

1 **Patterns of Sprawl: The Socioeconomic and Territorial**
2 **Profile of Dispersed Urban Areas in Italy**

3
4 **ABSTRACT**

5
6 The debate on causes and consequences of urban sprawl has not lead to a
7 widely accepted interpretative framework so far. However, to formulate
8 effective sustainable development policies, a comprehensive analysis of
9 sprawl is becoming more and more urgent in Europe. Through an exploratory
10 data analyses of the spatial distribution of 132 indicators (regarded as
11 socioeconomic and environmental factors of urban sprawl) in 8100 Italian
12 municipalities affected by different levels of settlement dispersion, this study
13 discusses place-specific factors which depend on the socioeconomic context
14 and lead to diverging models of sprawl throughout the country. The
15 illustrated methodology produces an informative base possibly supporting
16 urban containment and sustainable development policies in 'sprawling'
17 regions.

18
19 **Keywords:** Exurban development, Economic Structure, Social dynamics, Sprawl,
20 Italy.

21
22 JEL classifications: O18, P25, Q56, R14

INTRODUCTION

Massive urbanization and population growth have been observed for more than one century at the global scale (HALL, 1997a; COHEN, 2006; ANGEL *et al.*, 2011). Continuous urban expansion at higher rates than population growth has resulted in suburbanization processes in developed and developing countries (COUCH *et al.* 2007; YUE *et al.* 2013), thus fragmenting rural space, consuming fertile soils and increasing the demand for transport and energy (BURCHELL *et al.*, 2000). Residential urban sprawl, allowing people larger living space (i.e. single-family detached houses with private gardens), seems to be the preferred settlement pattern in affluent areas, where citizens' rights extend to housing choices (BRUEGMANN, 2005). Besides, non-residential sprawl could be 'a deliberate planning result to encourage low-density industrial investments' (YUE *et al.* 2013) and a 'short-cut to economic growth', fostering territorial competitiveness (CHORIANOPOULOS *et al.*, 2014). Due to new information technologies and auto-oriented development, market forces 'naturally' shape sprawled urban forms and, according to advocates of free market, sprawl represents the only possibility for cities to thrive (GORDON and COX, 2012).

However, the growth of dispersed and low-density urban areas creates negative (i) environmental, (ii) social and (iii) economic impacts for cities and the surrounding rural regions. These include, among the others, (i) conversion of rural and forested land to urban uses, ecosystems fragmentation, declining stocks of natural resource, 'ugliness' of the landscapes subject to sprawl; (ii) income and racial segregation of neighbourhoods, job and housing mismatch, weakened sense of community, even human health problems; (iii) increased reliance on private car transportation, increased costs or reduced coverage of public utilities for citizens, increases in energy demand, and socioeconomic divisions (GALSTER *et al.* 2001; CAMAGNI *et al.* 2002; RICHARDSON and CHANG-HEE, 2004; BRUEGMANN, 2005; PACIONE, 2005; CHORIANOPOULOS *et al.*, 2014).

1 Thus, sprawl definitely represent a threat to sustainable development.

2 Suburbanization and urban sprawl processes initially received major attention in North
3 America, where the phenomenon first appeared with great intensity in the early decades
4 of the 20th century. During the last century, however, urban sprawl was gradually
5 becoming a global issue, both for developed and emerging countries. A distinction
6 between suburbanization and sprawl should be made at this point. While
7 suburbanization refers to population movements and the (partial) densification of
8 already urbanized areas closer to inner cities, sprawl processes are reflected in land-use
9 change (from rural to urban) producing a dispersed, low-density patch expansion of
10 urban areas implying little or ineffective planning control of land subdivision (COUCH *et*
11 *al.*, 2007).

12 In Europe, although artificial cover accounts for 4% of the continental land, urban areas
13 increased by more than 3% between 2000 and 2006 and discontinuous settlements grew
14 four times faster than continuous urban areas (EUROPEAN ENVIRONMENT AGENCY, 2006).
15 The European Commission manifested in the early 1990s its concerns for urban
16 diffusion within the continent, as this negatively contributes to the achievement of a
17 truly sustainable development (FALUDI, 2006). As concerns regarding urban sprawl
18 grow, the need for an accurate analysis of the phenomenon in the European context is
19 becoming increasingly urgent for the formulation of efficient territorial policies (HASSE
20 and LATHROP, 2003).

21 Contrasting orientations towards urbanism can be found between northern and
22 southern Europe (e.g. CHAMPION, 2002; GUEROIS and PUMAIN, 2002; HAAG, 2002). In the
23 Mediterranean region, taken as a paradigmatic case of self-contained city's expansion, a
24 pro-urban ideology can be observed since very early times, which identifies the city
25 with progress and civilization, while the countryside was synonymous of poverty,
26 ignorance and economic backwardness (LEONTIDOU, 1996). From the morphological
27 perspective, urbanization in Mediterranean Europe was traditionally characterized by

1 compact forms and dense settlements (KASANKO et al., 2006; CATALÀN et al., 2008;
2 SCHNEIDER and WOODCOCK, 2008; CHORIANOPOULOS et al., 2010). In past decades,
3 Mediterranean areas have undergone widespread land-use transformations driven by
4 urbanization, including industrialization sometimes coupled with agricultural
5 intensification or depopulation with economic marginalization and the consequent
6 abandonment of rural areas.

7 More recently, however, a subtle form of urban diffusion reflecting sprawl processes
8 has been recorded especially around the largest cities, along the Mediterranean coasts
9 and in agricultural-specialized flat areas, even with different characteristics (lower
10 degree of decentralization, higher degree of a mixed use of land) from northern Europe
11 (ARRIBAS-BEL *et al.*, 2011). This process was largely driven by changes in the
12 socioeconomic context, such as accession to the European Community (LEONTIDOU and
13 MARMARAS, 2001) and strongly impacts the way the land is being used (HUBACEK and
14 VAN DEN BERGH, 2006).

15 The present study was devoted to assess the importance of sprawl's drivers by
16 comparing the territorial and socioeconomic characteristics of areas affected by various
17 levels of urban diffusion. To profile the areas experiencing sprawl processes from the
18 socioeconomic and environmental perspectives is a deserving research issue which
19 allows evaluating the influence of both external and internal variables to the urban
20 system (e.g. institutional, social, cultural and political changes, evolution of the
21 economic structure). Although recent studies have tried to address this original and
22 multifaceted issue (e.g. ROUX and VANIER, 2006), more investigation focusing on the
23 local scale is particularly needed.

24 Basically, research has dealt with defined geographic contexts and the description of the
25 socioeconomic conditions supposedly to influence urban sprawl was based on a
26 restricted number of indicators made available on the regional scale (e.g. PATACCHINI

1 and ZENOU, 2009). In view of the particular urban forms, the complexity of the processes
2 of suburbanization, the pervasiveness of planning-deregulated settlement expansion,
3 and the divergent socio-economic characteristics (LEONTIDOU, 1990), further research on
4 the Mediterranean region is necessary to understand the intimate connections between
5 the factors underlying sprawl.

6 Rather than differentiate recent development from inherited structures, the novelty of
7 the present study lies in the research framework based on a 'holistic' and multi-
8 dimensional approach supported by exploratory data analysis. The following section
9 describes the study area, the data and the statistical methods used for the analysis. More
10 than 130 indicators covering Italy on the municipal scale and investigating 17 research
11 dimensions have been considered. The third section presents the results of descriptive
12 statistics, multivariate and discriminant analysis. The discussion in the fourth section
13 points out the indicators discriminating between diffused and compact urban areas and
14 comments on different socioeconomic profiles at the base of the Italian sprawl 'models'.
15 Conclusions about the study performed and some policy indications are provided in the
16 fifth section. The research results might be illustrative for sprawl in other southern
17 European countries.

18

19

METHODOLOGY

20

Study area

22 Italy is a Mediterranean country extending for 301,330 km² and composed of nearly 23%
23 flat areas, 42% hilly areas and 35% mountainous ones. The partition into three
24 geographical divisions (North, Centre and South) reflects the socioeconomic divide still
25 observed in the country. In view of its diverging development path between the northern
26 and the southern regions of the country, Italy represents a paradigmatic case study in
27 southern Europe. While the growth of central and (mainly) southern Italy's urban system

1 was centred, for a long time, on few urban poles (e.g. Rome, Naples, Bari, Palermo,
2 Cagliari) characterized by compact and dense settlements, northern Italy, and especially
3 the 'megalopolis of the Po valley' ['La megalopoli padana'] as TURRI (1999) defined it,
4 had experienced one of the most rapid morphological changes observed in Europe, with
5 the uneven landscape transformation of flat areas into low-density, dispersed
6 settlements progressively further away from the main cities. By extending well beyond
7 the industry-service dichotomy, the north-south divide in Italy reveals its wide-range
8 impacts on urban forms and settlement characteristics, and involves processes of both
9 economic and social origin working on different scales, from national to local (BONAVERO
10 *et al.*, 1999). The polarization in a 'polycentric' and a 'mono-centric' urban system, as it
11 was respectively observed in northern and southern Italy, has been used here to contrast
12 different socioeconomic contexts influencing sprawl on the local scale.

13 Northern Italy, encompassing the Italian tract of the "blue banana" area of the most
14 developed regions in Europe, occupies the Po basin valley, with flat areas extending
15 through the 35% of its territory while the remaining 65% of the land being hilly or
16 mountainous. The regional urban system is polycentric with one city-region of more than
17 5 million inhabitants (Milan in Lombardy), one urban agglomeration with more than 1
18 million inhabitant (Turin) and several other cities with more than 500 thousand
19 inhabitants (including Genoa, Bologna, Venice and Trieste). Central Italy, separated from
20 northern Italy by the Apennines, is a polarized region with a marked urban-rural divide
21 and two main cities (Rome and Florence), with only 9% of flat land. Southern Italy,
22 including the main islands of Sicily and Sardinia, is an economically-disadvantaged region
23 with a productive structure centred on low- and medium-income agriculture and
24 traditional tertiary activities (including constructions, commerce and the public sector)
25 concentrated in the main urban centres (Naples, Bari, Palermo and Cagliari). Here, flat
26 areas account for the 18% of the whole territory. Apart from the economic polarization in

1 southern and northern regions, Italy shows important disparities in population density,
2 settlement form, agricultural intensity and natural resource endowments (SALVATI and
3 ZITTI, 2008).

4

5 *Methodological framework*

6 The causes and consequences of urban sprawl have long been debated in recent years
7 without producing widely accepted interpretation schemes (BRUEGMANN, 2005). As the
8 result of the complex actors' system, a multifaceted stratification of immediate and
9 underlying causes can be seen as influencing (and in turn influenced by) urban sprawl
10 in southern Europe (SALVATI *et al.*, 2013a). Linear and hierarchical approaches should be
11 avoided in a socioeconomic context, such as the Mediterranean region, characterized by
12 informality and deregulated planning, weak public policies and strong private interests,
13 fragmentation of land property and real-estate speculation (BAILLY *et al.*, 1996).
14 Following COUCH *et al.* (2007), an interpretative framework centred on the 'syndrome'
15 approach was developed in the present study with the aim of exploring the
16 fragmentation and multi-dimensionality of the Mediterranean urban reality (LEONTIDOU,
17 1990).

18 Based on the study of several interconnected causes analysed without hierarchical
19 causality, this approach tries to capture the complexity of processes and aspects of
20 urban life leading to sprawl in multicultural and rapidly changing societies. The
21 possible causes of urban sprawl are intended as economic, social and environmental
22 variables among which the most relevant are: (i) the composition of the urban economy
23 by activity sector and its spatial rearrangement towards a more scattered organization,
24 (ii) shifts in the location of the economic activities due to changes in land prices, (iii)
25 changes in personal income and spending patterns, (iv) infrastructures and accessibility,
26 (v) the structure of the labour market and its changes over time, (vi) demographic and
27 household changes, (vii) migration, segregation and filtering processes, (viii) changes in

1 lifestyle and behaviours, (ix) public regulations (e.g. taxes, subsidies, land-use planning,
2 housing policies), (x) a poor quality of the socio-environmental context and (xi) the
3 economic viability of the agricultural sector. The illustrated factors can be quantified
4 through indicators allowing for an objective assessment of the territorial contexts
5 favouring urban diffusion and for an integrated analysis of sprawl patterns and
6 processes (LONGHI and MUSOLESI, 2007).

7

8 *Assessing dispersed urbanization*

9 The surface area of dispersed settlements in each Italian municipality has been derived
10 from Corine (COoRdinate INformation on the Environment) Land Cover (CLC) 2000
11 cartography using the 'intersect' and 'zonal statistics' tools provided with ArcGIS
12 software (ESRI Inc., Redwoods, USA) after the overlap between the CLC map and the
13 shapefile representing the municipal boundaries. The 'zonal statistics' procedure
14 determines the surface area of each land-use class belonging to the analysed spatial unit
15 (the Italian municipalities). The CLC project was aimed at providing pan-European land-
16 cover maps and was co-ordinated by the European Environment Agency (EEA). The CLC
17 inventory is based on satellite images as the primary information source. The choice of
18 scale (1:100.000), minimum mapping unit (25 ha) and minimum width of linear elements
19 (100 m) for CLC mapping represents the trade-off between production costs and land
20 cover information details (SALVATI and BAJOCCO, 2011). The approach of computer-
21 assisted visual interpretation of satellite images was chosen as the CLC mapping
22 methodology. Geospatial information were validated in the field according to sampling
23 procedures (EUROPEAN ENVIRONMENT AGENCY, 2012).

24 The standard CLC nomenclature includes 44 land cover classes with 11 classes
25 describing urban uses of land. Urban areas in the CLC legend (class 1 at the first
26 hierarchical CLC level) include continuous and discontinuous residential urban fabric,

1 industrial and commercial units, infrastructural networks, construction, mine, dump
2 sites and green urban areas. According to the relevance of the settlement patterns (i.e.
3 continuity/discontinuity) dimension in the definition of sprawl (GALSTER *et al.*, 2001,
4 JAEGER *et al.*, 2010), the class labelled '112' ('discontinuous urban fabric') was regarded as
5 the dependent variable for the purposes of this study. This class comprises sealed land
6 with vegetation and bare soil occupying a discontinuous but relatively large area. In
7 order to classify the 8100 Italian municipalities according to the degree of dispersed
8 settlements, the percent land occupied by the '112' CLC class to the total municipal surface
9 area was used as the grouping variable. Municipalities have been classified into one of
10 three groups (1 - low urban diffusion: < 1%, 2 - moderate urban diffusion: 1 - 5% and 3 -
11 large urban diffusion: > 5%) based on inspection of this variable's statistical distribution
12 (average value approaching 5%) and evidence from previous studies (EUROPEAN
13 ENVIRONMENT AGENCY, 2006; KASANKO *et al.*, 2006; TUROK and MYKHENKO, 2007;
14 SCHNEIDER and WOODCOCK, 2008).

15 Other four variables have been computed in order to provide a description of urban form
16 and settlement characteristics in Italy (population density, percentage of urban areas to
17 total municipal surface, percentages of continuous and discontinuous urban fabric to the
18 total urban area). Although the grouping variable and the four supplementary indicators
19 selected in the present study cannot provide an exhaustive description of the
20 characteristics of the Italian urban system, they allow for a comprehensive assessment of
21 the morphological traits of urban settlements on a spatial scale which is compatible with
22 the aim of the present study.

23 24 *Social, economic and environmental indicators*

25 The variables used in the present study have been made available on the municipal scale
26 (8100 administrative units in Italy) from data provided by official statistical sources
27 (mainly from censuses carried out by the Italian National Statistical Institute [ISTAT] in

1 2000 or 2001). Variables were classified within six themes and 17 research dimensions (see
2 Appendix 1). For each Italian municipality, a total of 132 indicators has been calculated
3 from the collected variables (see Appendix 2). As pointed out by SARZYNSKI *et al.* (2014) in
4 their analysis of which socioeconomic and geographic factors most strongly differentiate
5 among land use patterns, 'these variables were selected based on their intuitive appeal
6 and intrinsic interest'. In particular, in the present study the selection of variables and data
7 sources, the procedure for the construction of indicators, and the identification of the
8 thematic dimensions adequate to describe the socioeconomic and territorial context
9 possibly influencing sprawl processes on the local scale have been set up according to
10 COUCH *et al.* (2007). Although the indicators selected in the present study should be
11 considered as giving a partial outlook of the socioeconomic local contexts of Italy, they
12 provide a broad qualification of the economic structure, social traits and environmental
13 characteristics observed in the Italian municipalities. All selected indicators are easily and
14 freely available from national statistical sources and regularly updated through time
15 (ISTAT, 2006).

16

17 *Statistical analysis*

18 Descriptive statistics of the selected indicators have been calculated using
19 three geographical divisions (northern, central and southern Italy) and the
20 three classes of urban diffusion as described in paragraph 2.3. A Kruskal-Wallis
21 non-parametric ANOVA was carried out separately for each indicator in order to test if
22 significant differences in the indicator's distribution exist according to the degree of
23 urban diffusion. Significance was set up at $p < 0.05$ after Bonferroni's correction for
24 multiple comparisons. A Principal Component Analysis (PCA) was undertaken on the
25 data matrix described in paragraph 2.4 in order to summarize the latent factors
26 describing the local socioeconomic contexts in Italy. As the PCA was based on the

1 correlation matrix, the number of significant axes (m) was chosen by retaining the
2 components with eigenvalue > 3. The Keiser-Meyer-Olkin (KMO) measure of sampling
3 adequacy, which tests whether the partial correlations among variables are small, and
4 Bartlett's test of sphericity, which tests whether the correlation matrix is an identity
5 matrix, have been used in order to assess the quality of the PCA outputs. These tests
6 indicate if the factor model is appropriate to analyse the original data. Municipalities
7 have been mapped into different groups based on their score on the two most important
8 principal components.

10 RESULTS

12 *Descriptive statistics*

13 A preliminary analysis of the territorial characteristics of areas experiencing a
14 different degree of urban diffusion in the three geographical divisions of Italy
15 is reported in Table 1. Nearly the 30% of the Italian municipalities developed
16 discontinuous settlements for more than 5% of the total municipal area
17 (hereafter called 'sprawl' municipalities), with the highest value observed in
18 northern Italy (41%). These municipalities cover only the 17% of the country
19 surface concentrating the 61% of Italian population. More than 75% of
20 northern Italy population lives in 'sprawl' municipalities with a drastic decline
21 in southern Italy (43%). The average growth rate of population is positive in
22 'sprawl' municipalities.

23 **insert table 1 here**

24 'Sprawl' municipalities developed primarily on flat areas (52% on the whole
25 country, with values ranging from 33% in southern Italy to 67% in central
26 Italy) with a percentage of sealed land to the total municipal area averaging
27 18%. Diffused settlements have been found associated with a high proportion

1 of continuous urban areas in southern Italy only, while the proportion of
2 discontinuous urban fabric to total sealed land was high (81%) and relatively
3 stable in all geographical divisions of Italy.

4 The spatial distribution of discontinuous settlements is shown in Figure 1
5 together with ancillary indicators characterizing the Italian urban system. The
6 analysis of these variables pointed out the influence of the north-south divide
7 (compact settlements concentrated in southern Italy), elevation (high
8 population density recorded in lowlands) and coastal-inland gradient (higher
9 proportion of discontinuous urban fabric observed along the coastal rim) on
10 the morphology of urban settlements in Italy.

11 **insert figure 1 here**

12

13 *Multivariate analysis*

14 Results of the Principal Component Analysis carried out on the matrix
15 composed by the 132 indicators made available for 8100 Italian municipalities
16 are reported in Table 2. The Keiser–Meyer–Olkin measure of sampling
17 adequacy and Bartlett’s test of sphericity ($p < 0.001$) indicate the
18 appropriateness of the selected model. PCA extracted four axes with absolute
19 eigenvalue > 3 which account for a cumulated variance of more than 33%. This
20 represents a high proportion of variance if compared with the huge number of
21 input variables. However, indicators' loadings $> |0.6|$ were observed for
22 components 1 and 2 only. Components 3 and 4 resulted to be poorly associated
23 with the investigated variables since the observed loadings were, on average,
24 lower than $|0.15|$.

25 **insert table 2 here**

26 Component 1 extracted the 13% of the total variance and is mainly associated

1 with labour market variables (L1-L8), level of education (F6), population
2 structure (P6), industrial specialization (S6), disposable income, revenues from
3 local taxes and other wealth indicators (Q2, Q8, Q11), together with the
4 elevation gradient (E9). Component 2 accounted for the 10% of the total
5 variance and represents a land-use/population gradient associated with the
6 agricultural intensity index (N4), the proportion of cropland on total
7 municipal surface (E2), the percentage of pasture and meadows to the total
8 cultivated area (M4), the average number of components per family (P2) and
9 the unemployment index (L3).

10 The analysis of the PCA scores by municipality (Figure 2) indicates component
11 1 as representing the north-south divide based on labour market structure,
12 level of income and population dynamics variables, as well as the elevation
13 gradient. Component 2 discriminates urban areas from agricultural-specialized
14 districts and natural landscapes based on elevation and coastal-inland
15 gradients together with minor factors important at the local scale only. A
16 specific analysis was developed to identify the socioeconomic and
17 environmental indicators discriminating municipalities respectively with low
18 and high proportion of discontinuous settlements in the three divisions of
19 Italy.

20 **insert figure 2 here**

21

22 *Discriminating 'sprawl' municipalities based on socioeconomic and environmental indicators*

23 Values of the 132 selected indicators by geographical division of Italy were tested for
24 significant differences between municipalities with high and low proportion of
25 discontinuous urban areas. Based on the non-parametric Kruskal Wallis Analysis of
26 Variance (H statistic), Figure 3 ranked the twenty indicators that allowed for the highest
27 discrimination between the two groups of municipalities.

1 **insert figure 3 here**

2 The first four indicators in the ranking (percentage of urban areas, U1; population
3 density, C3; workers density for km², S2 and agricultural utilized area per worker, N3)
4 discriminate between municipalities with high and low proportion of discontinuous
5 urban areas in all divisions of Italy. They represent indicators traditionally used to
6 describe the urban system at the local scale (i.e. U1 and C3) or directly/indirectly
7 associated with the urban-rural gradient (i.e. S2 and N3). Even if less important in the
8 statistical analysis, other five indicators (P3, P4, and P6: all describing the structure of
9 population with special regards to ageing phenomena, together with total resident
10 population, C1 and crime intensity index, D1) clearly identify 'sprawling' municipalities.
11 These findings indicate the existence of factors characterizing suburban areas
12 throughout Italy linked to both the functional characteristics (density of resident and
13 working population, agricultural specialization, population structure and ageing, crime
14 intensity) and the morphological traits of the area (e.g. population distribution, the
15 extent of sealed land).

16 Statistical analysis also suggests that municipalities with a different proportion of
17 discontinuous urban areas show a quite diverging socioeconomic and environmental
18 profile in the three Italian divisions. In northern Italy, 'sprawl' municipalities featured
19 an higher proportion of non-occupied houses (U6), a lower density of workers in the
20 public sector (S14), higher levels of per-capita income tax (Q8), a lower proportion of
21 population living in scattered houses (U4), a lower level of stores per inhabitants (T7), a
22 higher number of components per family (P2), a higher rate of employees on total
23 workers (L9) and higher densities of temporary workers (L12 and L14) compared to
24 municipalities developing a low proportion of discontinuous urban areas.

25 'Sprawl' municipalities in central Italy featured a significantly lower percentage of
26 workers in the primary sector (H1), higher savings levels (Q3, Q5 and Q6), a lower

1 proportion of population living in scattered houses (U4) and a higher activity rate (L1)
2 than the rest of municipalities belonging to that region. Finally, 'sprawl' municipalities
3 in southern Italy showed a significantly higher rate of population growth (P1) and
4 average family size (P2), a lower average size of farms (A3), a higher index of economic
5 marginality of farms (R9), a higher percentage of perennial crops (M3), a higher
6 proportion of total irrigated land (N2, R8), a lower proportion of pastures and
7 woodlands (M4, E3) and higher crop intensity (N4) compared to the other municipalities
8 of the region.

10 DISCUSSION

11
12 The present study investigates factors of urban sprawl in different Italian socioeconomic
13 contexts, taken as representative cases for southern Europe. By using exploratory
14 multidimensional and spatial data analysis applied to indicators covering the whole
15 country at a detailed geographical scale, the illustrated procedure allows integrated
16 socioeconomic and environmental assessment of urban expansion processes on the local
17 scale with a national coverage. This approach could be potentially useful to identify
18 local policies aimed at mitigating the unwanted effects of urban sprawl. The use of a
19 high-resolution spatial partition with homogeneous national coverage (i.e.
20 municipalities), together with multidimensional procedures, is a relatively novel
21 approach in the analysis of urban dispersion. A detailed investigation on this topic is
22 also rather timely, given that southern Europe is now experiencing a period of rapid
23 transition from a system led by compact and mono-centric cities to a more dispersed
24 network of urban poles (CHESHIRE, 1995; EUROPEAN ENVIRONMENT AGENCY, 2006;
25 KABISCH and HAASE, 2011). This development model is affecting areas further away
26 from the major urban centres and may influence urban competitiveness, land quality,
27 social structures and natural resource distribution (COUCH *et al.*, 2005).

1 A number of indicators was considered in this study to interpret the non-linear
2 relationships among drivers of urban dispersion. The picture is complicated by the
3 unpredictability of territorial actors' behaviour which is focused on decision variables
4 in turn influenced by broader forces. In agreement with previous studies (BOURNE, 1996;
5 BURCHELL *et al.*, 2000; COUCH *et al.*, 2007), the analysis presented here emphasizes the
6 role of social, demographic, economic and environmental factors affecting urban
7 diffusion.

8 Due to rapid changes in societies and modifications in the economic structures with
9 impact on the spatial organization of the entire region (GIANNAKOURE, 2005), the
10 geography of Mediterranean Europe progressively changed in the last decades as far as
11 income level and distribution, population density, infrastructure and land-use are
12 concerned (ALLEN *et al.*, 2004). However, the intensity of regional disparities remained
13 high in Italy and confirms the influence local contexts have on urban diffusion processes
14 and the importance of empirical research carried out on that spatial scale (BONAVERO *et*
15 *al.*, 1999).

16 Results of the present study identify different models of sprawl in the Italian regions (a
17 synopsis is provided in Table 3), and highlight the role of both 'structural' factors
18 (associated with suburbanization processes all over Italy) and 'place-specific' variables
19 associated with the socioeconomic local context. On the one hand, structural factors are
20 directly (or indirectly) associated with the urban-rural gradient and impact sprawl by
21 producing areas with functional characteristics similar to those found in consolidated
22 urban centres. On the other hand, place-specific factors are depending on the
23 socioeconomic context found in each examined region and lead to diverging models of
24 sprawl throughout the country.

25 **insert table 3 here**

26 Discontinuous settlements in northern Italy are characterized by specific demographic

1 and social traits (families of the middle-high class with four or more components)
2 reflected in selected economic (higher disposable income) and labour market indicators
3 (prevalence of employees in the private sector together with the increasing importance
4 of 'temporary workers' and 'consultants' in advanced tertiary sector, which can be
5 considered as the expression of an evolving labour market in mature polycentric
6 regions). These functional characteristics in turn reflect morphological features
7 (topography, accessibility, distance from compact urban centres), and are often
8 associated with the diffusion of second-homes mainly in tourism-specialized districts.
9 The one observed in northern Italy represents a model of suburbanization typical of the
10 most developed and economically-dynamic regions of Europe (SCHWARZ *et al.*, 2010;
11 HAASE and TOTZER, 2012; KROLL and KABISCH, 2012). Here, sustainable planning policies
12 should control unhindered sprawling and stimulate compact and semi-dense
13 polycentric patterns of urban development (CAMAGNI *et al.* 2002)

14 In southern Italy the 'sprawl model' identified in this study was based on the proximity
15 of discontinuous settlements to the main urban poles and the concentration of
16 population (high density and positive growth rate). Both factors represent
17 suburbanization as a process of progressive densification of areas surrounding compact
18 and dense cities. These findings may explain the importance of the land-use variables
19 associated with the urban gradient: in fact, discontinuous settlements developed in
20 areas where the primary sector is economically weak, with small-size and mainly
21 disadvantaged farms. These are the typical traits of peri-urban agriculture observed on
22 the fringe of several Mediterranean cities (SALVATI *et al.*, 2013a). Finally, the 'sprawl
23 model' found in central Italy incorporates characteristics *in between* the two models
24 described above but maintains functional traits (affluent population especially formed
25 by retired workers together with high activity rate and a considerable proportion of
26 population living in scattered rural houses) linked to the specific characters of the
27 region (low-density rural areas close to medium-size cities, medium-low accessibility

1 due to the rugged terrain, population ageing, a polarized economic structure in
2 manufacturing districts and large cities).

3 The analysis of the three models of sprawl points out the importance of socioeconomic
4 disparities in shaping the recent development of the Italian urban system (BONAVERO *et*
5 *al.*, 1999). Regional disparities reflecting economic polarization, gaps in population
6 density, social divisions and unequal distribution of natural resources, inherently push
7 the three models of sprawl towards new development paths. This also suggests a
8 causality link between spatially-balanced sustainable development and suburbanization
9 processes that should be clarified through in-depth quali-quantitative approaches
10 carried out at various investigation scales, from the regional to the supra-national level.

11 How the most recent socioeconomic trends observed in southern Europe will shape the
12 future development of the three 'sprawl models' is a matter for future research. Two
13 (supposedly relevant) examples include: (i) the 'housing boom' observed in southern
14 Europe during the early and mid-2000s which determined an uneven urban expansion
15 due to speculation, second-home and tourism development with drastic changes in land-
16 use (COUCH *et al.*, 2007) and (ii) the current financial crisis that struck violently the
17 northern Mediterranean countries, determining a persistent contraction in the
18 construction industry with the contemporary decline of traditional production sectors,
19 possibly leading to a new decentralized spatial organization of entire regions.

20 In both cases, the strengthening of sprawl processes may be a result of ineffective
21 policies for a spatially-balanced polycentric development (e.g. CATALAN *et al.*, 2008). In
22 the Mediterranean region, low-density and diffused urban growth is primarily the result
23 of *laissez-faire* policies and 'weak' planning (CHORIANOPOULOS *et al.*, 2010). Instead of
24 privileging semi-compact and medium-density land-saving settlements, this strategy
25 represents one of the new traits of southern European spatial planning or, more likely, a
26 subtle *continuum* with the deregulated planning observed till the 1990s and leading to

1 informal urban expansion (LEONTIDOU, 1990). Far from promoting urban competitiveness,
2 this strategy resulted in highly fragmented landscapes associated with diluted economic
3 structures in space and huge social inequalities (SALVATI *et al.*, 2013a).

5 CONCLUSIONS

6
7 Land mismanagement is emerging in southern Europe as one of the most striking
8 phenomena linked to urban diffusion on the local scale. Since land is managed for
9 multiple benefits, it is clear how the economic, social and environmental targets should
10 be considered jointly in order to prevent the depletion of natural resources together
11 with an unsustainable development (KAHN, 2000). Results of the present study suggest
12 how any debate about policy responses to urban sprawl should be formulated according
13 to the scope, administrative level and nature of the intervention, and to the
14 characteristics of the urban zone being considered. In other words, regional development
15 policy should move from a 'spatially-blind' to a 'place-aware' approach, aiming at
16 maximizing the development potential of each territorial unit, through multiple
17 pathways and spatial arrangements, according to the local context (BARCA *et al.*, 2012).
18 Thus, planning measures should consider jointly the urban form, housing and planning
19 systems, socioeconomic characteristics, demographic trends and environmental
20 conditions (HALL, 1997b; MORDRIDGE and PARR, 1997; NUISSL and RINK, 2005; COUCH *et*
21 *al.*, 2005; SALVATI *et al.*, 2013b).

22 By investigating three different socioeconomic contexts in the same country, the present
23 study demonstrates how the spatial distribution of dispersed and discontinuous urban
24 settlements in Italy influences (and is in turn influenced by) multifaceted territorial
25 configurations with possible impact on the effectiveness of sustainable development
26 policies. This indicates the need for planning strategies which address the specificity of
27 local socioeconomic contexts, and a permanent scheme for monitoring sprawl patterns

1 and processes at country level.
2 Measures aimed at mitigating the impact of suburbanization and urban sprawl in
3 southern Europe should follow a multi-target and multi-scale perspective (DAVOUDI,
4 2003). The territorial context characterizing suburban areas should become itself a target
5 for integrated socioeconomic policies and environmental measures embedded into a
6 sustainable development framework (KLOOSTERMAN and MUSTERD, 2001; RIVOLIN and
7 FALUDI, 2005; MEIJERS, 2008; HERRSCHEL, 2009). In this perspective, as demonstrated in
8 the present study, the local municipality is a meaningful unit of analysis since the
9 understanding of these policies is underpinned by a comprehensive investigation of the
10 political, cultural, socioeconomic and institutional settings of suburban land.

11
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