

Marche Region Census Section Classification in Residential Typologies

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Abstract

An experimental classification of Marche Region census sections into eight typologies has allowed the identification of five main macro-typologies: 1) urban areas, 2) rural areas, 3) transition zones between urban and rural areas 4) mountain zones, marginal agriculture, green areas almost completely lacking in population, 5) productive zones.

Keywords: Large data-sets, classification, census mapping

The aim of the research

With the General Population and Housing Censuses, the entire national territory is divided into elementary areas: the census sections (more than 380.000 elementary units for the 2001 census). These units, used initially for the purpose of managing census operations, assumed an information value which can be used for the detailed analysis of the territory starting from 1981 (Istat-Irpet 1986). Since 1991 their boundaries have been available in digital format (Napolitano 1999). In 2001 thematic and geometric quality was improved (Crescenzi et al. 2000).

This document shows the first results of a research carried out on the Marche region by a working group of statisticians and geographers¹ whose aim was to identify residential typologies in a region that shows great variety in its landscape. It was divided by the 2001 census into 13,337 sections. These spatial units were chosen as the context of our analysis. For data clustering, the classification method “k-means” (Fastclust procedure in SAS language) was used. The increased processing power of the available HW and SW (Vickers, Rees 2007) makes the application of the procedure to very large data sets possible. The decision has been made to apply the k-means method directly to statistical indicators selected without their reduction through methods such as the Principal Component Analysis. Pearson correlation coefficients analysis was used to avoid inclusion of highly correlated variables. Data already available were used without any ad hoc elaboration.

Forty indicators regarding the 2001 population and housing census were selected. Regarding population, thirty-two of them are divided into the following domains: age, civil status, educational level, labour force, employment, sectors of economic activity (residence based), commuting, family size, foreign residents. Such indicators were integrated with eight others related to housing and buildings. In order to identify areas with prevalent production characteristics, employee density (work place based) was also incorporated. The indicators were transformed in their natural logarithmic values and then divided by respective range values. For the selection of the number of clusters, the criteria assumed were: a) the minimization of the medium distance of the spatial units from the centre of the corresponding group, b) parsimony in the number of typologies to be characterized.

To make the presentation effective, the typologies have been grouped into four macro-clusters that we identify as urban, rural, transitional, and essentially not residential areas.

The Macro-clusters

Urban typologies

Typologies one and two can easily be characterized as urban (see Tables 1, 2 and 3). Both show a high density of population and employees. They include nearly 80% of the population in the region, but cover only 5% of the area. The two typologies differ in some characteristics. We can compare data on the buildings (Table 3): the medium number of buildings for the sections of typology one is equal to 9, that of two is 50, the percentage of buildings with four or more floors is equal to 51.1% for typology one and 10.4% for two. The latter is shaped as a complex of urbanized areas, zones of certain extension (on average of 10,6 hectares) where buildings with less than four floors prevail. The majority of the population, 67.0%, resides in this typology.

From a social point of view, typology two compared to typology one shows: a) a lesser ageing index, b) a superior percentage of labour force, 66.8% to 64.9%, c) a decidedly inferior percentage of high school and university graduates, d) a percentage of employed people (residence based) in industry nearly 13 points higher (42.3% vs. 28.7%). Typology one has a high percentage of employed people in the third sector, in particular Public Administration.

In the macro group of urban areas, typology three can also be included, which represents a rather limited portion of the area and the regional population (Table 1). The density of population is decidedly higher than the regional average, but lower than that of typologies one and two. It has, however, a rather elevated percentage of buildings with four or more floors, more than 40%. In comparison, the number of buildings per hectare is inferior by a factor greater than ten. The resident population is employed above all in the service sector, with nearly 17% working in Public Administration.

Rural typology

The typology that covers the majority of the territory of the Region is seven. It can be considered as the rural part of the Marche region. The average extension of its sections is over 260 hectares, the largest amount of all the typologies. More than 17% of the population resides there. The number of employees is close to 100 thousand units, nearly 17% of the total. These zones are characterized by a low density of population and employees, respectively 50 and 20 people per square kilometre (Table 1). The ageing index (Table 2) is slightly lower than the regional average. The percentage of high school and university graduates is lower than the regional average and significantly different from that of the urban areas. A large percentage of agricultural employment characterises this area, when compared to the regional average. The majority of the labour force is employed in Industry. Despite the high number of buildings per section, 150, the number per hectare is inferior to 14. This can help forming an image of a rural environment which has many jobs and a rich social life, but maintains the characteristics of an agricultural landscape.

Transition zones

In some aspects, typologies four and eight have similar characteristics. These are areas of limited extension, between three and nine percent of the regional surface. Both have a low population density (especially typology eight). The population and employee density is between 25 and 50 persons per square kilometre. The percentage of occupied dwellings is 57.0% for both typologies. The number of buildings per section and hectare is similar: 13 and 9, 20.8 and 17.1, respectively for typologies four and eight. The majority of buildings are used for housing: 84.2% for typology four, 78.4% for typology eight; slightly inferior to the regional value of 88.5%. There are however some indicators of the population characteristics that clearly distinguish the two typologies. The percentage of high school and university graduates are much lower in zone four than in eight: 2.4% and 17.3% compared to 13.5% and 28.9%. A marked difference can also be found for the indicators regarding the percentage of employed persons in economic activities (residence based): a strong presence of Industry workers in typology four, an elevated percentage of workers in the Service sector for zone eight, 80.8%, of which 23% in the field of Commerce, Hotels, Restaurants and 19.8% in Public Administration.

Non residential typologies

Typologies five and six, have the characteristic of being sparsely populated areas in common. However these are completely different areas from the point of view of other characteristics. Typology five has a significant number of employees, 6.6% of the total, while it is spread over a rather limited surface, 0.6% of the region (Table 1). This typology can be identified as almost exclusively production areas, even if in this phase of research we cannot identify specific productive functions. The low percentage of buildings intended for habitation, equal to 19.7%, seems to support this theme.

Typology six includes a limited number of inhabitants, 2.279, but extends over a large part of the region, 19.5%. The small population is characterized by an ageing index greater than 1,000, and a percentage of employed people in agriculture that borders on 50% (Table 2). The area is spread generally over mountain zones, sometimes characterized by marginal agricultural use. Green urban areas missing a majority of indicators are sometimes included in it.

Table 1 Principal aspects of dimension and density - Census 2001

Typology	Section Numbers	Areas %	Hectares per section	Population	Population %	Employees (work place based)	Inhabitants per section	Population per Km ²	Employees per Km ² (work place based)
1	1.260	0,3	2,0	184.756	12,6	49.160	147	7.187	1.912
2	4.097	4,5	10,6	985.901	67,0	342.153	241	2.261	785
3	375	0,3	6,5	6.985	0,5	10.428	19	286	427
4	1.289	8,5	64,3	28.011	1,9	23.236	22	34	28
5	422	0,6	13,4	472	0,0	38.316	1	8	676
6	1.025	19,5	185,0	2.279	0,2	5.612	2	1	3
7	2.310	63,4	266,6	254.175	17,3	95.313	110	41	15
8	559	2,9	50,9	8.002	0,5	14.055	14	28	49
Region Marche0	11.337	100,0	85,6	1.470.581	100,0	578.273	130	151	60

Table 2 Some indicators of the characteristics of the population - Census 2001

Typology	Ageing index	Labour Force%	Degrees %	Diplomas %	Agriculture Employment (residence based)	Industry employment (residence based)	Service sector (residence based)		
							total %	Hotel Restaurant Business %	PA %
1	179	64,9	11,6	31,8	1,9	28,7	69,3	19,6	9,8
2	163	66,8	7,8	27,2	2,5	42,3	55,1	19,1	6,5
3	229	65,0	9,0	29,7	2,0	33,9	64,1	18,4	16,6
4	321	64,4	2,4	17,3	12,9	56,9	30,2	11,5	4,7
5	258	68,1	18,1	37,9	6,0	15,0	79,0	13,3	17,2
6	1.188	44,7	2,5	9,1	49,4	19,3	31,3	11,7	4,8
7	164	69,2	4,1	20,0	15,6	46,7	37,7	14,7	3,9
8	339	62,7	13,5	28,9	7,0	12,3	80,8	23,1	19,8
Region Marche	169	66,9	7,6	26,3	5,0	41,5	53,5	18,3	6,5

Table 3 Some housing and building indicators – Census 2001

Typology	Occupied dwellings %	Average surface m ²	Buildings per section	Buildings per hectare	Buildings used as habitations %	Buildings 4 floors or more %
1	85,8	93,1	9	439,6	91,2	51,1
2	83,2	97,5	50	470,1	86,8	10,4
3	65,0	81,2	2	37,1	70,8	40,8
4	57,0	88,7	13	20,8	84,2	1,2
5	25,2	66,9	2	21,6	19,7	2,1
6	32,7	82,5	6	1,7	85,1	0,9
7	77,8	109,5	150	13,6	95,2	1,2
8	57,0	99,6	9	17,1	78,4	3,2
Region Marche	81,2	98,4	29	33,7	88,5	8,7

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