DAYTIME POPULATION for study and work.

An experimental approach with administrative data.
Year 2016, December

Introduction

Many studies on the settlement population modalities and on the urbanisation dynamics show how, in the cities, some types of non-resident populations live together with the resident one using the same spaces with their own modalities. These are the individuals who, even if not residents, go there with different motivations (study, work, tourism, travel, etc.), with different frequency (daily, periodical, occasional) and for different periods.

The daytime population in a given area is composed of subpopulations of workers, students and city users, etc. The more attractive or repellent the area is, the more the daytime population differs from the population registered in the population registry. People moving towards cities with services or productive activities change the physiognomy of both the place of origin and the place of destination, and generate competition between the residents and non-residents in the use/consumption of resources and services.

Being able to answer questions such as "How many of these people are there?", "Where do they come from?", "What are their characteristics?", "How far away are their places of origin?", "How often do they travel?", can be useful in the planning of transport, housing, energy, and health services, etc. It can be useful for prevention and intervention plans in case of natural disasters (earthquakes, floods, landslides, etc.).

Here we present the preliminary results of a study[1] aimed at designing and implementing an information system to quantify and characterise the daytime population.
To date, the available sources have made it possible to quantify by a unique information system an important proportion of the daytime population in a territory: the daytime population net of tourists, individuals who travel for business, or move for reasons of medical care or religious[2] tourism, to which the traditional data sources are applicable.
Within this framework, new units of analysis have been formalised: the individuals whose movement is categorised as "dynamic for study/work", for whom both the place of origin and

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[1] The PSN project to which the work relates is IST-2661.
[2] Istat data are available for these population sub-sets (see bibliography).

destination of the movement are determined in the system, and the individuals who are classified as "static with respect to work/study". Moreover:

- As regards the question of "how many?" the numbers entering or leaving the various territorial domains can be quantified;
- As regards "how far away?" it is possible to calculate the distance in km between the place of origin and the place of destination of the movement, or the origin with respect to the perimeter of an area;
- As regards "what characteristics?" the information makes it possible to distinguish between primary/secondary school students, university students and workers; these types also include foreigners who are in Italy for work or study.

Finally, flexible processing methods are possible in terms of territorial output (both traditional administrative subdivisions and functional territorial partitions including Labour Market Areas or Functional Urban Areas).

All this makes it possible to examine the distribution of the population in the territory from a new point of view.

The text is organised as follows. The first paragraph illustrates the conceptualisation of the aggregates, the second outlines the information system implemented and the third paragraph provides some evidence from the data.

The text is accompanied by a statistical Annex, containing a set of six tables on the following territorial domains: Italy, Large Municipalities, Metropolitan Cities, the twenty-one main Labour Market Areas (*Sistemi locali del Lavoro* - SLL) defined as "Main urban realities"[3], Functional Urban Areas (FUA) and University Cities.

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[3] See paragraph 3 below for a detailed definition.

The daytime population (*Popolazione Insistente Diurna* - PI) in municipality *j* is defined according to [1] as the set of resident individuals, dynamic individuals per study/work (LUS) and city users (CU) entering *j*, net of dynamic individuals per study/work and city users leaving *j*:

$$PI_j = \textit{Resident pop.}_j + \left(\sum_{\substack{i=1 \\ i\neq j}}^{n} LUS \underset{ij}{\rightarrow}\right) - \left(\sum_{\substack{i=1 \\ i\neq j}}^{n} LUS \underset{ij}{\leftarrow}\right) + \left(\sum_{\substack{i=1 \\ i\neq j}}^{n} CU \underset{ij}{\rightarrow}\right) - \left(\sum_{\substack{i=1 \\ i\neq j}}^{n} CU \underset{ij}{\leftarrow}\right) \qquad [1]$$

Since the population residing in municipality *j* can be calculated as:

$$\textit{Resident pop.}_j = NO\_LUS_j + LUS \underset{jj}{\leftrightarrow} + \left(\sum_{\substack{i=1 \\ i\neq j}}^{n} LUS \underset{ij}{\leftarrow}\right) + \left(\sum_{\substack{i=1 \\ i\neq j}}^{n} CU \underset{ij}{\leftarrow}\right) \qquad [2]$$

[1] can be written as follows:

$$PI_j = NO\_LUS_j + LUS \underset{jj}{\leftrightarrow} + \left(\sum_{\substack{i=1 \\ i\neq j}}^{n} LUS \underset{ij}{\rightarrow}\right) + \left(\sum_{\substack{i=1 \\ i\neq j}}^{n} CU \underset{ij}{\rightarrow}\right) \qquad [3]$$

J = 1, …n;
(n= number of municipalities; *I* = municipality of origin; *j* = destination municipality;

$\underset{jj}{\leftrightarrow}$ movement within *j*;

$\underset{ij}{\leftarrow}$ movement from *j* to *i*;

$\underset{ij}{\rightarrow}$ movement from *i* to *j*)

where:

NO_LUS$_j$ Static individuals without work/study activities: individuals resident in municipality *j* who isn't a worker according to administrative registers, who do not attend preschool/primary/secondary school and who are not enrolled in university courses (e.g. children who do not attend preschool, pensioners, housewives, unemployed).

LUS $\underset{jj}{\leftrightarrow}$ Dynamic individuals with mobility within j for study or work: workers, students or academics with residence/fiscal domicile coinciding with municipality of work/study *j*. Mobility is within this municipality.

LUS $\underset{ij}{\rightarrow}$ Dynamic individuals with incoming mobility in j for study or work: workers, students or university students with residence/fiscal domicile in a municipality other than the one of work/study. Mobility is incoming in the municipality of study/work *j*, outgoing from the municipality of residence/domicile *i*.

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[4] See the in-depth analysis and definitions in the Glossary.

LUS $\underset{ij}{\leftarrow}$ *Dynamic individuals with outgoing mobility from j for study or work*: workers, students or university students with the residence/fiscal domicile in a municipality other than the one of work/study. Mobility is incoming in the municipality of study/work *i*, outgoing from the municipality of residence/domicile *j*.

CU $\underset{ij}{\rightarrow}$ *Incoming city users:* Individuals with residence/fiscal domicile in a municipality *i* different from the destination municipality *j* to which they move for tourism, health, sport, etc. Mobility is inbound to *j*. Frequency is occasional.

CU $\underset{ij}{\leftarrow}$ *Outgoing city users*: individuals with residence/fiscal domicile in *j*, with outgoing mobility for tourism, health, sport, etc. Mobility is outgoing from *j*. Frequency is occasional.

At national level, the daytime population on the national territory includes residents in Italy, non-residents working or studying in Italy, and non-residents in Italy but present for occasional reasons (e.g. tourists). It excludes Italian citizens resident abroad who do not work or study in Italy.

Each type of individual (dynamic, static, etc.) has been defined according to the type of activity carried out, the place of residence (or domicile) and the frequency of movement. Scheme 1 shows the types of population identified and their characteristics.

Scheme 1 – Types of individuals in the daytime population with respect to *j* and their characteristics

	Type of individual	Activity	Place of Residence/Domicile	Location of activity	Direction of movement	Frequency of movement	Symbology
1	Dynamic within *j*	Study or work	*j*	*j*	$\underset{jj}{\leftrightarrow}$ Inside area *j*	Daily, periodic (not occasional)	$LUS \underset{jj}{\leftrightarrow}$
2	Dynamic incoming to *j*	Study or work	Other than *j*	*j*	$\underset{ij}{\rightarrow}$ Inbound into *j* from *i*	Daily, periodic (not occasional)	$LUS \underset{ij}{\rightarrow}$
3	Dynamic outgoing from *j*	Study or work	*j*	Other than *j*	$\underset{ij}{\leftarrow}$ Outgoing from *j* towards *i*	Daily, periodic (not occasional)	$LUS \underset{ij}{\leftarrow}$
4	Static in *j*	Neither work nor study	*j*	-	-	-	NO_LUS_j
A	City users incoming into *j*	Tourism, sporting, religious, cultural events, etc.	Other than *j*	*j*	$\underset{ij}{\rightarrow}$ Inbound into *j* from *i*	Occasional	$CU \underset{ij}{\rightarrow}$
B	City users outgoing from *j*	Tourism, sporting, religious, cultural events, etc.	*j*	<> *j*	$\underset{ij}{\leftarrow}$ Outgoing from j towards i	Occasional	$CU \underset{ij}{\leftarrow}$

2 The information system on Day time population

The information system is implemented by the integration of individual micro-data from administrative sources and statistical registers in the field of demographic, social security and tax, and which coverage is at national level. Since similar sources are not available for tourism and travel fields in general, the information system includes types 1 to 4 of the target population (see Scheme 1) and excludes types A and B (city users)[5]. The procedures developed make

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[5] Information on tourism is however available from some ISTAT sources, including travel and holiday survey, RACLI survey, Satellite account on tourism, Survey on accommodation establishments.

possible to identify people with administrative signals for work or school/university enrolment, locate them and distinguish between residents and non-residents[6].

The minimum territorial detail is the Municipality: the Daytime Population can, therefore, be calculated for any aggregation of municipalities.

The production process of the database has been engineered in order to guarantee a more timely release and the possibility to carry out automatic controls during processing.

The data in this experimental statistics derive from the prototype of the *Daytime Population information system*, which underwent a validation process, on the basis of which a close consistency with the official statistics used as benchmarks were proved.

3 Some outputs

The outputs are contained in the Statistical Annex, that consists of six tables (absolute values and indicators), each of which is dedicated to a particular partition of the territory. These are illustrative tables about the informative potentiality contained in the system.

To select the territorial domains has been taken into account user demand, as well as data quality parameters, the robustness of measurements and the constraints imposed by the rules of GDPR.

There is also a table dedicated to university cities, because of their particular nature as attractors of flows of young people.

No releases will be made for lower territorial levels until the limits of the experimental measurement of aggregates are exceeded.

The data in the statistical appendix, concern:

- Metropolitan cities;
- Municipalities with over 100,000 inhabitants;
- The twenty-one main Labour Market Areas (Sistemi Locali del Lavoro - SLL) defined as "Main urban realities"[7];
- *Functional Urban Area* (FUA)[8]: functional urban areas, consisting of the city and its daily commuting area;
- University Cities[9].

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[6] Individuals irregularly present on the territory are not included, as they cannot be inferred by the administrative sources used as input.

[7] These twenty-one Labour Market Areas, identified in the ISTAT volume "Forms, levels and dynamics of urbanisation in Italy", are based on the following criteria: belonging to a metropolitan city, population of the local system of over 500 thousand inhabitants or population of the municipality capital of the area of over 200 thousand inhabitants.

[8] The Functional Urban Area consists of the city and its daily commuting area, formally known as the "Larger Urban Zone" (LUZ larger urban zone).

[9]Only non-telematic universities.

The national framework[10]

The daytime population in Italy in December 2016 amounts to 61.2 million, of which 784.6 thousand are non-residents (779.4 thousand in 2015) (Table 1). The population without mobility for study or work amounts to 28.5 million. There are 32.7 million individuals with mobility, of which 17.1 million move within their own municipality of residence or domicile and 15.6 million go to a different municipality. For 8.6 million preschool, primary and secondary school students, mobility is mainly within the municipality of residence (74.5%). More than half (54.2%) of the 22.9 million individuals have a work employment signal in a different municipality. Finally, 78.9% of university students[11] have a study signal in a different municipality.

Table 1 – Daytime population by type. Italy, December 2016 (absolute values, row percentage values).

Signal	Dynamic individuals		Static individuals (without mobility)	Total daytime population
	with mobility within the municipality of residence	with mobility in a municipality other than that of residence		
ABSOLUTE VALUES				
DAYTIME POPULATION				
Work	10,475,050	12,405,590	-	22,880,640
School	6,392,702	2,185,654	-	8,578,356
University	261,697	975,692	-	1,237,389
No signal	-	-	28,501,716	28,501,716
Total	**17,129,449**	**15,566,936**	**28,501,716**	**61,198,101**
Of which NON-RESIDENT				
Work	139,953	266,655	-	406,608
School	56,540	57,947	-	114,487
University	15,705	14,018		29,723
No signal	-	-	233,792	233,792
Total	**212,198**	**338,620**	**233,792**	**784,610**
PERCENTAGE (ROW) VALUES				
DAYTIME POPULATION				
Work	45.8	54.2	-	100.0
School	74.5	25.5	-	100.0
University	21.1	78.9	-	100.0
No signal	-	-	100.0	100.0
Total	**28.0**	**25.4**	**46.6**	**100.0**
Of which NON-RESIDENT				
Work	34.4	65.6	-	100.0
School	49.4	50.6	-	100.0
University	52.8	47.2	-	100.0
No signal	-	-	100.0	100.0
Total	**27.0**	**43.2**	**29.8**	**100.0**

Source: Daytime information system, 2016

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[10] Table 1 of the Statistical Annex.

[11] Working students (about 300 thousand) are not included among university students as it is assumed that their main activity is work (consequently, they are classified as workers).

From the point of view of territorial distribution, the municipalities for which the daytime population is greater than the resident population due to the positive balance between incoming and outgoing flows are 1,146 out of 7,998. (Cartogram 1). For these municipalities the coexistence index, i.e. the percentage ratio between daytime and resident population[12], is higher than one hundred.

There is a greater presence of attractive municipalities in the North and Centre than in the South of Italy.

Overall, the population of these municipalities is 20% larger than the resident population: 32.6 million compared to 27.1 million. Table 2 shows the distribution of the attractive municipalities, the amount of the daytime and resident population, by classes of coexistence index.

Cartogram 1 – Municipalities with coexistence percentage index greater than 100 per class of coexistence index, December 2016.
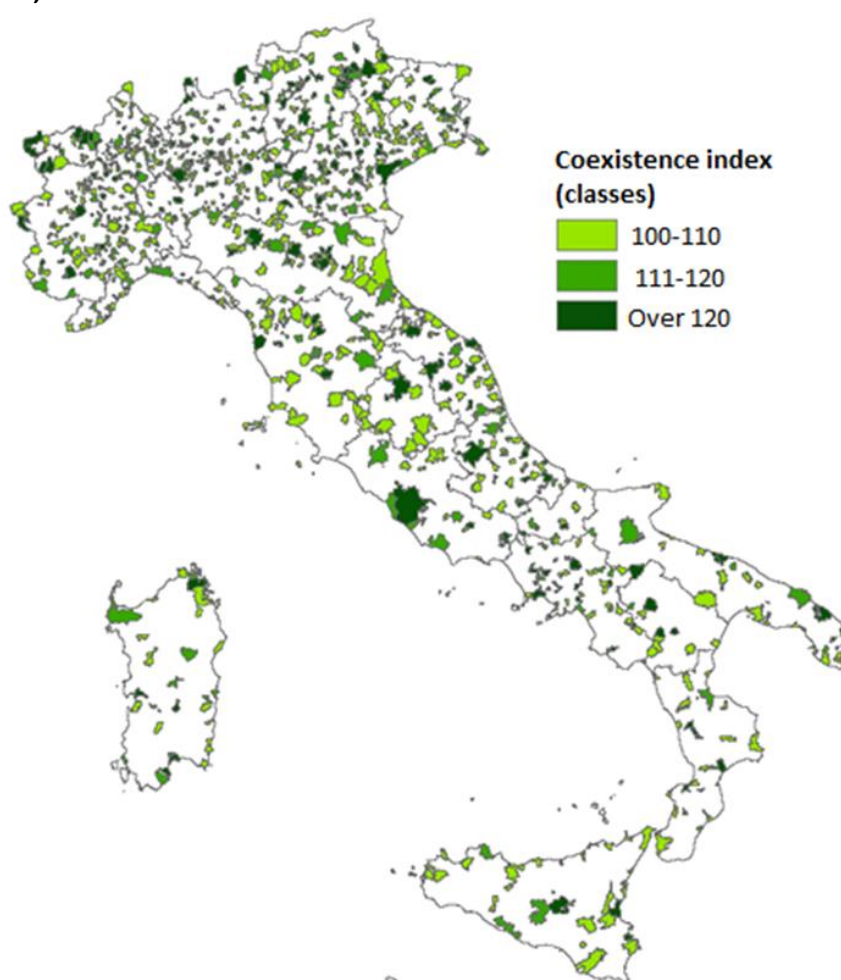
Source: Daytime information system, 2016

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[12] See glossary.

Table 2 – Municipalities with a percentage coexistence index greater than 100 (number of municipalities, resident population, daytime population and percentage difference between daytime and resident population), December 2016.

Coexistence index class	No. of Municipalities	Resident population	Daytime population	Percentage difference between daytime population and resident population
]100-110]	581	8,394,395	8,820,314	5.1
]110-120]	255	5,524,524	6,265,361	13.4
Over 120	310	13,228,432	17,537,879	32.6
Total	**1,146**	**27,147,351**	**32,623,554**	**20.2**

Source: Daytime information system, 2016

Large municipalities[13]

On the 31st of December, 2016 there were forty-six large municipalities, i.e. those ones with more than 100 thousand inhabitants. Overall, these municipalities have a resident population of around 14.3 million and a daytime population of around 17.7 million (23.8% more than the resident population). Table 3 shows the amount of the daytime population components for municipalities with more than 300 thousand inhabitants.

Table 3 - Resident population, daytime population by type of individuals, destination and reason for movements (absolute values) and coexistence index (percentage values). Municipalities with more than 300 thousand inhabitants, December 2016.

Basic data				Daytime population						
Name	Resident population 01/01/2017	Static individuals without work/study activities	Dynamic individuals with mobility within the municipality of residence for work/study	Dynamic individuals with mobility out of the municipality of residence for work/study	Dynamic individuals with mobility entering the municipality for work/study				TOTAL (*)	Index % of coexistence
					Total	of which for work	with origin within the province	of which for work		
Rome	2,873,494	1,363,795	1,369,712	173,171	949,222	831,083	287,179	242,408	3,688,672	128.37
Milan	1,351,562	602,796	612,944	178,943	809,934	661,660	289,700	237,479	2,032,385	150.37
Naples	970,185	539,232	345,818	97,849	299,323	196,204	181,622	115,159	1,186,674	122.31
Turin	886,837	424,207	355,538	120,441	285,402	208,738	176,859	137,008	1,066,680	120.28
Palermo	673,735	379,994	252,921	43,854	108,599	73,382	62,704	39,061	742,345	110.18
Genoa	583,601	278,369	271,225	41,661	87,465	70,895	35,464	27,961	644,866	110.50
Bologna	388,367	168,959	156,805	67,964	170,679	117,078	80,219	62,942	497,742	128.16
Florence	382,258	168,789	160,111	54,558	171,164	125,018	84,559	63,074	500,889	131.03
Bari	324,198	165,231	126,931	37,294	122,083	78,170	75,614	49,029	414,706	127.92
Catania	313,396	181,273	103,630	33,884	112,903	67,522	82,438	51,749	398,219	127.07
Total	**14,282,876**	**6,855,879**	**5,907,119**	**1,729,487**	**4,882,581**	**3,713,047**	**2,408,781**	**1,793,782**	**17,684,071**	

(*) The total daytime population also includes individuals whose municipality of origin is not included in the official ISTAT classification of Italian Municipalities.

Source: Daytime information system, 2016

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[13] Table 2 of the Statistical Annex.

The Municipality of Rome has 3.7 million daytime individuals (excluding tourists), 28.4% more than the resident population. The daytime population has 1.3 million of individuals who move within the municipality to reach their place of work or study, 1.3 million people who neither working nor studying considered "static" for our classification, and 949.2 thousand individuals entering from another municipality. Among these ones, only 287.2 thousand come from the province of Rome; the remaining part, on the other hand, has a medium/long range mobility, which is most likely not daily. The population leaving the municipality counts 173 thousand individuals.

The Municipality of Milan has a coexistence index (daily population on resident population) equal to 150 per cent, and 809.9 thousand incoming units.

Most of the individuals entering these municipalities are workers; others are university students (the municipalities with more than 300 thousand inhabitants are all University sites), while school students move more frequently within their municipality of residence.

Table 4 shows the ten main municipalities, among those with more than 100 thousand inhabitants, by ratio between daytime and resident population. Milan, Cagliari and Bergamo are on the top of the ranking, followed by Padua and Bolzano, while Rome in this particular ranking is in ninth place.

Table 4 - Resident population, daytime population by type of individuals, destination and reason for movement (absolute values) and coexistence index (percentage values). Ten municipalities with higher coexistence index, December 2016.

Basic data				Daytime population					
Name	Resident population 01/01/2017	Static individuals without work/study activities	Dynamic individuals with mobility within the municipality of residence for work/study	Dynamic individuals with mobility out of the municipality of residence for work/study	Dynamic individuals with mobility entering the municipality for work/study				TOTAL (*)	Index % of coexistence
					Total	of which for work	with origin within the province	of which for work		
Milan	1,351,562	602,796	612,944	178,943	809,934	661,660	289,700	237,479	2,032,385	150.37
Cagliari	154,083	79,056	54,644	21,892	95,672	64,867	62,936	42,992	229,636	149.03
Bergamo	120,287	53,388	39,617	28,836	83,764	55,494	62,591	39,680	177,061	147.20
Padua	209,829	95,511	78,197	40,044	133,938	81,967	70,470	47,733	308,096	146.83
Bolzano	106,951	45,448	47,873	12,622	57,960	53,518	47,327	43,714	151,520	141.67
Brescia	196,670	90,543	75,195	34,862	103,157	75,025	78,708	53,986	269,234	136.90
Trento	117,417	54,107	50,112	15,236	54,721	39,251	39,858	32,474	159,049	135.46
Florence	382,258	168,789	160,111	54,558	171,164	125,018	84,559	63,074	500,889	131.03
Rome	2,873,494	1,363,795	1,369,712	173,171	949,222	831,083	287,179	242,408	3,688,672	128.37
Bologna	388,367	168,959	156,805	67,964	170,679	117,078	80,219	62,942	497,742	128.16
Total	**14,282,876**	**6,855,879**	**5,907,119**	**1,729,487**	**4,882,581**	**3,713,047**	**2,408,781**	**1,793,782**	**17,684,071**	

(*) The total daytime population also includes individuals whose municipality of origin is not included in the official ISTAT classification of Italian Municipalities.

Source: Daytime information system, 2016

The metropolitan cities[14]

The metropolitan city is one of the local territorial authorities present in the Italian Constitution, after the 2001 reform (Constitutional Law no. 3/2001), established to replace the provinces as a large area authority by Law no. 56 of 7 April 2014.

Metropolitan cities are characterised by a considerable population flow either inside or incoming. In all metropolitan cities, the daytime population is bigger than the resident is (Table 5). Milan and Rome have the highest values of the coexistence indexes: 117.9 and 114.2 respectively.

Metropolitan cities show, however, a different propensity to attract individuals from outside their borders. As Figure 1 shows, the metropolitan city of Milan attracts a higher proportion of individuals than other metropolitan cities: 32.1% of total flows entering the area, followed by Rome, Bologna, Florence and Venice, with more than 20% of incoming flows from outside the metropolitan city.

On the other hand, Turin, Genoa, Naples and Bari have a high percentage of dynamic individuals among the municipalities of the metropolitan city, presenting a less extensive basin of attraction from a territorial point of view.

Table 5 - Resident population, daytime population by type of individuals, destination and reason for movement (absolute values) and coexistence index (percentage values). Metropolitan cities, December 2016.

Basic data					Daytime population					
					Dynamic individuals with mobility entering the municipality for work/study					
Metropolitan City	Resident population 01/01/2017	Static individuals without work/study activities	Dynamic individuals with mobility within the municipality of residence for work/study	Dynamic individuals with mobility out of the municipality of residence for work/study	Total	of which for work	with origin within the metropolitan city	of which for work	TOTAL (*)	Index % of coexistence
Turin	2,277,857	1,036,395	630,004	632,376	677,241	540,136	516,436	420,591	2,345,620	102.97
Genoa	850,071	404,681	326,234	128,213	140,334	114,303	81,035	64,656	876,679	103.13
Milan	3,218,201	1,370,828	975,189	936,122	1,441,409	1,229,702	666,213	562,884	3,794,141	117.90
Venice	854,275	361,569	258,039	243,260	238,112	196,516	133,923	111,288	858,808	100.53
Bologna	1,009,210	417,658	310,855	289,073	361,853	290,592	210,526	178,773	1,094,550	108.46
Florence	1,014,423	434,778	314,980	274,687	342,961	277,566	195,579	158,856	1,093,964	107.84
Rome	4,353,738	2,061,493	1,681,607	671,471	1,225,224	1,051,202	501,893	406,598	4,973,921	114.24
Naples	3,107,006	1,625,051	807,977	691,341	714,588	496,502	506,728	338,630	3,151,310	101.43
Bari	1,260,142	616,735	403,647	247,650	258,550	189,254	171,722	123,872	1,279,905	101.57
Total	**17,944,923**	**8,329,188**	**5,708,532**	**4,114,193**	**5,400,272**	**4,385,773**	**2,984,055**	**2,366,148**	**19,468,898**	

(*) The total daytime population also includes individuals whose municipality of origin is not included in the official ISTAT classification of Italian Municipalities.

Source: Daytime information system, 2016

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[14] Table 3 of the Statistical Annex.

Figure 1 – LUS individuals with mobility inside the Metropolitan City and LUS individuals with incoming mobility originating outside the Metropolitan City (percentage composition). Metropolitan cities, December 2016.
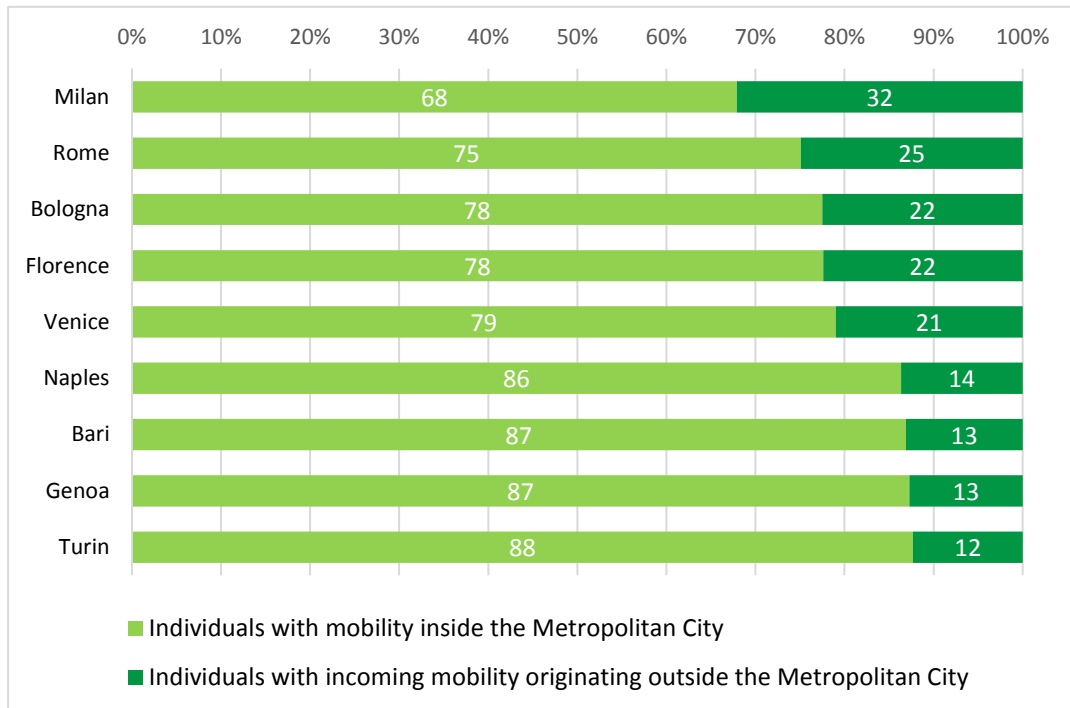
Source: Daytime information system, 2016

The main urban realities[15]

Labour Market Areas (*sistemi locali del lavoro* - SLL) represent a territorial grid whose boundaries, regardless of the administrative articulation of the territory, are defined using the daily home/work travel flows (commuting) recorded during the general population and housing censuses. Among these ones, the 21 main "urban realities" have been selected, i.e. the areas most characterised by urbanisation phenomena compared to other realities. The data related to the 21 SLLs defined as "main urban realities" are reported in Table 6.

SLL of Milan is the one with the largest amount of daytime population (4.4 million), with 1.7 million incoming individuals and 931 thousand individuals moving between municipalities belonging to the SLL.

The SLLs with a higher ratio between daytime and resident population are Rome (117.7) and Florence (113.8), followed by Milan (113.7) and Bologna (110.3).

On the other hand, the SLLs of Busto Arsizio, Como and Taranto have a coexistence index of just under one hundred, indicating that the daytime population is, if only slightly, lower than the resident population.

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[15] Table 4 of the Statistical Annex.

Table 6 - Resident population, daytime population by type of individuals, destination and reason for travel (absolute values) and coexistence index (percentage values). Main Labour Market Areas, December 2016.

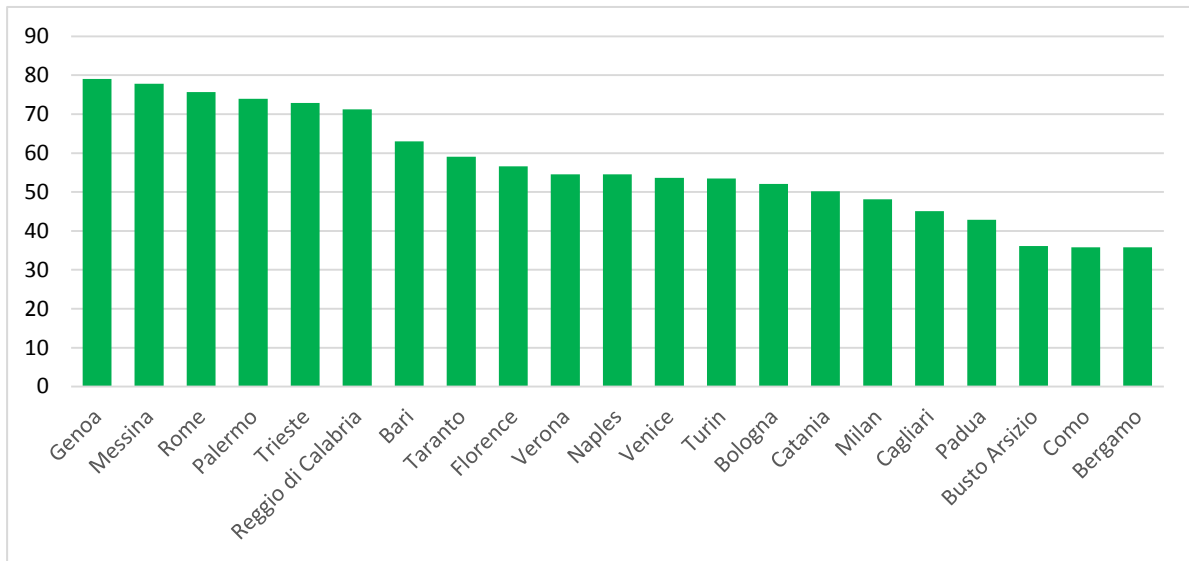|	Basic data				Daytime population					
					Dynamic individuals with mobility entering the municipality for work/study					
Main labour market area	Resident population 01/01/2017	Static individuals without work/study activities	Dynamic individuals with mobility within the municipality of residence for work/study	Dynamic individuals with mobility out of the municipality of residence for work/study	Total	of which for work	with origin within the labourur market area	of which for work	TOTAL (*)	Index % of coexistence
Turin	1,763,821	805,178	522,437	454,676	540,593	431,424	339,133	281,497	1,870,220	106.03
Busto Arsizio	639,422	270,739	134,675	238,518	197,405	166,576	124,782	100,705	603,390	94.36
Como	544,525	246,595	108,871	195,180	174,956	141,377	111,753	87,674	531,289	97.57
Milan	3,888,399	1,643,355	1,112,860	1,200,695	1,656,824	1,410,615	930,752	784,831	4,422,670	113.74
Bergamo	823,555	337,352	176,413	316,936	315,769	256,746	210,948	168,496	830,462	100.84
Verona	469,206	198,626	152,962	127,336	162,929	129,481	71,138	56,563	515,150	109.79
Venice	611,885	263,022	190,281	164,348	179,761	147,076	86,654	72,527	634,378	103.68
Padua	680,581	278,901	175,503	234,257	272,313	204,850	155,283	124,004	727,580	106.91
Trieste	234,682	114,384	90,771	33,853	40,957	30,875	16,057	13,748	247,000	105.25
Genoa	676,311	321,464	286,686	76,146	102,691	83,858	34,091	27,650	718,706	106.27
Bologna	864,874	357,634	269,183	247,519	325,153	257,678	169,896	144,445	953,927	110.30
Florence	722,448	311,498	235,602	180,753	273,856	218,919	122,394	99,498	822,046	113.79
Rome	3,804,465	1,796,521	1,554,842	500,506	1,117,725	965,754	332,378	269,595	4,475,861	117.65
Naples	2,560,640	1,357,002	663,894	552,950	625,379	416,944	384,787	247,993	2,652,023	103.57
Bari	749,034	368,835	243,560	143,257	187,751	133,898	83,837	62,330	800,988	106.94
Taranto	385,362	201,588	109,172	75,756	57,087	47,487	30,299	23,046	368,135	95.53
Reggio di Calabria	219,162	117,155	73,363	29,594	31,194	23,735	8,534	5,598	222,052	101.32
Palermo	906,112	511,084	294,702	103,775	130,325	91,200	52,920	34,997	937,039	103.41
Messina	259,813	141,217	92,212	26,362	36,572	20,082	4,682	3,158	270,194	104.00
Catania	710,909	382,195	168,508	167,556	189,523	124,296	121,289	80,888	740,855	104.21
Cagliari	515,516	252,264	117,770	143,594	156,183	117,988	107,258	81,314	526,689	102.17
Total	**22,030,722**	**10,276,609**	**6,774,267**	**5,213,567**	**6,774,946**	**5,420,859**	**3,498,865**	**2,770,557**	**23,870,654**	

(*) The total daytime population also includes individuals whose municipality of origin is not included in the official ISTAT classification of Italian Municipalities.

Source: Daytime information system, 2016

Some SLLs show, compared to others, a greater capacity to contain the population flows that originate from them, and therefore to satisfy the demand for study and work produced within them. The self-containment index[16], which measures this propensity, is high for the SLLs of Genoa, Messina and Rome, followed by Palermo, Trieste and Reggio Calabria (values above 70%), indicating that the share of flows that are exhausted within these systems is very close to the total movements generated in the area (Figure 2). Index values below 50 per cent are detected for the SLLs of Milan, Cagliari, Padua, Busto Arsizio, Como and Bergamo.

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[16] See glossary

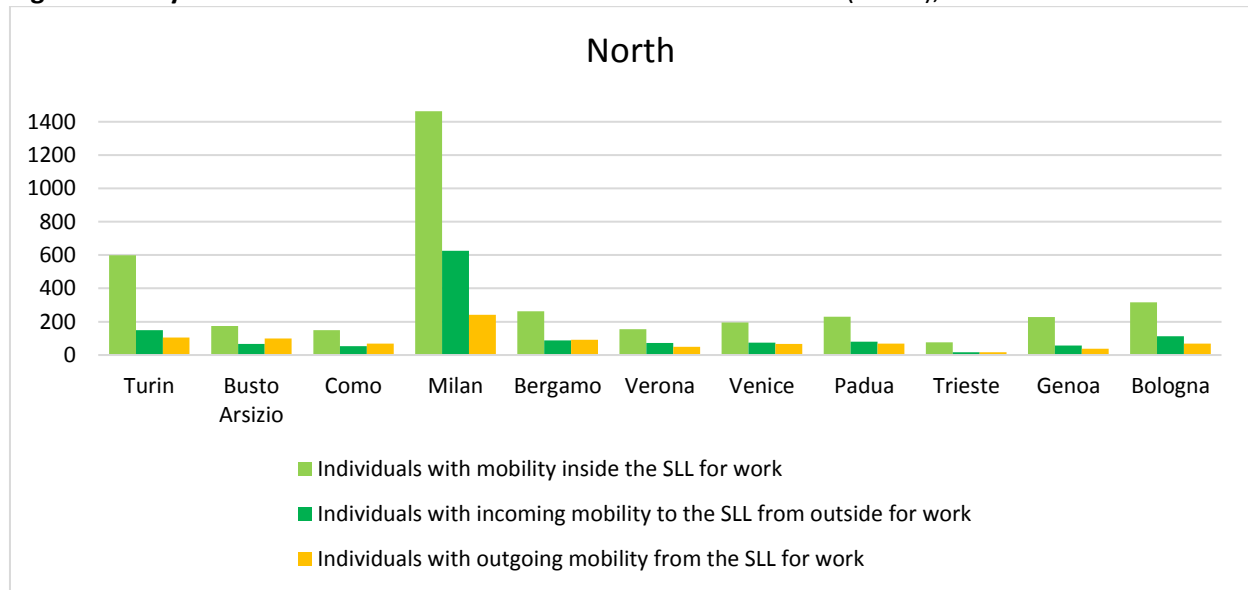**Figure 2 – Self-containment index** Main Labour Market Areas, December 2016.

Table 6 shows that most of the flows into or within the main urban realities are to be attributed to individuals with work signals. The literature on the subject shows that, in recent decades, the phenomena of daily commuting for work purposes have become more relevant, either in absolute values or in relative terms, involving an increasing number of employed people. There has also been an increase of the number of people moving outside their usual place of residence for work (Istat, 2015).

From a methodological point of view, SLLs are built as an aggregation of two or more municipalities, maximising the level of interaction between municipalities belonging to the same SLL, expressed by the daily commuting flows between place of residence and place of work. For this reason, the number of individuals with mobility for work within the main urban realities is much higher than the number of individuals entering the SLL or leaving the SLL for work (Figure 3). However, in some main urban realities the number of individuals with incoming mobility is smaller than the amount related to outgoing mobility workers.

Figure 3a – Dynamic individuals for work. Main Labour Market Areas (North), December 2016.

North

- Individuals with mobility inside the SLL for work
- Individuals with incoming mobility to the SLL from outside for work
- Individuals with outgoing mobility from the SLL for work

Source: Daytime information system, 2016

Figure 3b – Dynamic individuals for work. Main Labour Market Areas (Centre and South), December 2016.

Centre and South

- Individuals with mobility inside the SLL for work
- Individuals with incoming mobility to the SLL from outside for work
- Individuals with outgoing mobility from the SLL for work
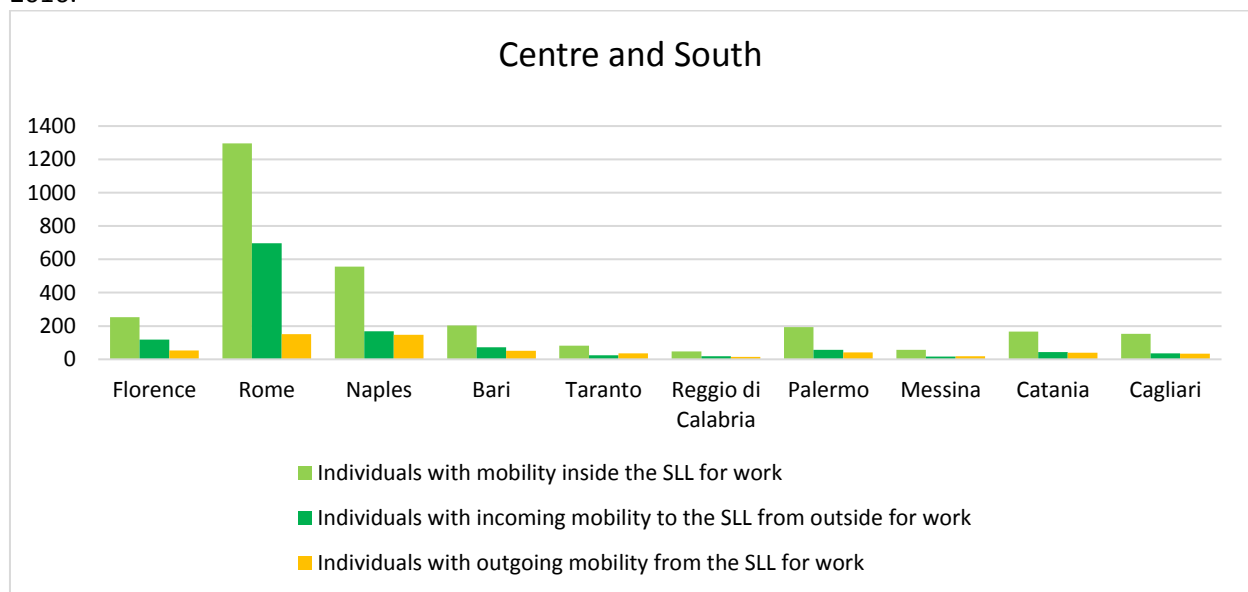
Source: Daytime information system, 2016

The Functional Urban Areas[17]

A Functional Urban Area (FUA) is a group of municipalities in which one as the nucleus and the others as satellites. This functional subdivision of the territory is useful for planning effective sectoral policies (e.g. policies for education, transport, energy, IT, etc.). The FUA can also be considered as an agglomeration of jobs attracting labour from the surrounding area.

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[17] Table 5 of the Statistical Annex.

The total number of FUAs in the Italian national framework as of 2016 is 84. Table 7 shows the nine principal functional areas by number of municipalities belonging to them.

The Milan FUA, which includes 359 municipalities, has almost 2 million people entering compared to 1.7 million leaving. The daytime population amounts to 5.5 million, the resident population to 5.1 million. The FUA of Rome includes fewer municipalities (159) than the FUA of Milan, but has higher coexistence index (113.76 compared to 107.84). This result differs from that one observed at the municipal level, where the Municipality of Milan has a higher coexistence index than the Municipality of Rome (see Table 3).

The FUAs of Naples and Turin have a daytime population of 3.4 million and 1.9 million, respectively. The others functional urban areas among those ones with the highest number of municipalities within the FUA have a smaller population, ranging from the 100 thousand residents of Campobasso to the 709 thousand inhabitants of Genoa.

All these FUAs, except for the Asti FUA, have coexistence index value greater than 100, indicating the existence of an imbalance, albeit in some cases minimal, between the population using the territory and the resident population.

Table 7 - Resident population, daytime population by type of individuals, destination and reason for travel (absolute values) and coexistence index (percentage values). FUAs, December 2016.

Basic data				Daytime population						
Name	Resident population 01/01/2017	Static individuals without work/study activities	Dynamic individuals with mobility within the municipality of residence for work/study	Dynamic individuals with mobility out of the municipality of residence for work/study	Dynamic individuals with mobility entering a municipality of the FUA for work/study				TOTAL (*)	Index % of coexistence
					Total	of which for work	with origin within the FUA	of which for work		
Milan	5,125,565	2,163,400	1,367,166	1,672,600	1,986,073	1,680,545	1,330,569	1,117,774	5,527,359	107.84
Rome	4,427,117	2,099,265	1,690,364	699,316	1,239,122	1,063,853	522,817	424,992	5,036,113	113.76
Naples	3,412,064	1,777,808	868,399	783,760	780,868	537,652	584,620	388,388	3,434,005	100.64
Turin	1,766,147	802,563	526,480	455,154	541,857	433,954	334,510	278,286	1,872,931	106.05
Trent	236,318	105,767	73,556	59,192	77,504	59,055	35,980	29,637	257,001	108.75
Genoa	709,453	337,330	292,764	87,458	107,928	87,996	43,035	34,886	745,906	105.14
Asti	115,174	53,488	33,956	28,552	23,918	18,251	11,651	8,509	111,469	96.78
Brescia	480,357	204,934	135,037	146,441	184,378	152,484	93,855	77,243	524,922	109.28
Campobasso	100,423	50,969	26,891	23,579	26,570	17,377	12,579	8,472	104,498	104.06

(*) The total daytime population also includes individuals whose municipality of origin is not included in the official ISTAT classification of Italian Municipalities.
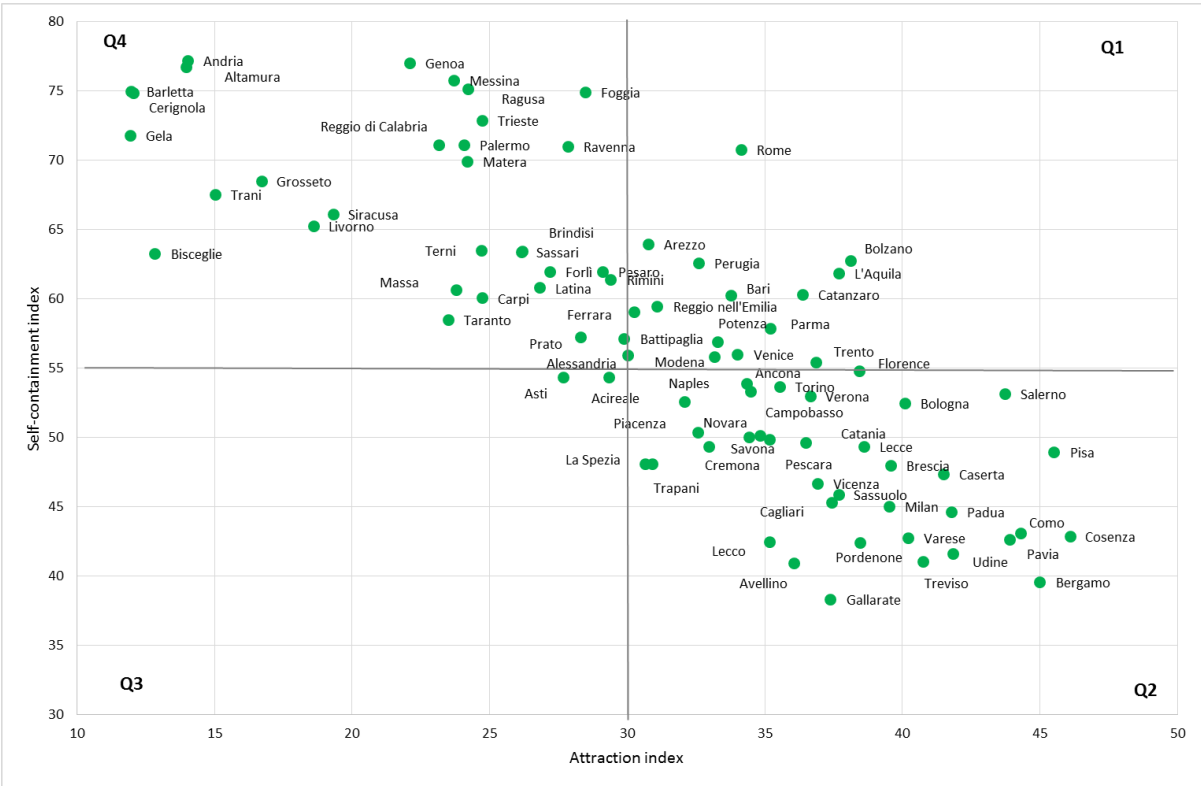
Source: Daytime information system, 2016

Figure 4 relates to the attraction index, which quantifies the capacity of a territory to attract incoming flows, and the self-containment index that indicates the capacity of an area to contain the population flows originating from it.

The FUAs with values of the attraction index greater than 30 per cent, and values of the self-containment index greater than 55 per cent (positioned in the first quadrant of Figure 4) represent the areas in surplus either from the point of view of attractiveness or of work and study satisfaction demand. These are mainly Northern FUAs (Bolzano, Parma, Trento, Venice, Modena, Ferrara and Reggio in Emilia); some FUAs of the Centre (Rome, Perugia, Arezzo and

L'Aquila) and of the South (Catanzaro, Potenza and Bari) also belong to this quadrant. The attraction index shows, instead, low values for the FUAs positioned in the fourth quadrant. Many of these FUA, however, although not attracting large flows of population from the outside, are able to contain the flows originating from the inside. These include, above all, FUAs of the South such as the Apulian ones of Andria, Altamura, Barletta, Cerignola, Foggia and Trani and the Sicilian ones of Messina, Ragusa, Palermo and Syracuse. Genoa and Trieste are also part of this FUA group.

On the other hand, the FUA placed in the second quadrant have high values of the attraction index. These are mainly areas located in the North of the country, among which stand out for the low self-containment index levels of Bergamo, Gallarate, Treviso and Udine.

Figure 4 – Attraction index and self-containment index. FUAs, December 2016.

Source: Daytime information system, 2016

The University Cities[18]

The evolutionary dynamics of universities are linked to those ones of the urban contest in which they unfold. The Italian university system has been characterised over the years by a consistent expansion of the number of universities in the whole Country. The establishment of a university certainly has a various impacts, both on the urban layout of the city and on the economic and social system of the area, as universities are a place of attraction for the younger generations.

In the 2016, in Italy there were 80 universities, both public and private (in addition to the

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[18] Table 6 of the Statistical Annex.

distance-learning universities, not considered here[19]) located in fifty-six cities[20].

Rome, Milan and Naples are the Italian cities with the highest number of university students with 167 thousand, 146 thousand and 106 thousand students respectively, while the cities with the lowest number of university students (less than 600) are Aosta, Rozzano and Bra. However, there are other cities where the "weight" of university students is more significant, so there is an "imbalance" between the resident and daytime population. Table 8 shows the amount of the resident population and the university population for the university cities with the highest percentage ratio between university students and the resident population. Fisciano, seat of the University of Salerno, leads this ranking (more than two university students per resident), followed by Urbino (14.8 thousand residents and 10.3 thousand university students), Rende, seat of the University of Calabria (over 35 thousand residents and 24 thousand university students), Camerino (7 thousand residents and 3.6 thousand university students) and Pisa (90.5 thousand residents and 37.9 thousand university students). These are small towns from the point of view of the resident population, where the university population, conceivably, has a considerable impact on their territory and on their economy.

Table 8 - Resident population, university population (absolute values) and percentage ratio between registered university students and resident population. Top ten university cities by percentage ratio of enrolled university students to resident population, December 2016.

Name of University City	Resident population 01/01/2017	University population				Ratio % between registered university students and resident population
		University students resident in the municipality seat of the University	University students with mobility within their own municipality	University students with incoming mobility from another municipality	University students with mobility outgoing from their own municipality	
Fisciano	13,971	29,420	443	28,947	114	210.6
Urbino	14,844	10,294	410	9,649	170	69.3
Rende	35,475	24,065	1,611	22,428	576	67.8
Camerino	7,007	3,607	430	3,128	149	51.5
Pisa	90,488	37,850	2,951	34,795	444	41.8
Siena	53,772	14,228	1,629	12,488	634	26.5
Chieti	51,330	13,414	694	12,694	1,124	26.1
Pavia	72,612	18,160	2,006	16,046	590	25.0
Padua	209,829	39,538	4,042	35,374	2,184	18.8
L'Aquila	69,605	13,095	1,981	11,077	787	18.8

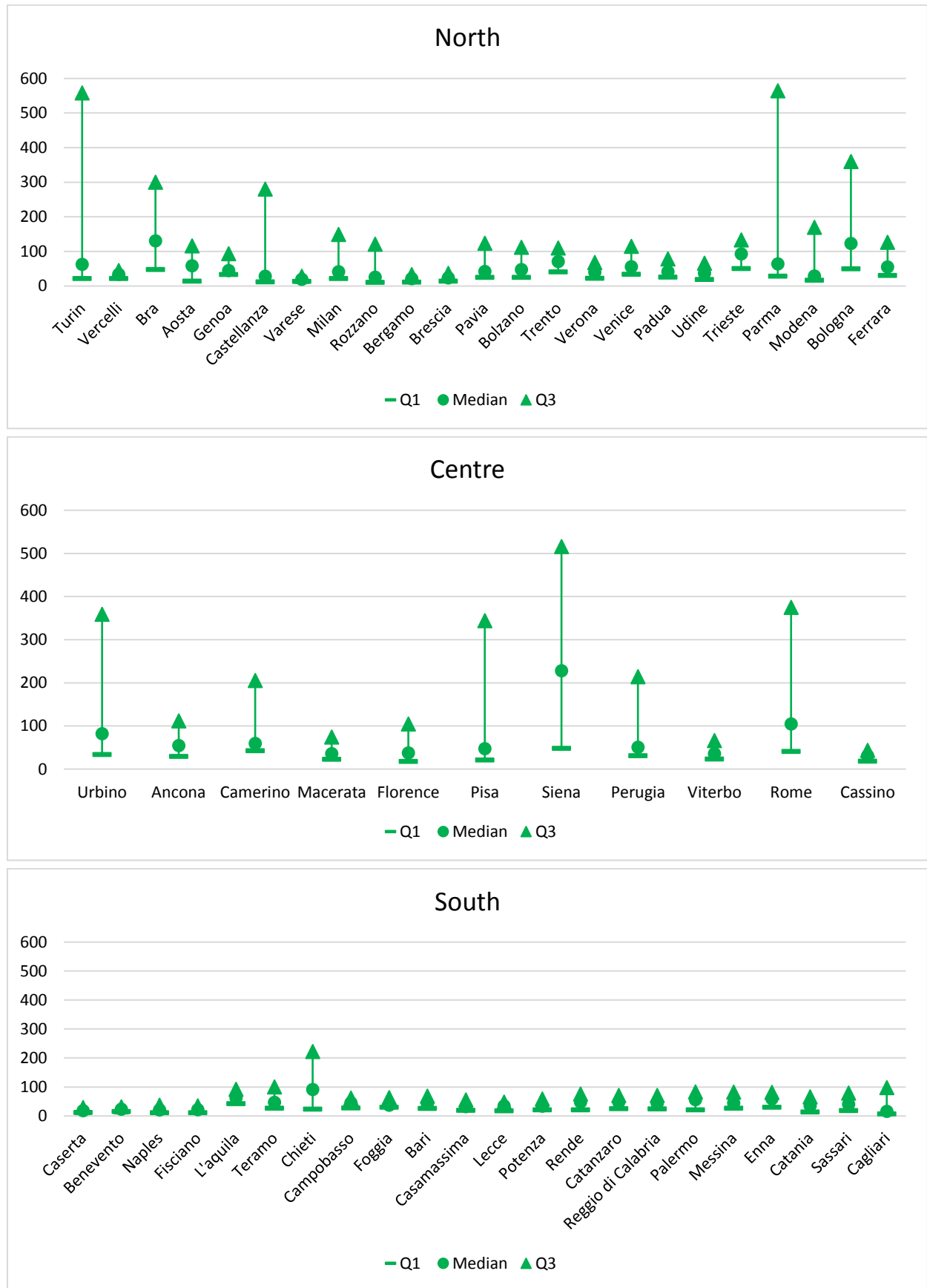Source: Daytime information system, 2016

Figure 5 shows the position indexes (first quartile, median and third quartile) of the distances between the place of residence and the University's municipalities seat, distinct for the cities of the North, the Centre and the South. Observing the figure, the distances travelled by students in a southern university city are generally shorter than those ones travelled by students who go to universities in some northern and central cities. This result is according to other empirical

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[19] Students of telematic universities have not been included in the information system as they are supposed to make occasional trips for study purposes.

[20] The cities with at least one course are more than two hundred.

evidences descripted in literature about this subject, so universities in the Centre and North are more attractive than those ones in the South, generating large flows along the North-South route.

Figure 5 – Indices of position (first quartile, median and third quartile) of the distances between the place of residence and the municipality seat of the University, by geographical area. University cities, December 2016.

Source: Daytime information system, 2016

Future developments

The data presented in the Experimental Statistics refer to December 2016. As in the meantime the data for the two following years are becoming available, an update of the attached statistical tables will be made as soon as possible.

Particular attention will be paid to the study of other dissemination methods, the search for additional indicators and other territorial aggregations.

Furthermore, the harmonization of the *Daytime Population* Information System with the Integrated Registers System (*Sistema Integrato dei Registri*) – SIR is in the planning stage. The SIR is expected to be fully operational on all thematic domains within the period 2020-2022.

For "Mobility for work/study", it is appropriate to clarify the meaning of the term in the present work. The administrative sources do not provide direct information on this phenomenon, as it happens with a survey with a questionnaire containing one or more questions addressed to a respondent, in respect of which the term "mobility" is generally used. However, with a few exceptions, between the place of residence/domicile and the place of work/study there is a distance that must be covered by making a "movement", which depending on the frequency with which it is made is part of daily mobility (commuting) rather than periodic mobility. The feasibility of inferencing the frequency of mobility (daily or periodic) using information such as the distance between place of origin and place of destination is being studied.

Worker

For the purposes of the daytime population is an individual resident or non-resident who, according to the analysis of the administrative information available, is occupied on December.

Primary and secondary school student

For the purposes of the daytime population is an individual resident or non-resident who, according to the analysis of the administrative information available, is enrolled and attending a primary or secondary school.

University student

For the purposes of the daytime population is an individual who is enrolled at university level. Working students are counted in the universe of workers, assuming that their main activity is working.

Attraction index

The attraction index (I_ATTR) is the ratio between the flows entering the area and the total flows generated by the territorial domain in question. It quantifies the capacity of the territory to attract incoming flows.

$$I\_ATTR = \frac{Incoming\ dynamics}{Dynamics\ within\ the\ area + Incoming\ dynamics + Outgoing\ dynamics}$$

This index can be calculated both respect to the entire national territory and respect to its own area. For example, the attractiveness index for the Labour Market Areas (SLL) of Rome with respect to Italy is the ratio between the dynamics entering the SLL from the whole of Italy and the sum of the components: dynamics inside the SLL, dynamics entering from the whole of Italy and dynamics leaving with destination Italy. Instead, the attraction index for the SLL of Rome respect to its own area is the ratio between dynamics entering the SLL from another municipality of the same SLL and the sum of the internal dynamics of the SLL, the incoming dynamics from another municipality of the same SLL and the outgoing dynamics with destination to another municipality of the same SLL.

Self-containment index

The self-containment index (I_AutoCont) represents the capacity of an area to contain the population flows that it originates and therefore to satisfy the demand for study and work that is produced within it. It is the ratio between the number of movements within an area and those generated in the same area (flows that are exhausted within the area and flows that leave the area itself).

$$I\_AutoCont = \frac{Dynamics\ inside}{Dynamics\ within\ the\ area + Outgoing\ dynamics}$$

This index can also be calculated with reference to the specific area or to the entire national territory.

Coexistence index

The coexistence index (I_COE) is the ratio between the daytime population and the resident population in the territorial domain of interest. It quantifies the imbalance between the population using the territory and the resident population.

$$I\_COE = \frac{daytime\ population}{resident\ population}$$

Metropolitan City

The metropolitan city is one of the local authorities present in the Italian Constitution, in article 114, after the 2001 reform (Constitutional Law no. 3/2001). Law no. 56 of 7 April 2014 on "Provisions on metropolitan cities, provinces, unions and mergers of municipalities" regulates its establishment in place of the provinces as a large area body. The institution of the Metropolitan City is part of a more complex reform plan with which the Italian legislator has revised the local government system, the latter once again confirmed as a multi-level system, but with different representation for each individual institutional pole: on the one hand, the levels of government with direct representation, i.e. regions and municipalities, on the other hand, the levels with indirect representation, i.e. Provinces, Metropolitan Cities and Unions.

Labour Market Areas

Labour Market Areas (*sistemi locali del lavoro* - SLL) represent a territorial grid whose boundaries, regardless of the administrative articulation of the territory, are defined using the daily home/work travel flows (commuting) recorded during the general population and housing censuses. Since each Labour Market Area is the place where the population resides and works and where most of the social and economic relations take place, the home/work trips are used as a proxy for the existing relations in the territory[21].

Functional Urban Areas

The European Commission, in collaboration with the OECD, has developed a harmonised definition of a city, which enables it to collect comparable statistical information on cities at an international level. The European Commission and the OECD have established technical criteria on the basis of which cities and their *commuting zones*, i.e. commuting areas linked to them in a "functional" way, can be identified. The whole of a *core* city and its *commuting* zone therefore constitutes a territorial aggregate defined as a *functional urban area* (FUA) (Dijkstra and Poelman 2012). Functional urban areas are, therefore, constitute of a densely populated urban centre and a surrounding commuting zone, not necessarily contiguous, but closely integrated from an employment point of view with the former.

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[21] https://www.istat.it/it/informazioni-territoriali-e-cartografiche/sistemi-locali-del-lavoro.

REFERENCE LITERATURE

Monducci, R. (2019), Audizione dell'Istituto nazionale di statistica. Esame del disegno di legge C. 1698 recante Delega al Governo in materia di turismo.

Istat, Movimento turistico in Italia (2018), https://www.istat.it/it/archivio/224376.

Istat, Spostamenti quotidiani e nuove forme di mobilità (2018), https://www.istat.it/it/archivio/224469.

Basile, R., Girardi, A., Mantuano, M., Russo, G., (2017), "Interregional migration, human capital externalities and unemployment dynamics: evidence from Italian provinces" http://hdl.handle.net/10419/168560.

City of Melbourne. (2017) "Daily population estimates and forecasts".

De Angelis, I., Mariani, V., Torrini, R., (2017) "New evidence on interregional mobility of students in tertiary education: the case of Italy". Questioni di economia e finanza.

Dijkstra L., Poelman H. (eds.) (2012) "Cities in Europe. The new OECD-EC definition", Brussels: European Commission.

Faggian, A., Rajbhandari, I., Dotzel, K., (2017) "The interregional migration of human capital and its regional consequences: a review", Regional studies, 51:1, 128-143 DOI: 10.1080/00343404.2016.1263388.

Istat (2017), "Forme, livelli e dinamiche dell'urbanizzazione". Letture statistiche. ISBN: 978-88-458-1916-2 http://www.istat.it/it/archivio/1.

Statistics New Zealand, (2017), "Experimental population estimates from linked administrative data".

Vivio, R., (ed.) (2016) "Studenti e Bacini Universitari", Istat Letture Statistiche.

Istat, (2015) "La nuova geografia dei sistemi locali".

Salvucci, G., Abbate, C., (2015) "Densità demografica notturna e diurna". Conferenza ESRI ITALIA.

Istat (2014), "Gli spostamenti quotidiani per motivi di studio e di lavoro".

Vivio, R. (2014), "Il sottoprogetto sperimentale: popolazione insistente". In Garofalo: Il Progetto ARCHIMEDE obiettivi e risultati sperimentali. Istat Working Paper, 1/2014.

Eurostat, (2013), "Feasibility studies on the usually resident population and vital event". Working group on population statistics, Luxembourg.

Eurostat, "Statistics on commuting patterns at regional level" http://ec.europa.eu/eurostat/statistics-xplained/index.php/Statistics_on_commuting_patterns_at_regional_level.

Biagi, B., Faggian, A., McCann, P. (2011) "Long and Short Distance Migration in Italy: The Role of Economic, Social and Environmental Characteristics", 6:1, pp.111-131.

City of Melbourne. (2009) "Melbourne city users Estimates and Forecasts", 2004-2020 (di Silk. B., Bell, J.A.).

Istat (2009), "Atlante di geografia statistica ed amministrativa".

Palvarini, P., (2009) "Popolazioni nuove e forme dell'abitare".

Cristaldi, F., (ed.) (2003) "Le mille popolazioni metropolitane, un'analisi geografica dell'area romana", Centro Interdipartimentale di studi e ricerche sulla popolazione e la società di Roma.

Nuvolati, G. (2003) "Resident e Non Resident", The journal of regional analysis and policy, 33:2, pp. 67-83.

Gismondi, R (2002), "Un confronto tra metodi di identificazione di osservazioni outlier in indagini longitudinali finalizzate alla stima di una variazione: proposte teoriche e verifiche empiriche", in Statistica, LXIII, no. 2, 2002.

Martinotti, G. (1994) "New social morphology", UNESCO/MOST Wien, 10-12 February 1994.

Martinotti (1993), "Metropoli", Il Mulino, Bologna.

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