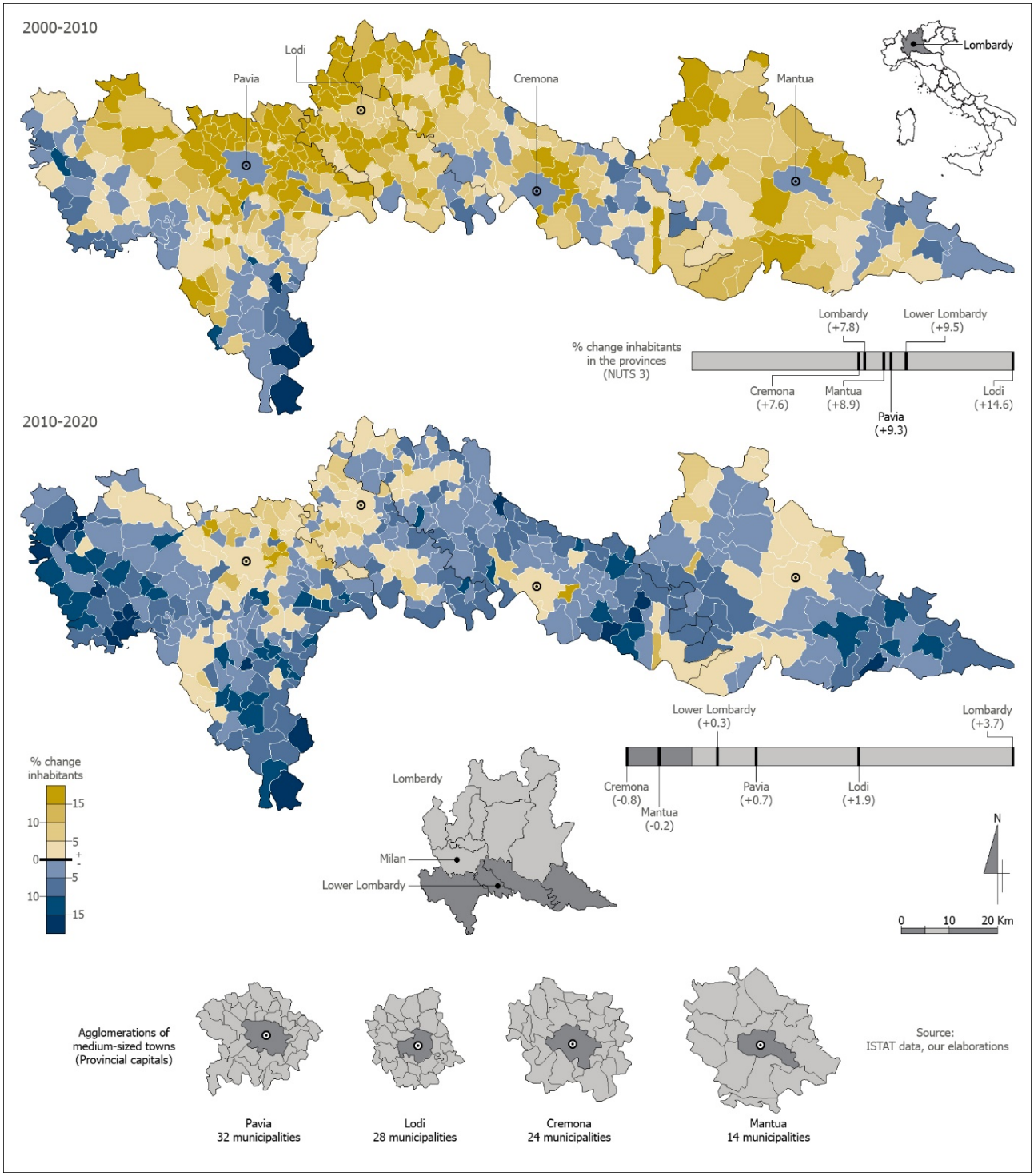


Fig. 1 Change in resident population in the municipalities of Lower Lombardy, 2000–2010 and 2010–2020, % values (Source: ISTAT data, our elaborations)

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Between 2010 and 2020, Lower Lombardy recorded only slight population growth (+0.3%, amounting to 4010 new inhabitants: see Fig. 1). There was a marked slowdown compared to the previous decade, when the population had increased by 132605 units, at a higher rate than regionally (9.5% against 7.8%). The provinces of Lodi and Pavia drove growth in the area during both decades. The other provinces, on the other hand, were less vibrant and have recently lost inhabitants. In the 2000–2010 period, the population rose in most municipalities in Lower Lombardy (318 out of 423). The growth was very intense around the provincial capitals, in the Alto Mantovano area and particularly in the territorial area close to Milan. These areas stood out for their vitality even after 2010, when the falling population situation became widespread (affecting 292 municipalities). This vitality is in contrast with the long-standing depopulation of many municipalities in the areas of Lomellina, Oltrepò Pavese, Basso Cremonese and Oltrepò Mantovano. To break the spiral of decline of these inpost-metropolitana great deal of public resources have been appropriated in recent years to the Rural development plans and the National strategy for inland areas.

The population recovery of the four capital MSTs is also significant. In fact, between 2010 and 2020, the trajectory of decline which started in the 1970s, linked to the deindustrialisation of these towns, was reversed. In the space of fifty years, Mantua and Pavia have lost around 19000 inhabitants, 29% and 21%, respectively, of the population recorded in 1971. There was also a sharp decline in Cremona (–15%, approximately 12500 inhabitants), while Lodi coped better in the long-term (–2.5%, around 1100 inhabitants), its population recovering earlier than the other capitals (its population is now at 1981 levels). Nevertheless, in the 2010–2020 decade, the growth of the capital MSTs and the other towns with more than 10000 inhabitants just about managed to offset the decline recorded in smaller municipalities, especially those with fewer than 2000 inhabitants.

4 MSTs and their belts: varied evolutionary trajectories

The recent rise in population in the MSTs indicates a process of reurbanisation. Proper use of this term requires an analysis of urban systems or functional areas, but this is not an easy task. Identification of the urban systems is not clear-cut, and their boundaries change over time. This is also apparent if we use employment areas (Sistemi locali del lavoro) to identify "cities proper", which extend well beyond the municipal borders. For this reason, we have only taken into account agglomerations composed of capital MSTs and the surrounding first- and second- belt municipalities within a range of 15 km from the core. A similar approach has also been adopted by other studies (Adam 2006; Escudero Gómez et al. 2019). The areas close to the capitals are first in line when it comes to accommodating decentralised people and businesses, with an associated increase in land take. The agglomerations thus defined have a size of between 126521 inhabitants (Cremona) and 161527 inhabitants (Mantua) (see Table 2)[3].

Table 2 Resident population in the agglomerations of MSTs 2010–2020

Areas	Resident population 2020	Resident population balance 2010–2020	% change in resident population 2010–2020	% change in Italian resident population 2010–2020
Pavia	71882	2546	3.7	–4.0
First belt	36463	3007	9.0	6.3
Second belt	44733	2175	5.1	3.6
Agglomeration	153078	7728	5.3	0.6
Lodi	44928	1750	4.1	0.1
First belt	30893	137	0.4	–1.5
Second belt	71981	2385	3.4	0.9
Agglomeration	147802	4272	3.0	0.1
Cremona	72399	1385	2.0	–2.6
First belt	31986	–211	–0.7	–1.8
Second belt	22136	–955	–4.1	–5.2
Agglomeration	126521	219	0.2	–2.9
Mantua	48835	1678	3.6	–0.4
First belt	70263	1228	1.8	1.1
Second belt	42429	214	0.5	–1.8
Agglomeration	161527	3120	2.0	–0.1
Lower Lombardy	1530615	4010	0.3	–2.2
Lombardy	10027602	356988	3.7	1.0

(Source: ISTAT data, our elaborations)

The spatial distribution of the population in the agglomerations is different. Pavia and Cremona have a monocentric structure, with the capitals attracting 47 to 57% of the total population. In the other cases, there is greater balance between centres and belts (the capitals have a share of around 30%). There are also different population density gradients, indicative of different living landscapes. While the belts are mainly composed of small mu-

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nicipalities, these are bigger on average around Mantua (8600 inhabitants) for geographical reasons and as a result of recent administrative reorganisation.

There is a high level of integration between belts and capitals. This applies in particular to the inner belts, where at least half of daily travel for work and study is captured by the capitals (data from 2011). Compared to the other capitals, Mantua and Cremona have networks that are more local. Approximately 40 to 60% of outward flows from the two towns is bound for the belts and 60 to 80% remains within the provincial boundaries. Pavia and Lodi have lower values, suggesting greater openness to relations outside the local area. In particular, there is a high commuting flow (30%) to nearby Milan, facilitated by the railway link. Therefore, each of the four MSTs is positioned differently within the settlement networks: despite being located at the centre of their own reference regions, Pavia and Lodi are affected by Milan for better or for worse, while Cremona and Mantua are more autonomous.

The agglomerations performed well between 2010 and 2020: the population grew at higher (or at least similar) rates than the data for Lower Lombardy and the individual provinces. Peaks were recorded in Pavia (+5.3%) and Lodi (+3.0%). But the trajectories within the agglomerations are different. In the case of Pavia, the capital grew, but not as much as the surrounding areas (especially in the first belt), suggesting that there is still a strong process of suburbanisation at play. Both the capitals and belts of Lodi and Mantua underwent growth, which was driven, however, by the capitals. Cremona presents yet another different situation, where the capital grew, making up for the decline in the surrounding areas.

The MSTs most closely linked to Milan metropolitan area – Pavia and Lodi – are the most dynamic, which is consistent with the findings of other studies (see section 2.1). In the period from 2010 to 2020, there was a high correlation between the population variation rates of the capitals and those of their respective provinces (r = 0.827). Moreover, there was a high correlation between the above variable and the level of openness of MSTs to relations outside the local area, inferred from the share of commuting flows crossing the borders of the agglomeration (r = 0.753).

So far, we have considered the total population, but if we look solely at the Italian population, the picture changes. In the 2010 to 2020 period, Lower Lombardy lost inhabitants (–2.2%), going against the regional trend (+1.0%). Therefore, the entry of foreign citizens was key in determining the net population gain of the area in the last decade[4]. The importance of the capitals in the respective agglomerations has reduced, suggesting that peri-urban areas are highly attractive for the Italian population. The agglomerations do not always perform well compared to the wider area: there are situations of growth (Pavia and Lodi) and of varying degrees of decline (Cremona and Mantua). It is also evident how the capitals are continuing to push the Italian population away, with particular force in Pavia (–4.0%). The only exception to this is Lodi (+0.1%). There are a number of different situations in the surrounding areas: intense growth involving the belts (Pavia), growth focused on one belt only (Mantua and Lodi) or a decline in both belts (Cremona).

Table 3 Demographic balance in the agglomerations of MSTs, average annual rates 2010–2020, ‰ values

Areas	Natural rate (NR)	Internal migration rate (IMR)			Foreign migration rate (FMR)
		Total pop.	Italian pop.	Foreign pop.	
Pavia	–4.9	1.9	2.0	1.6	7.0
First belt	0.9	6.2	5.7	13.9	1.6
Second belt	–0.7	4.5	4.3	6.7	1.2
Lodi	–3.2	3.1	3.7	–1.5	4.1
First belt	1.1	–2.4	–2.6	–0.9	2.1
Second belt	1.3	0.3	–0.5	6.1	1.8
Cremona	–3.8	2.8	1.3	13.2	3.2
First belt	–2.7	1.5	0.4	13.9	0.9
Second belt	–8.4	2.2	2.7	–2.5	2.2
Mantua	–5.4	6.2	3.8	22.8	3.2
First belt	–1.3	2.5	1.8	10.6	0.8
Second belt	–2.0	–0.2	–0.7	3.9	2.9
Lower Lombardy	–3.3	1.4	–	–	2.4

(Source: ISTAT data, our elaborations; pop. = population)

Underlying the dynamics of growth/decline described up until this point is a varied combination of the natural population rate (NR), the internal migration rate (IMR) and the foreign migration rate (FMR). We took into consideration the average ten-year rates (Table 3). The NR is negative in all the capitals, consistent with or higher than that of Lower Lombardy (–3.3‰), peaking in Mantua (-5.4‰). The situation is more varied in the belts: the values are positive or slightly negative around Lodi and Pavia; the data is more noticeably negative in the cases of Cremona and Mantua, and generally lower than in the capitals. Around half of the municipalities in the belt (42 out of 94)

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still had a positive NR in the 2010–2020 period. Outside the agglomerations, this situation is concentrated near the Milan area, which is a unique part of Lower Lombardy. With regard to the IMR, all the capitals have positive values, higher than those of the wider area (1.4‰); however, there is a significant gap between Mantua (6.2‰) and Pavia (1.9‰). The IMR is generally positive even in the belts, but in the case of Pavia only, the values are higher than those of the core. The FMR is the only index that is positive everywhere, with significant deviation in favour of the capitals. Pavia stands out, with a value of 7‰, almost double that of the other capitals.

The combination of the three rates determines different local conditions. The population growth in the capitals is driven by the FMR (Pavia, Lodi and Cremona) or IMR (Mantua). In the belts, among growing municipalities (51), two combinations prevail: 1) all positive rates (16 cases, concentrated around Pavia and Lodi); 2) negative NR and positive FMR and IMR (13 cases, more spread out). Population decline (43 municipalities) is primarily due to negative NR and IMR values, not offset by FMR (21 cases, almost all around Cremona), or a negative NR not offset by the other indices (8 cases).

It is interesting to focus on the IMR, separating the Italian population from the foreign population, to understand the lure of municipalities in transfers of residence. In general, the highest values are for the foreign population, characterised by greater mobility, seeking to achieve the difficult balance between job opportunities and residential choices. Returning to the case of Pavia – the capital with the lowest IMR – it is clear that there is little lure for both the Italian and the foreign population. The other capitals have higher IMRs, but also major irregularities: Mantua and Cremona attract the transfer of residence of foreigners in particular, while Lodi attracts Italian citizens, pushing others away.

5 Social divisions of space by age group

If we look at the population breakdown by broad age groups (Table 4), persisting opposition between cores and belts is evident: in 2020, the cores were still home to higher shares of the older population (>65 years). The differences are significant, especially in the cases of Pavia and Lodi. A second aspect that is evident is the gradual ageing of the belts in the decade from 2010 to 2020. There was a sharp increase in the population of over 65s, as well as in the 40 to 64 years age group (the "older" cohorts of the working age population). In contrast, MSTs performed better than belt municipalities in the younger age groups (even where there was a decrease in inhabitants). The ability to attract younger foreign citizens plays a key role in this. Overall, it is clear that convergence is taking place in the age structure of the population in the agglomerations, which confirms the findings of research conducted in large metropolitan areas (see section 2.2).

Table 4 Resident population in the agglomerations of MSTs by age group, 2020

Areas	<14 years	15–39 years	40–64 years	>65 years
	% Resident population 2020 (row = 100 %)			
Pavia	10.8	27.3	36.0	25.9
First and second belt	13.9	25.5	40.5	20.1
Lodi	12.4	25.9	37.3	24.3
First and second belt	14.6	26.7	38.6	20.1
Cremona	11.6	25.4	36.2	26.8
First and second belt	12.6	24.5	38.5	24.4
Mantua	11.7	24.2	37.3	26.8
First and second belt	13.3	24.9	38.4	23.4
	% Change in resident population 2010–2020			
Pavia	2.7	4.0	4.9	2.1
First and second belt	2.2	–13.9	17.5	26.3
Lodi	2.8	–5.0	8.8	8.4
First and second belt	–2.5	–16.1	10.0	28.2
Cremona	0.8	–3.5	3.6	5.9
First and second belt	–8.4	–16.2	4.0	10.1
Mantua	4.7	–0.7	7.4	1.9
First and second belt	–2.1	–16.4	9.0	16.2

(Source: ISTAT data, our elaborations)

Various indicators can be used to study changes in a place's population structure. Of these, we have examined the dependency ratio and the active population structure index. The first index evaluates the ratio of the non-working population compared to the population that is potentially active in the labour market. The overall social burden is defined by a different combination of shares of young and older people, with various implications for public policies:

$$Total\ dependency\ ratio = \left[\frac{population \leq 14\ years + population \geq 65\ years}{population\ 15-64\ years}\right] \cdot 100 \quad (1)$$

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$$Old-age\ dependency\ ratio = \left[\frac{population \geq 65\ years}{population\ 15-64\ years}\right] \cdot 100 \quad (2)$$

$$Young-age\ dependency\ ratio = \left[\frac{population \leq 14\ years}{population\ 15-64\ years}\right] \cdot 100 \quad (3)$$

The active population structure index considers the balances within the working-age population, defined by the ratio of the 25 older generations (40–64 years) to the younger generations (15–39 years). The degree of ageing of the working age population can therefore be calculated as follows:

$$Active\ population\ structure\ index = \left[\frac{population\ 40-64\ years}{population\ 15-39\ years}\right] \cdot 100 \quad (4)$$

Table 5 Demographic indices in the MSTs of Lower Lombardy and Milan, 2020

Indices	Areas	Total population		Italian population	
		2020	Difference 2010 –2020 (p.p.)	2020	Difference 2010 –2020 (p.p.)
Total dependency ratio	Pavia	57.8	–1.3	65.1	2.3
	Lodi	58.0	2.0	63.3	4.1
	Cremona	62.2	2.2	69.8	5.4
	Mantua	62.5	–0.8	69.8	0.8
	Milan	55.3	–5.1	63.6	–3.0
Old–age dependency ratio	Pavia	40.8	–1.0	48.7	2.7
	Lodi	38.4	2.0	45.2	4.1
	Cremona	43.5	2.2	52.3	5.0
	Mantua	43.5	–0.9	51.6	0.5
	Milan	35.8	–4.2	44.5	–2.7
Young–age dependency ratio	Pavia	17.0	–0.3	16.4	–0.4
	Lodi	19.6	0.0	18.1	0.0
	Cremona	18.8	0.1	17.6	0.4
	Mantua	19.0	0.2	18.2	0.4
	Milan	19.5	–1.0	19.1	–0.3
Active population structure index	Pavia	131.4	1.0	152.3	7.3
	Lodi	144.0	18.3	165.1	19.9
	Cremona	142.1	9.6	170.7	14.1
	Mantua	154.2	11.5	174.3	11.5
	Milan	130.1	55.8	140.9	–3.0

(Source: ISTAT data, our elaborations)

If we examine these indices and their evolution over the 2010–2020 period, the four MSTs considered clearly have a different demographic profile from Milan (Table 5). The social burden is greater (high total dependency ratio), a feature that has been consolidated over the last decade (only Mantua had a value higher than Milan in 2010).

In particular, the old-age dependency ratio is very high (accounting for 65–75% of the total ratio), especially in the case of the Italian population. The ratio has decreased only in Pavia and Cremona, but the change is only slight compared to that recorded in Milan. Here, the social burden has decreased in all components, including for the Italian population, unlike in the MSTs of Lower Lombardy. Despite the difficulties faced in the Great Recession, the Milan metropolitan area has been very vibrant, strengthening its ability to attract young workers. There are also clear differences when it comes to the active population structure index: the degree of ageing is high, but the scenario is better in Milan, despite the steep rise in the index over the last decade. If we consider only the Italian population, the index has actually decreased (younger population), which goes against the trend recorded in the MSTs in Lower Lombardy. A closer look at the values of the indicators in these four cities reveals significant differences and a hierarchy that fairly accurately reflects the distance from Milan: Pavia and Lodi have a less aged population structure than Cremona and Mantua.

With regard to the situation within agglomerations linked to the MSTs, we can see how all the cores have a higher total dependency ratio than the belts (Fig. 2). In particular, there is a very high number of older people. Only for young people is there a gap in favour of the belts, which tends to remain stable over time. Between 2010 and 2020, the gaps between cores and belts decreased, at times considerably, but they still remain evident, especially in the case of Pavia. Recalculation of the dependency ratios for the Italian population highlights the structural problems of the country, associated with the high social burden and rapidly ageing population. The gaps within the agglomerations are growing and last longer, indicating a more pronounced division

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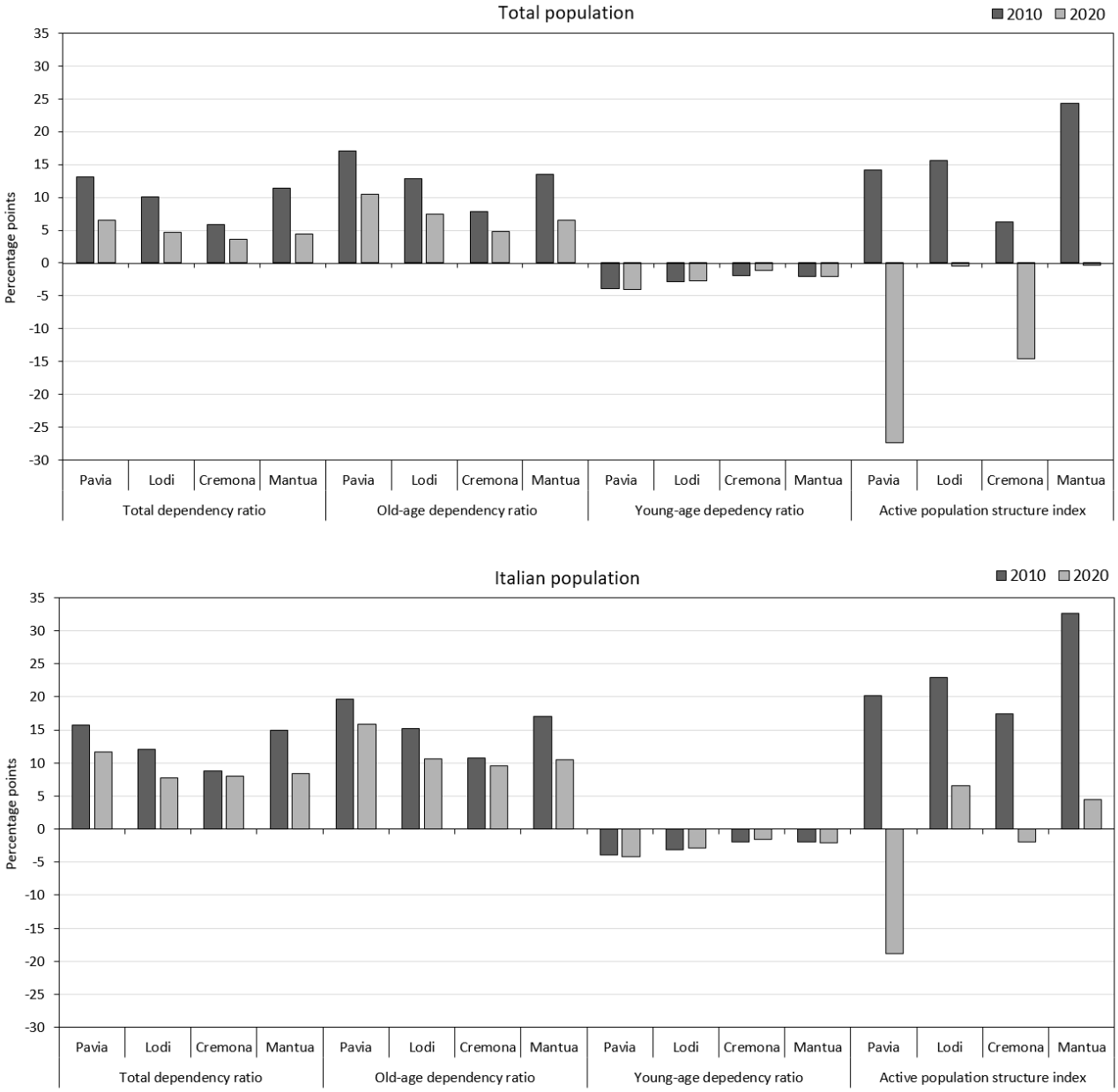


Fig. 2 Demographic indices in the agglomerations of MSTs: pole – belt difference, 2010 and 2020

Fig. 2 Demographic indices in the agglomerations of MSTs: pole – belt difference, 2010 and 2020 The active population structure index shows a unique dynamic: the gap was in favour of the cores in 2010, but it then switched in favour of the belts, peaking in Pavia. Ageing of the active population in the peripheral municipalities and the entry of young immigrants into the capitals explains this reversal in the ratios.

Of the capitals in Lower Lombardy, Pavia is the one with the highest per capita income (26500 euros in 2019). Many municipalities neighbouring this town have similar or higher values. This creates a much narrower gap between the capital and the first belt than can be found in the other agglomerations. In the light of the data discussed earlier, a major suburbanisation process is under way, involving the young and the rich. Property values might explain this peculiar situation (Table 6). The town of Pavia has high prices. What is more, these increased in the 2010–2020 period, contrary to the situation in the other capitals.

In the other capitals, lower values and higher depreciation than in the belts most likely supported population recovery, while also fostering higher IMRs. This was not the case in Pavia: the high property values “slashed” the IMR and pushed many Italian and young people out to the peripheral areas.

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Table 6 Real estate prices in the agglomerations of MSTs, 2010–2020

Areas	Residential property prices[1]			
	Euro/sqm 2020	% change 2010–2020	Capital–belts gap 2010	Capital–belts gap 2020
Pavia	2650	9.3	100.0	100.0
First belt	1051	–8.9	47.5	39.6
Second belt	943	–12.8	44.6	35.6
Lodi	1850	–20.4	100.0	100.0
First belt	1142	1.8	48.2	61.7
Second belt	1163	2.6	48.7	62.8
Cremona	1200	–17.2	100.0	100.0
First belt	766	–9.3	58.2	63.8
Second belt	638	–14.2	51.3	53.2
Mantua	1550	–19.5	100.0	100.0
First belt	854	–16.7	53.2	55.1
Second belt	743	–17.8	46.9	47.9

(Source: ISTAT and Agenzia delle Entrate data, our elaborations)
[1] Civilian dwellings in zone B (central), normal state of preservation, average market values

6 Different pressures for land take

The population dynamics fuel land take, a thorny problem in an already densely urbanised region such as Lombardy. From the early 2000s, despite the lack of national laws on the matter, the regional authorities introduced rules to minimise the new forms of urbanisation and encourage the redevelopment of brownfield sites. The Regional territorial plan (2018) provided criteria for reducing land take, with different criteria for each of 40 homogeneous territorial areas[5].

While Lower Lombardy has a low level of urbanisation, in recent years (2012 to 2020), the increase in land take has been above the regional figure (+1.6% against +1.2%). However, this occurred in a situation of poor population vitality and economic viability. The incidence of urbanised areas is, of course, greater in the capitals (23 to 28% of the town's surface area), but high levels are also found in the surrounding municipalities, especially in the inner belts of Pavia and Lodi (Table 7). Considering all the areas converted for urban uses between 2012 and 2020, 29.7% are located in the agglomerations of the capital MSTs. It is common to find higher increases in land take in the belt than in the wider area (33 municipalities), but this land take also concerns the MSTs of Lodi and Mantua.

Table 7 Land consumption and urban density in the agglomerations of MSTs, 2012–2020

Areas	Urbanized area			Inhabitants/ha urbanized area	
	2020, ha	Balance 2012 -2020, ha	% change 2012 –2020	2020	% change 2012 –2020
Pavia	1472.6	5.6	0.4	48.8	3.1
First belt	1404.1	19.0	1.4	26.0	2.8
Second belt	2273.1	48.2	2.2	19.7	–0.4
Lodi	947.6	16.3	1.7	47.4	1.0
First belt	1560.8	44.2	2.9	19.8	–3.6
Second belt	2529.0	78.3	3.2	28.5	–1.1
Cremona	1961.6	8.7	0.4	36.9	2.6
First belt	2565.4	19.9	0.8	12.5	–3.0
Second belt	1795.8	22.6	1.3	12.3	–6.6
Mantua	1569.9	29.9	1.9	31.1	1.1
First belt	3498.5	55.5	1.6	20.1	–1.3
Second belt	2959.1	30.9	1.1	14.3	–2.4
Lower Lombardy	80685.0	1278.5	1.6	19.0	–2.1

(Source: ISPRA and ISTAT data, our elaborations)

Do population concentration and deconcentration processes prevail within the agglomerations? To answer this, we evaluated the trend of urban density, population and land take in the 2012–2020 period[6]. We were able to identify three scenarios:

- increase in urban density, with population growth more than the amount of land taken (case A);
- decrease in urban density, with population growth less than the amount of land taken (case B);
- decrease in urban density, with a declining population and increased land take (case C).

A population concentration process is at play in case A only. Thanks to redevelopment policies for brownfield sites and under-utilised areas, all the capitals fall under this scenario. The drive for concentration (increased urban density) is however variable: it is strong in Pavia, yet weak in Lodi. The picture is not unitary around the capitals. The first belt of Pavia falls under case A, a unique example due probably to the presence of the Parco Lombardo della Valle del Ticino Nature Park, which restricted land take and contributed to increasing the density of the urban area. Around Cremona, in both belts, the type C population deconcentration is predominant, while there is a mix of cases B and C in the other belts. In any case, the situation of the individual municipalities needs to be considered: local urban policies are more or less conservative and land

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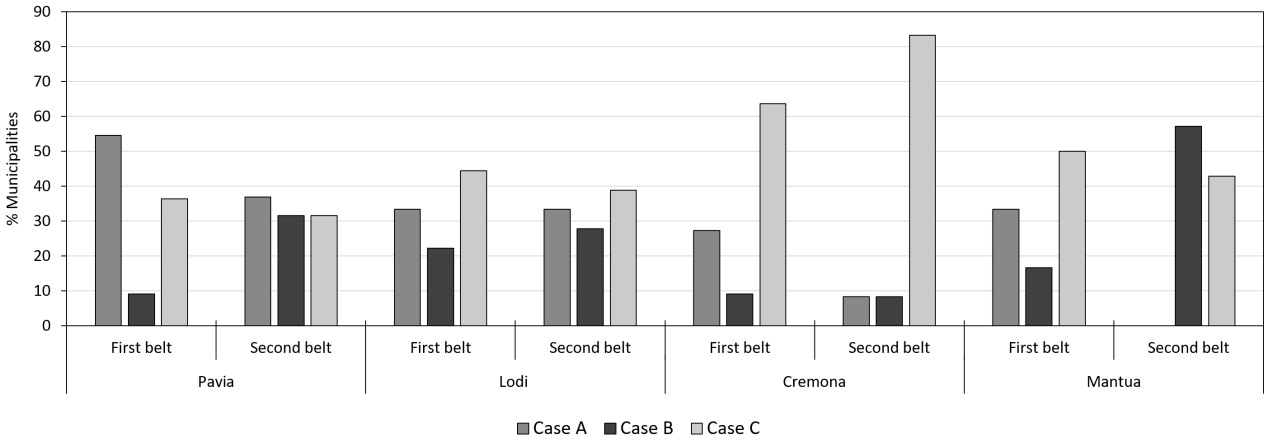


Fig. 3 Cases of settlement concentration and deconcentration in the agglomerations of MSTs, 2012–2020, % values (Source: ISPRA and ISTAT data, our elaborations)

take pressures vary according to the location with respect to the capitals and major roads. Agglomerations stand out in the wider area for the high number of municipalities affected by increased urban density. However, if we look within the belts, the drive for population deconcentration is overwhelming (66 out of 94 municipalities). This dynamic is linked to population growth (case B = 23% of municipalities located in the belt) but more commonly to a decline in the population (case C = 47% of municipalities). The picture is fragmented on a municipal scale (Fig. 3), with the exception of the agglomeration of Cremona, where case C is by far the most prevalent. Although most of the municipalities around Pavia fall under case A, on an aggregated level, the drive for population decentralisation prevails in the second belt, unlike in the first.

7 Conclusions

Between 2010 and 2020, all the MSTs considered left a long phase of population decline behind them. And yet this renewed residential lure did not undo the previous social divisions of space. The indices on structure by age of the population reveal greater ageing in the capitals than in the surrounding municipalities. The gap narrowed after 2010, but still remains pronounced, especially in the cases of Pavia and Lodi. There, in the belts, there are many small municipalities affected by the suburbanisation process whose NR is still positive. If we consider only the Italian population, the capitals show no or very little recovery (Lodi). The gap between capitals and belts, in the structure by age of the population, is not only growing, but is more long-lasting. Other aspects highlighting the social division of space should be considered (education, labour status, and so forth). Nevertheless, even reflecting solely on age groups of the population, we encounter the thorny problem of territorial cohesion. Policymakers should step up their efforts to attract back to the capitals those population groups who continue to be pushed out into the belts, driving the suburbanisation process and land take.

The paper also shows how population dynamics vary on a local level. Just as in other countries, the MSTs (and their belts) that are most closely linked to metropolitan settings stand out for their greater vitality. Pavia and Lodi, which interact more with the city of Milan, performed better than the other capitals. Proximity to the vibrant city of Milan does have its drawbacks: wide social gaps, higher land values, greater territorial density and considerable pressure for the localisation of homes and activities serving the city, with high land take (this is the case of logistics in the Lodigiano area, for instance). Even Mantua demonstrated major population growth, despite being the most autonomous capital from Milan, due to its distance from the city and historical events. This vitality is explained by a number of factors. The province of Mantua responded to the Great Recession better than the other provinces. This capital is located along a major infrastructural corridor and is a UNESCO World Heritage Site. Local policies have worked extensively on the identity of the “capital of culture”, on social inclusion and environmental and landscape quality (in 2020, the city was number two in the Ecosistema urbano [Urban Ecosystem] report drafted by the environmentalist association Legambiente). Mantua has also taken advantage of European funds to build

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long-distance relations with other MSTs. All this has produced good results, such that, out of the four capitals in Lower Lombardy, Mantua is the only one to have enjoyed population growth driven by transfers of residence (high IMR).

Lastly, this paper also highlights the stark contrast between capitals/belts in terms of land-take dynamics. While a population densification process is under way in all the capitals, the opposite trend prevails in the surrounding areas. The local settlement models should be investigated to understand whether urban growth is compact or scattered and fragmented. However, we cannot fail to be concerned by land take that is fast-paced even in places where the population is falling. Land take (waste) is one of the major problems for the sustainable development and identity of MSTs, as Dicecca (2019) also reminds us. Coordinated policies at agglomeration level are what would be required, but these are hard to activate in Italy, due to the historic weakness of the intermediary bodies between region and municipalities. This is a crucial matter for the post-COVID-19 town, too. Living in areas with a lower population density would reduce health risks and could be facilitated by forms of remote working (smart working). However, this could trigger a new wave of population decentralisation and land take. While small, depopulated villages in remote areas could benefit from this process – as an opportunity for regeneration – it will probably be more pronounced in intermediate settings such as Lower Lombardy.

We took a limited number of MSTs into account. If we were to extend the scope of study to other areas, we would obtain a more complete picture of the changes in these towns. In any case, it is clear that even within a limited area, with similar structural characteristics, MSTs have different population trends. This has important implications for policymakers: they will need to take a place-based approach.

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Footnotes

[1] Outcome of the Informal Meeting of EU Ministers Responsible for Territorial Cohesion and Urban Matters (Riga, 10 June 2015).
[2] SMUAs have a population of between 5000 and 50000 inhabitants.
[3] These agglomerations concentrate most of the resident population in the employment areas of the MSTs (Lodi = 65.3%; Pavia = 83.4%; Cremona = 88.8%; Mantua = 92.3%).
[4] In 2020, there were 182156 foreigners residing in Lower Lombardy, accounting for 11.9% of the total population, but the proportion rises to 15% in the MSTs. The geopolitical areas of origin are as follows: EU-27 = 27.6% (26.4% from Eastern European countries); other European countries = 16.8%; North Africa = 18.3%; Central and Southern Asia = 14.2%; other areas = 23.1%. The origins vary according to the specialisation of the provincial economies (ISTAT data).
[5] Composed of a cluster of several municipalities and defined as “entities with a high degree of morphological, historical, infrastructural and socioeconomic integration”. These are factors supporting the diagnostic, assessment and strategic phases of the Regional territorial plan.
[6] We did not consider businesses, as it was assumed that the population trend was the primary driver of land take.

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