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A subregional analysis of family change: The spatial diffusion of one-parent families across Italian municipalities, 1991–2011

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Abstract

This paper documents the expansion of new family patterns in Italy by scrutinising the spatial diffusion of one-parent families across Italian municipalities for the period 1991–2011. We apply a hierarchical Bayesian model to the data of the last three Italian Population Censuses, acknowledging that variation cannot be broken down into temporal and spatial effects because space–time interaction is at the very heart of family changes. Our results illustrate substantial subregional and sub-provincial heterogeneities in the spatial organisation of family systems, patterns that might have gone undetected had larger territorial units of analysis been considered. In addition, we show that especially socio-economic factors were associated to the diffusion of new family forms. This paper challenges international scholarship that caricatures Italy as a monolithic, homogeneous family-oriented country.

KEYWORDS

Bayesian space–time model, family change, italy, municipality level, one-parent families, spatial diffusion

1 | INTRODUCTION

Since the mid-20th century, family typologies have diversified everywhere in Europe. Increasing life expectancy, together with the decreasing propensity to marry and have children, and the postponed exit from the parental home, have led to the formation of very different types of family structure. In response to these developments, scholars have become increasingly interested in studying family model variations in different geographic contexts (variations across space) and different historical trajectories (variations through time). Perhaps the best established theoretical framework on the spatial diffusion of diverse family forms is the second demographic transition (hereafter SDT; Lesthaeghe & van de Kaa, 1986). The rise of individualism and secularisation have, according to this theory, led to shifts in the moral

code that have allowed for major changes in family behaviour (Lesthaeghe & Surkyn, 2006; Lesthaeghe & van de Kaa, 1986). The source of this kind of ideational change is, however, rather abstract (Ruggles, 2012), and has generally been interpreted in terms of diffusional processes in ideas and attitudes (Casterline, 2001). Despite decades of debate around the geography and history of family and household composition, there has, however, only been limited use of spatial analysis in this kind of research (Ruggles, 2012). In a series of recent articles, Steven Ruggles (2009, 2010, 2012) has argued that family scholars should study historical changes in spatial patterns in families, such as the increase in one-parent families.

We contribute to the literature on the spatial diffusion of new family patterns by analysing the spread of one-parent families in Italy from 1991 to 2011. The increase over time of one-parent families and

their spatial diffusion represent valid markers of family changes; variations in living arrangements are the best indicators of diversity in family patterns (Gruber & Szołtysek, 2012). In addition, diversity in living arrangements reflects a variety of preferable or—when optimum conditions are not possible—attainable residential patterns and likely indicates differential notions about living together as a family.

Viewing the prevalence of one-parent families as a spatial diffusion process, our article contributes to the debate about the predictive power of the SDT narrative in Mediterranean Europe. Italy belongs to the so-called "Southern or Mediterranean model," characterised, according to most scholars, by a very low level of social protection and by strong family ties (e.g., Reher, 1998; Viazzo, 2003). These countries are classified as "traditional" in term of values because of strong Roman Catholic influence (Caltabiano, Dalla-Zuanna, & Rosina, 2006). In light of these characteristics, some scholars claimed that the adoption of innovative family behavioural models among Italians would stagnate at lower levels compared with the rest of Europe (e.g., Nazio & Blossfeld, 2003; Reher, 1998). Other researchers argue that Italy is just a latecomer, as the spatial diffusion of new family patterns is only temporally lagged (e.g., Barbagli, Castiglioni, & Dalla-Zuanna, 2003; Vignoli & Salvini, 2014). By empirically describing sequences of temporal and spatial change in one-parent families, we provide historical evidence for the ongoing transformation of Italian family demography in light of the SDT narrative. Italy is, for these purposes, particularly interesting as the country has experienced relevant family changes over the last decades: An increase in non-marital cohabitation; higher divorce rates and more step-families; the legalisation of same-sex unions; and all this in a context of stagnating very low fertility rates (Gabrielli & Hoem, 2010; Salvini & Vignoli, 2011; Vignoli, Tocchioni, & Salvini, 2016). An explicit diffusionistic approach has been undertaken in Italy to study fertility (Vitali & Billari, 2017), cohabitation (Di Giulio & Rosina, 2007; Guetto, Mancosu, Scherer, & Torricelli, 2016; Pirani & Vignoli, 2016), and divorce (Salvini & Vignoli, 2011). But, to the best of our knowledge, there has never been an attempt to study the spatial diffusion of one-parent families.

When conceptualising how family composition might be related to social context and socio-economic conditions, one has to note that there can be links across multiple social and geographic levels (e.g., regions, provinces, and municipalities). These links are often simultaneously relevant, with neighbouring units displaying similar patterns (Klüsener, Perelli-Harris, & Sánchez Gassen, 2013; Meggiolaro, 2011). Previous authors found important distinctions in fertility and nuptiality in: western and eastern Germany (Goldstein & Kreyenfeld, 2011); the Flemish and the Walloon parts of Belgium (Lesthaeghe & Neels, 2002); northern and southern Portugal (Livi Bacci, 1971); and northern and southern Italy (Castiglioni & Dalla-Zuanna, 2009). One limitation though of previous efforts is that the spatial units used have often been quite large (Potter, Schmertmann, Assunção, & Cavenaghi, 2010).

In this article, we posit that the *municipality level* is decisive in uncovering the temporal and spatial patterns of family change. The profound changes in demographic dynamics, which are normally assessed at the regional or provincial level, are, however, deeply rooted in individual municipalities. The social norms and customs that influence demographic dynamics (for example, age at marriage and at first child; social acceptance of divorce; moral obligation for offspring to take care of elderly parents; and so forth) are usually tied to local settings rather than to larger spatial units (Lappegård, Klüsener, & Vignoli, 2017; Ruggles, 2012; Viazzo, 2010); note, too, that the role of social pressure and social networks is especially relevant at the local level (Dykstra & Komter, 2012; Jappens & Van Bavel, 2012; Meggiolaro & Ongaro, 2008). Here, they produce effects that alter the general population dynamic and structure, sometimes profoundly. In addition, a focus on the municipality level allows researchers to distinguish between *mountain areas* and *plains* and between *interior* and *coastal areas*. These have traditionally had, in Italy, different familial and demographic patterns (Golini, Mussino, & Savioli, 2000). Specifically, our study deals with the following research questions: *Is the diffusion of one-parent families homogeneous across Italian municipalities? Is the traditional North–South divide still important? Or, conversely, does it mask strong subregional and subprovincial heterogeneities between provinces and, within provinces, between municipalities? Can pockets of "new" types of family behaviour be located in Southern Italian regions? Or do these regions continue to have monolithic strong family ties?*

All these questions are addressed in this paper by performing a detailed reconstruction of family typologies at the municipality level, based on the last three Italian Population Censuses, investigating the spatial and temporal patterns of one-parent families between 1991 and 2011. Census data makes it possible to construct family typologies for smaller and more homogeneous spatial units. However, from the methodological point of view, even with census data, the number of cases in a given space–time unit may be too few to produce a reliable evaluation of the level of diffusion of one-parent families. This article proposes a unified statistical model to analyse the diffusion of one-parent families in space and time. The model, defined in a Bayesian framework, includes the spatial structures between neighbouring areas to "borrow strength from neighbours" when estimating the trajectories of individual municipalities; neighbouring municipalities are more similar than non-neighbouring municipalities. In our analysis, both spatial and non-spatial considerations arise, and spatial–temporal interactions may, as such, become an important factor.

2 | BACKGROUND AND RELATED WORKS

2.1 | The importance of context in shaping the diffusion of family-related behaviour

In the SDT framework, the diffusion of new types of family behaviour has generally been interpreted in terms of spatial diffusion in ideas and attitudes (Casterline, 2001). Clearly, the spatial diffusion of innovation to new areas is dependent on the receptivity of the new area to that process. In the very nature of the spatial diffusion process, in fact, there is the notion of *spatial interaction* put forward by Edward L.

Ullman during the 1950s (Chauncy, 1977), "By spatial interaction I [Edward Ullman] mean actual, meaningful, human relations between areas on the earth's surface [...] not static location as indicated by latitude, longitude, type of climate, etcetera" (1953, p. 56; quoted by Bunge, 1966, p. 209). The spatial interactions take place on multiple levels, including trade relations, commuting, the exchange of information, and cooperation between local areas, groups, and individuals (Salvati & Carlucci, 2017).

Sequences of maps have been important in recent SDT studies in documenting the diffusion of non-marital cohabitation, non-marital childbearing, divorce, and single parenthood in Europe and the United States (Lesthaeghe & Neels, 2002; Lesthaeghe & Neidert, 2006, 2009). Regardless of the underlying changes occurring at the individual-level, scholars agree, however, that macro-level contexts affect behaviour (Vitali, Aassve, & Lappegård, 2015; Vitali & Billari, 2017). Demographic change, in fact, does not occur in spatial isolation (e.g., Coale & Watkins, 1986). Individuals are, by their very nature, nested in households, wards, administrative regions, countries, and so forth, and these "contexts" affect people's decisions. Previous studies have shown that regional and state borders can prove important in spatially defining demographic and family processes, as they often constitute strong geographical divides in terms of jurisdiction and cultural and economic conditions (Lesthaeghe & Neels, 2002; Lesthaeghe & Neidert, 2006). The nation state had a dominant role in shaping demographic behaviour, especially in the late 19th and the first half of the 20th century. However, regional variation within countries was and has continued to be substantial (Klüsener et al., 2013). Regional borders can demarcate not only socio-economic, ethnic and linguistic boundaries, but also different religious attitudes, social norms, and political loyalties—and all these factors may have profound effects on the diffusion of new forms of demographic behaviour in the family (Lesthaeghe & Neidert, 2006). In highly federated countries, family legislation may also vary from region to region (Rosina & Del Boca, 2010).

The Princeton Project (Bongaarts & Watkins, 1996; Coale & Watkins, 1986), and more formal spatial analyses (e.g., Bocquet-Appel & Jakobi, 1998), have documented the emergence of regional subcultures that have either fostered or obstructed innovations associated with a decline in historical fertility. Provinces that shared the same language, ethnicity, and religion experienced similar fertility transitions (Coale & Watkins, 1986). Crucially, several scholars have argued that the timing and pace of fertility change at the regional level, highlighted in the Princeton Project, resulted from diverse patterns in provincial subpopulations (Brown & Guinnane, 2007; Casterline, 2001; Guinnane, Okun, & Trussell, 1994). They claimed, indeed, that a more fine-grained analysis would produce a different picture of transition timing and flag up the relevance of socio-economic covariates.

In this paper, we follow this recommendation by addressing the spatial diffusion of one-parent families at the municipality level in Italy. At the municipality level, a multivariate ensemble of social, economic, cultural, and institutional factors operate in tandem; these factors are sensitive to the size of the spatial assets and their relative distance from each other (Salvati & Carlucci, 2016).

2.2 | The Italian setting

At the end of the 1970s, later than most other Western European countries, early traces of the SDT started to become visible in Italy. These changes intensified in the 1990s, and accelerated still more in the first decade of the twenty-first century (Castiglioni & Dalla-Zuanna, 2009). Although the incidence of new family behaviour remains less evident in Italy than in other Western European countries, marriage dissolution is now pervasive (the rate of divorces over marriages increased from 158‰ in 1995 to 349‰ in 2015; Italian National Institute of Statistics - Istat, 2016a) and informal unions have reached surprisingly high levels (from 1.7 every 100 residents in 1998 to 4.2 in 2009; Istat, 2011); at the same time, Italian fertility has been blocked at very low levels since the 1980s (total fertility rate under 1.5 since 1984, with a minimum of 1.19 in 1995 and a slow growth afterwards, up to 1.4; Istat 2016b).

In addition, Italy represents an interesting laboratory in light of the extraordinary territorial differences, in the temporal and spatial distribution, of different family types. SDT-related behaviours have shown a strong pattern of contrasts between receptive and unreceptive areas. This can often be explained by the territorial differences in economic and cultural history, particularly along the North–South gradient (Kertzer, White, Bernardi, & Gabrielli, 2009). The "innovative" North, where the diffusion of new family-related behaviours is more advanced, and the "traditional" South, which appears more resistant to such diffusion, offer two different models here (Kertzer, White, Bernardi, & Gabrielli, 2009; Gabrielli & Hoem, 2010). Moreover, at least two types of family organisation are rooted in Italian culture: The complex patrilocal family in the North and the central part of the country and simple neolocal families in the South (e.g., Barbagli et al., 2003; Santarelli & Cottone, 2009).

Despite the North–South divide, sub-provincial Italian differences are culturally rooted, and the local environment represents one of the main sources shaping family behaviour (Breschi, Esposito, Mazzoni, & Pozzi, 2014). Regional laws and municipal rules can differ, sometimes profoundly, with respect to public housing and the economic support given to families. These differences are often influenced by the governing political party in the locality (Andreotti, Mingione, & Polizzi, 2012; Bifulco, Bricocoli, & Monteleone, 2008; Boccuzzo, Caltabiano, Dalla-Zuanna, & Loghi, 2008). At the same time, sociocultural norms at regional level (or below), for example, on the social acceptability of remarriage and repartnering after union dissolution (Meggiolaro & Ongaro, 2008), represent crucial correlates of family-related behaviours (Kertzer, White, Bernardi, & Gabrielli, 2009; Lappegård et al., 2017). The local milieu of each municipality influences the culture, customs, and social norms of its residents. Generally speaking, this is the product of the fragmentation of the Italian peninsula into several separate states, with quite different languages, until Italian unification in 1861 (Dalla-Zuanna & Righi, 1999). What is more, mountainous/internal areas and coastal areas/plains have different demographic structures and dynamics. Mountainous/internal areas have an older population and a slower turnover rate, whereas coastal areas/valleys are characterised by a younger population and more

dynamic natural and migratory growth rates (Kalc & Navarra, 2003; Viazzo, 1989; Viazzo & Albera, 1990). In addition, changes in family structures started in more populated and better connected areas: highly urbanised coastal areas and large cities in the Po Valley (Emilia Romagna, Lombardy, Piedmont and Veneto), such as Milan and Turin (Di Giulio & Rosina, 2007; Livi Bacci, 1977).

In short, the focus on the local dimension is necessary because of a remarkable variability at the sub-provincial level and the way that homogeneous cultural and social areas do not respect regional and provincial borders (Golini et al., 2000). Ancient territorial divisions generate new differences, inhibiting or facilitating the spread of new behavioural patterns in family life. In the country, territorial analyses are rarely employed to interpret behavioural changes, as was done with the Princeton Project (Livi Bacci, 1977), and later, for example, by Dalla-Zuanna & Righi (1999). On the one hand, individual data is generally used to describe and verify behavioural assumptions, particularly survey data (e.g., De Sandre, Ongaro, Rettaroli, & Salvini, 1997), which are not statistically representative at the municipality level. On the other, there are important examples of Italian historical research on the demography of families that have focused on the analysis of small communities (e.g., Breschi, Fornasin, & Manfredini, 2013; Rettaroli & Scalone, 2012). The rationale for the community approach has been that local conditions have a powerful influence on residents' decisions. These historical studies are, by their very nature, geographically confined and focus on the 17th to the 19th centuries. Yet, the greatest period of family change proved to be the late 20th century.

2.3 | The focus on one-parent families

To analyse household composition in a temporal and spatial dimension, we must use demographically appropriate measures that are sensitive to the effects of variation on both population composition and family structure (Ruggles, 2012). In this article, we consider the diffusion of *one-parent families* as a valid marker for family change. This kind of indicator embodies two different situations: (a) an unmarried, divorced, or widowed parent with at least one co-resident *young* child; and (b) an unmarried, divorced, or widowed parent with at least one co-resident *adult* child (without his or her own family).[1] However, because in Italy non-marital births only recently became numerically important, unmarried parents are much more common among young parents, whereas, being in a low mortality setting, widowed parents are especially frequent among the old. For this reason, in the following, we often refer, in part simplifying reality, to unmarried parents with a young child/children and widowed parents with an adult child/children.

The first category fits clearly into the *pattern of modernization*. From the immediate post-war period until the breakdown of the old political order in 1992, Italy was led by Catholic-oriented governments (De Rose, Racioppi, & Zanatta, 2008). The progressive "cultural shift" claimed by Lesthaeghe and van de Kaa is likely to be connected with an increase in one-parent families because of the diffusion of divorce (legalised in 1970) and the diminishing importance of marriage since the 1990s. These multiple waves of change follow the same geographical patterns as literacy, secularisation, and female participation in the labour force (Castiglioni & Dalla-Zuanna, 2009; Livi Bacci, 1977).

The second category is probably linked to *restraint factors*, particularly economic ones. Young Italians find themselves forced to remain at home due to a series of material constraints: high unemployment; underemployment with temporary jobs; a scarcity of available housing with reasonable rents; and a lack of governmental help for leaving the parental home at a young age (Billari & Rosina, 2004; Livi Bacci, 2001). The cost of weddings remains a restraining factor, too (Vignoli & Salvini, 2014). Finally, there is the difficulty in finding a partner with adequate characteristics (age and income) (Dalla-Zuanna & Righi, 1999), given the prevalent homogamy of the Italian marriage market (De Rose & Fraboni, 2015). Economic constraints may affect early childbearing and favour cohabitation (Rosina & Fraboni, 2004; Vignoli et al., 2016). Nevertheless, this family typology is not only linked to patterns of home leaving related to economic reasons but also to cultural factors, factors typical of a society with persistent strong family ties (Dalla-Zuanna, 2001); it is thus possible that a single (widowed, divorced) parent moved into an adult child's home or that an adult child returned to the protective family nest. In a nutshell, these events are related to a feeling of responsibility towards an aged parent or towards an adult offspring; for example, the economic hardship of a parent in need of (medical) care or offspring unable to support the costs of living alone after divorce or unemployment (Aassve, Betti, Mazzuco, & Mencarini, 2007; Tomassini, Wolf, & Rosina, 2004).

This kind of multifaceted theoretical framework cannot be comprehensively dealt with by the kind of territorial analysis offered below. However, by focussing hard on the territory, we are able to document how these dynamics coexist even within the same region or the same province. To the best of our knowledge, no study has systematically explored the temporal and spatial patterns of family change at the municipality level, at least not for Italy.

3 | ANALYTICAL STRATEGY

3.1 | Data, covariates, hypotheses

Italian population censuses are carried out by Istat every 10 years, and the corresponding socio-demographic data are available for the municipal level (and, in some cases, also for the census section level).[2] This gives us the opportunity to explore the changes in Italian families at the municipal level (about 8,000 administrative units), a territorial level rarely considered in Italian studies. We select the three censuses held from 1991 to 2011, whose data quality is generally very good (census coverage was 99.1% in 1991, and 98.6% in 2001 and 2011 —see Istat, 2016c). If two municipalities merged between 1991 and 2011, we consider them as one in all three censuses. Conversely, if a municipality split into two or more new administrative units in the same period we considered them as a single unit throughout the series.[3] Raw rates for single parent families in 1991, 2001, and 2011

are reported in Figure A2, along with a map of Italian regions (Figure A1).

To uncover major factors responsible for the spatial diffusion of one-parent families, we model the number of one-parent families for each municipality (dependent variable) through a range of demographic, socio-economic, and cultural characteristics chosen among those available at the municipality level (independent variables).

Living arrangements are highly sensitive to the demographic characteristics of a population. We hypothesise that both the age structure and the dynamics of the population in each municipality influence the number of one-parent families inside its borders. We included in the model the *old age dependency ratio*, computed as the share of individuals aged 65+ over those aged 15–64. A higher number of older residents over potentially active individuals in a municipality should imply a higher number of one-parent families composed of an aged widow parent and an adult child.

We also hypothesise that the particular configuration of kin available for co-residence in a given area is a direct function of its natural dynamic, a product of prevailing levels of fertility and mortality (Ruggles, 2012). For instance, co-residence with a parent is possible only if at least one of the parents is still alive, and this survival is related to local mortality rates, whereas in areas where birth rate is low, and thus children are scarce, family typologies other than one-parent families would be more common. We measure the population dynamics by means of two additional statistical controls, namely, the *crude birth* and *death rates*.

In addition to the general demographic characteristics of the population, new living arrangements could be related to certain local socio-economic and cultural characteristics (Caltabiano & Dalla-Zuanna, 2015). Note, however, that the availability of a large array of variables of this kind is somewhat limited at the municipality level.

To test the role of the *pattern of modernization*, we considered the structural predictors theorised for the SDT: the diffusion of tertiary education and (women's) labour-force participation, the increased concentration of employment in the industrial sector, and cultural changes (Caltabiano & Dalla-Zuanna, 2015; Livi Bacci, 1977; Di Giulio & Rosina, 2007). We anticipate that the circulation of these factors facilitates the spatial diffusion of new types of family behaviour. Thus, we included the *share of residents with a medium-high level of education* (calculated as the share of residents with at least completed secondary education among those aged six or older) as well as the *share of residents with low level of education* (calculated as the share of residents with primary school or no education among those aged six or older). Then, we include the *share of individuals employed in the industrial sector* (calculated as the percentage of residents aged 15+ employed in the industrial sector over all residents aged 15+ in employment).

We decided to proxy cultural changes across Italy by considering the *proportion of votes gained by the large centre-left coalition* that, over the last decades, included in its electoral platform: support for easier and faster divorce, the legitimatization of non-marital childbearing (prior to this parents had limited rights), and the approval of certain rights for same-sex couples. Residents of geographical areas with more unconventional forms of family formation and dissolution, as well as higher levels of secularisation (Castiglioni & Vitali, 2013) should display centre-left preferences—something that would correspond to a preference for the Democratic Party in the United States (Lesthaeghe & Neidert, 2009: 391). In particular, we elaborated the data of the Italian Ministry of Interior's historical electoral database, *Eligendo* (http://elezionistorico.interno.it). We considered the elections for the lower House of the Italian Parliament (*Camera dei Deputati*) held in 1994 (for the 1991 census), 2001 (for the 2001 census), and 2008 (for the 2011 census), when two strong centre-left and centre-right coalitions faced off against each other.[4]

To test the role of *restraint factors*, we considered the *share of individuals in search of a job among those aged 15+* as a pointer for economically-disadvantaged and deprived areas. We expect that the higher this indicator, the higher the share of one-parent families composed of an unmarried, divorced, or widowed parent with a co-resident *adult* child (without his or her own family).

Finally, it is possible that the diffusion of new types of family behaviour in more secularised and urbanised areas in the North was affected by the massive internal South-to-North migration in Italy in the last decades. Perhaps migrants coming from the south of the country with more conservative ideas and attitudes slowed change. Hence, to account for the residential relocation of individuals and, more generally, for changes in population composition due to internal Italian migratory movements, we included *crude immigration* and *emigration rates* (Pugliese, 2006). These rates were approximated as the ratio between events in the census year and the residents recorded in the census.

At the onset of the analysis, we verified that the old age dependency ratio is not collinear with the crude birth and death rates, and also that the crude immigration and emigration rates are not collinear with one another. Note that municipality size is indirectly considered by including the total number of families on the Binomial model described in the following section. Descriptive statistics on the considered variables are available in Table A1.

3.2 | The model

A key feature of data collected across both time and space is the non-independent nature of the observations. Valid statistical inference requires to take into account for time and space dimensions and their interaction. Moreover, also a spatial correlation structure could be important. According to the first law of geography, close areas are more likely to be similar than areas which are far from each other.

The generalised linear mixed models (GLMMs) are one of the most useful construction in contemporary statistics (i.e., Fahrmeir, Kneib, Lang, & Marx, 2013). They allow for an extraordinary range of extensions (related to particular dependency patterns between the data) to be handled within the familiar linear model framework.

Building on the model proposed by Knorr-Held (2000), a GLMM is used in studying the temporal and spatial dimensions (and their interaction) of one-parent families in Italy. A hierarchical Bayesian

approach is taken and a Markov chain Monte Carlo procedure is used for estimation and inference. Using a Bayesian setting, we acknowledge heterogeneity between municipalities due to unobserved covariates and also consider, in a computationally easy way, their spatial structure. This is not possible in a frequentist approach due to the large dimension of the data. The convenience of using GLMMs in a Bayesian approach is evinced by their widespread use in disease mapping (i.e., Lawson, 2013).

Our response measurements denoted as y_{it} are the number of "one-parent families" for municipality ith at the census tth. We assume a Binomial distribution for Y_{it} with mean value $\pi_{it}N_{it}$, where N_{it} represents the total number of families in ith municipality and tth census, and π_{it} is the probability that a family in ith municipality and tth census is a "one-parent family."

Then, we express the logit of π_{it}, which is our linear predictor, additively as the sum of some fixed effects and some random effects. The considered fixed effects are a series of demographic and socio-economic variables known at municipal level for each census-time and that may affect household composition across populations. Their number is denoted with K. The random effects are three: A spatial effect, a temporal effect, and a spatio-temporal interaction effect. In formula, we have:

$$\text{logit}(\pi_{it}) = \log(\pi_{it}/(1 - \pi_{it})) = \beta_0 + \Sigma_k \beta_k x_{itk} + \omega_i + \theta_t + \varphi_{it}$$
$$\text{with} \quad \omega_i = v_i + u_i$$

where:

- x_{itk} ($k = 1, ...,K$) is the value of the kth covariate for municipality i and census time t.
- $\beta_0, \beta_1, ... \beta_K$, are the intercept and the parameters associated with the fixed components.
- $\omega_i = v_i + u_i$ is the spatial (municipal) random effect broken down as the sum of two components, one, v_i, representing the spatially-unstructured variation (heterogeneity) and the other, u_i, representing a spatially-structured variation (clustering). The clustering spatial effect u_i is an effect in which the mean is allowed to depend on the neighbouring u_j through the Gaussian intrinsic conditional autoregressive model (i.e., Banerjee, Carlin, & Gelfand, 2014). This latter accounts for the spatial autocorrelation among municipalities that occurs along all three censuses. It gives back the aggregation between municipalities that have similar behavioural patterns in 1991, 2001, and 2011. Note that there are other methods to detect aggregation, but we prefer to use a model that allows for the simultaneous inclusion of covariates, a time dimension, and time–space interaction.
- θ_t is the temporal effect that includes only a temporal unstructured variation (heterogeneity). It is common to model the temporal random term as a structured random effect, ensuring that contiguous periods are likely to be similar, but allowing for flexible shapes in the evolution curve. We have not considered this second possibility as our data takes in only three censuses. This effect represents the average time trend across all municipalities.
- φ_{it} is a space–time heterogeneity effect. This interaction can represent all kinds of—non persistent—circumstances that may cause a slight increase or decrease in the probabilities in a specific municipality-period. This allows for random—independent—oscillations around expected global probability given by time and space main effects.

In the Bayesian approach, all unknown functions and parameters can be treated within a unified general framework by assigning appropriate prior distribution with the same general structure, but with different forms and degrees of smoothness. Moreover, additional structures might be put on the hyperparameters.

The prior distributions assigned to the random effects v_i, u_i, θ_t, and φ_{it} are the following:

- v_i is distributed as a Normal random variable with zero mean and precision τ_v (following the common practice of the Bayesian approach, we parametrized distribution using the precision, i.e., the reciprocal of the variance).
- The prior distribution for each u_i is an intrinsic conditional autoregressive Normal model that introduces a spatial structure into the model. Accordingly with this prior, the conditional distribution of u_i, given all the other u terms is $1/n_i\Sigma_{\{i \sim j\}}u_j$, where $\{i \sim j\}$ indicates that areas i and j are spatially contiguous, n_i represents the number of adjacent municipalities. The conditional precision is given by $n_i \tau_u$.
- The time effect θ_t is Normal distributed with mean zero and precision τ_θ.
- For the interaction term, φ_{it}, different specifications are possible depending on assumptions about their dependence structure (see Knorr-Held, 2000). In our model, we assumed that the interaction term is not structured in space neither in time. This assumption was made to retain a simple degree of the model and to avoid an excessive clustering that could hide some interesting changes over time and space. The prior is a Normal distribution with mean zero and precision τ_φ.

Proper Gamma priors with very high dispersion have been assumed for the hyperparameters τ_v, τ_u, τ_θ, and τ_φ. An uninformative Normal prior for β parameters have been given. Posterior distributions of the parameters of interest have been approximated using Gibbs sampling. After a burn-in of 100,000 iterations, we retained 1,000 samples taken from the last 100,000 iterations. The posterior distributions have been summarised using the posterior mean. All calculations have been done using Open BUGS (Lunn, Thomas, Best, & Spiegelhalter, 2000).

To assure the convergence of the simulation algorithm we should theoretically check this across all parameters of the model. However, as the convention is done in the presence of a model with a greater number of parameters, given the high number of terms in our model (over 40,000), convergence has only been assessed for a subset of the identifiable parameters. Gelman and Rubin (1992) test and partial

autocorrelation plots have been used to check for the achieved convergence of probabilities and τ hyperparameters.

The estimates from the GLMM model are obtained as the exponentiated means of posterior distributions. The effects are multiplicative on the odds of being a single parent family.

Finally, according to Mollié (1996), we consider a measure of the strength of each spatial component, the clustering and the heterogeneity. The variance of the clustering terms, u_i, is $1/(n_i \tau_u)$; the variance of the heterogeneity term, v_i, is $1/\tau_v$; and their sum gives back the variance of the main spatial effect, ω_i. Therefore, the ratio between the estimate of the parameter $1/\tau_u$ and the estimate of the parameter $1/\tau_v$ gives a measure of the relative strength of one component with respect to the other: a value of the ratio higher than the mean values (over i) of n_i, indicates that the clustering component dominates over the heterogeneity one; a value of the ratio smaller than the mean value of n_i denotes that it is the heterogeneity component to be dominant.

4 | RESULTS

We start the description of our results by looking at the fixed effects, that is, the effects of the covariates, on the linear predictor (Section 4.1). We continue by illustrating the 1991–2011 time trend in the diffusion of one-parent families, averaged across all municipalities (Section 4.2), as well as the geographical distribution of one-parent families averaged across the whole period of interest (Section 4.3). We then present the interaction between temporal and spatial distribution of one-parent families across Italian municipalities (Section 4.4). Here, the time and space main effects and their interaction have to be considered as multiplicative effects on the odds of a one-parent family occurring. We conclude the results section by looking at the predicted probabilities of being a one-parent family (Section 4.5).

4.1 | Factors associated with changes in the diffusion of one-parent families

Table 1 shows the fixed effects. It is worth recalling that, while interpreting the results, we assume that the effect of each covariate is constant over municipalities and time points.

The higher the old age dependency ratio, the higher the odds of one-parent families. This indicates that the "older" the municipality considered, the higher the share of one-parent families. Indeed, a one-parent family might represent a family typology formed by an unmarried (divorced) parent with her/his young child; but also a parent (possibly widowed) with a co-resident adult child; or, in a smaller number of cases, an unmarried (divorced) adult child remains (or becomes) a co-resident, assisting an elderly widowed parent who, in poor health, cannot afford external support. This is a main effect, in other words a mean effect across municipalities, the Centre North municipalities, where the population is older, and the municipalities in the South, where the population is younger. Any differences with respect to

TABLE 1 Changes (multiplicative effects) in the odds of being a one-parent family. Italy, 1991–2011 according the covariates. Estimates of the fixed effects (exponentiated) with their 95% credibility interval (CI) from the GLMM

Coefficient	Mean	Lower 95% CI	Upper 95% CI
Constant	0.9947	-	-
Old age dependency ratio	1.0030	1.0023	1.0034
Crude birth rate	0.9963	0.9955	0.9971
Crude death rate	1.0083	1.0076	1.0090
Share of tertiary educated residents	1.0229	1.0215	1.0245
Share of low educated residents	0.9982	0.9971	0.9990
Percentage of individuals employed in the industry	0.9997	0.9993	1.0001
Percentage of vote for centre-left	0.9971	0.9968	0.9974
Share of individuals in search for a job	1.0033	1.0027	1.0038
Crude rate of immigration	0.9993	0.9991	0.9996
Crude rate of emigration	1.0007	1.0004	1.0009

the mean effect are, instead, included in the space, time, and interaction effects.

Thinking of basic demographic forces, we found that the higher the crude birth rate, the lower the odds of a one-parent family. This finding is consistent with the SDT narrative; the logic behind fertility decline is largely the same as that driving the diffusion of new family models. On the contrary, the higher the crude mortality rate, the higher the odds of one-parent families.

As with regards to the socio-economic predictors of the incidence of one-parent families, we show that the growth in the number of highly-educated citizens increases the odds of one-parent families. These findings are clearly connected to the emergence of innovative models of family behaviour as the diffusion of new forms of behaviour is facilitated in better-educated areas (for example, large cities and their residential suburbs). On the contrary, the proportion of individuals working in the industrial sector did not significantly affect the diffusion of one-parent families.

Surprisingly, the proportions of votes for the centre-left coalition is negatively related to the probability of there being a one-parent family. Possibly, a vote for the large centre-left or the centre-right political coalition, which dominated Italian politics in the 1990s and 2000s, points to a centrist position, less favourable to new family forms; alternative and culturally more innovative minor parties may be more open in this respect. In any event, this variable controls our estimates for changes in terms of the cultural inclinations of residents (De Rose et al., 2008; Lesthaeghe & Neidert, 2009).

A larger share of people in search of jobs increases, meanwhile, the odds of one-parent families. This finding signals that restrain factors are also at play: people marry—or more often enter into a non-marital union (which is preferred when jobs are temporary or underpaid, Vignoli et al., 2016)—at a younger age and then get divorced (Ongaro, Mazzuco, & Meggiolaro, 2009). In addition, in particularly deprived areas, unemployed men with low education may not find

a match in the marriage market, and so, might remain at home with a parent.

4.2 | The time dimension

Figure 1 displays the time trend for the period 1991–2011 for the diffusion of one-parent families averaged across all municipalities and net of all covariates introduced into the linear predictor of the model. The odds of having one-parent family grows through these two decades. We note a clear change upwards in the speed of diffusion in the period 2001–2011, compared to the slower diffusion of 1991–2001. The prevalence of a single parent (unmarried or divorced) with a young child increases as part of a more general socio-demographic trend. 2001–2011 marks, then, a clear acceleration in the diffusion of new family patterns in Italy. Social observers suggested that the cut-off point was 1995. After that year fertility started to rise again, the popularity of cohabitation increased, and divorce reached unprecedented levels (Castiglioni & Dalla-Zuanna, 2009): divorce, in fact, went mainstream (Salvini & Vignoli, 2011). On the other side, the prevalence of the single parent (widow) with an adult co-resident child (without his/her own family) decreased through 2001–2011. Generally speaking, the restraining factors, preventing the exit of adult children from the parental home had been slowly falling away, at least before the onset of the economic recession in 2008. In addition, the growing presence of foreign women increased mixed marriages, helping to balance the fall off of marriages among natives (Maffioli, Paterno, & Gabrielli, 2014; Vignoli, Pirani, & Venturini, 2017).

4.3 | The space dimension

Figure 2 displays the spatial distribution of one-parent families across Italian municipalities, averaged across the period 1991–2011 and net
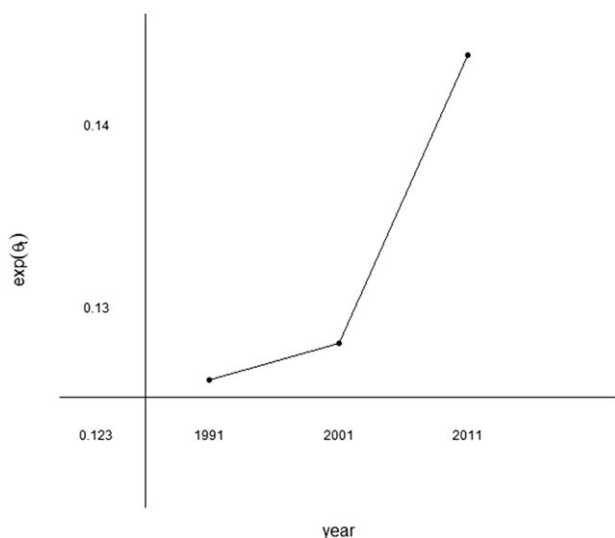

FIGURE 1 Time (multiplicative) effects on the odds to be one-parent families (average across all municipalities). Italy, 1991–2011. Estimates of exp (θ_t) from the GLMM
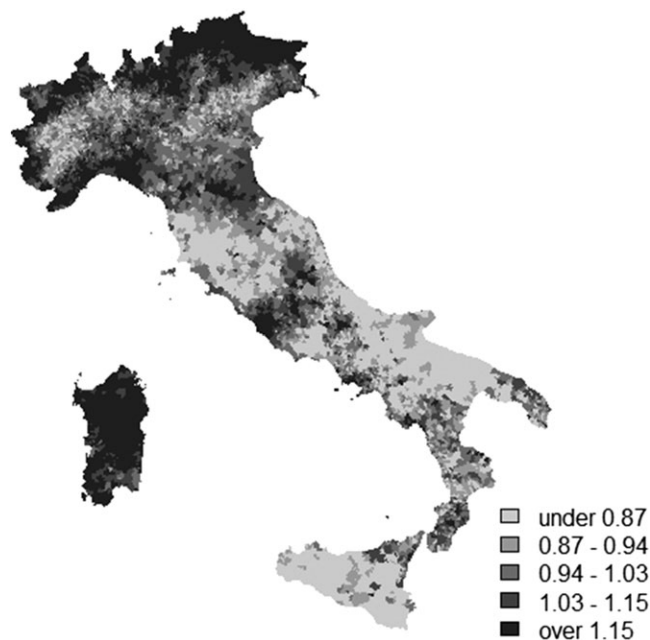

FIGURE 2 Spatial (multiplicative) effects on the odds to be one-parent families (average across all periods). Italy, 1991–2011. Estimates of exp (ω_i) from the GLMM

of all covariates introduced in the equation. The relative importance of the clustering terms with respect to the heterogeneity ones is measured by comparing the ratio between the estimate of $1/\tau_u$ and $1/\tau_v$ with the mean number of neighbouring areas (the mean of n_i) whose value, calculated on the data, is equal to 5.9. The estimates are calculated as the mean of the posterior distributions. The estimate of $1/\tau_v$ is 0.0028 with 95% credibility interval [0.0020, 0.0038]; and the estimate of $1/\tau_u$ is 0.0483 with 95% credibility interval [0.0437, 0.0531]. Their ratio is 17.11, and it is far above from the mean number of neighbouring areas, that is, 5.9, so to suggest that one-parent families tend to cluster spatially (i.e., the clustering component dominates the heterogeneity one).

Clearly, the "innovative" North and the "traditional" South offer two different models here. Thus, at first glance, the synthetic picture shows a dual-level process. Nonetheless, the whole pattern masks substantial subregional, and even sub-provincial, differences. For instance, some regions seem to be characterised by a remarkably heterogeneous pattern, for example, Apulia, Calabria, Sardinia, and Sicily. Within their borders, pockets of innovations can be found, for example, the north-eastern municipalities of Sicily.

Demographically vulnerable areas are to be found in the high hills and in mountains. Take the municipalities in the Apennines mountain in central Italy, or in the Abruzzo and Sardinian interior. Particularly, these Abruzzo and Sardinian municipalities appear to be characterised by a "demographic malaise" (Golini et al., 2000)—that is, a very low crude birth rate, an inverted age structure, and a deterioration in the local socio-economic environment. The demographic dynamics displayed by these regions appear to be different from the more homogeneous diffusion of one-parent families in other regions, such

as in Emilia-Romagna, Tuscany, and the northern regions of the country.

4.4 | Time–space interaction

Figure 3 illustrates the distribution of the interaction between the spatial and temporal effects on being one-parent families. This interaction allows us to observe how a time trend is shaped by a specific context. We note a growing trend over the three time points under consideration in almost all areas to the south of the Po River, which offered a sharp dividing line, especially in 1991 between the Lombardy and Veneto regions to the north, and the Emilia-Romagna to the south. The diffusion of one-parent families is especially visible in the municipalities located in the centre of Italy (see as an example of diffusion Figure 4a for Tuscany) and in the densely populated plains of the north (especially in Emilia-Romagna). The temporal and spatial diffusion of the likelihood of a one-parent family occurring is also remarkably different within regions and provinces. For instance, the municipalities located along the Po Valley or in the metropolitan area of Naples in Campania show an earlier diffusion when compared with neighbouring areas in the same administrative region. These changes can be said to conform to the SDT narrative, and trace the diffusion of innovative family practices among Italians. In addition, as divorce becomes more common, it spreads down among the least educated segments of the population; a segment which is more numerous in the South and in peripheral areas (Salvini & Vignoli, 2011).

The South is characterised as more complex dynamic (see Figure 4 b as an example for Sicily). In the first decade under the study (1991–2001), we observe a contraction in the number of one-parent families. This contraction can likely be attributed to the declining prevalence of a parent (widow) with an adult co-resident child (with no children of his/her own). As already noted, the reasons beyond this decline might be explained by a weakening of restraint factors locking young adults into the parental home. In addition, there is also the question of renewed flexibility in the marriage market (both because of a larger pool of available partners, and thanks to the diffusion of unmarried and so less costly unions). In the second decade under the study (2001–2011), we detect, however, an increase in the likelihood of one-parent families. We ascribe this increase to the diffusion of

unmarried (or divorced) parents with a young child or children. This is the decade in which more innovative forms of family behaviour spread through Italy. This pattern is discernible in Sicily (see Figure 4 b—2001), where in 1991–2001, the diffusion of one-parent family decreased, especially in the most traditional and economically-deprived southern parts of the island. Then, in the following decade, the increased diffusion of one-parent families was especially visible in the more modern and secularised parts of Sicily, such as the metropolitan areas around the coastal cities of Catania and Messina (in the northeast of the island; see Figure 4b—2011). A very similar story is found within Calabria. Here, the more secularised north of Calabria contrasts with the more economically disadvantaged south. Also, in Sardinia, the innovative west (Sassari province) stands against the more traditional east (Barbagia district).

The diffusion pattern of one-parent families in the Northeast of Italy (see as an example Figure 4c for Veneto) is more difficult to explain. We notice an overall contraction in the incidence of one-parent families between 1991 and 2011. Is this because of a growing international migratory presence that revitalises the (re)marriage market, favouring the formation of new (or reconstructed) unions through mixed marriages? The large cities of Padua and Venice continue to display higher levels of one-parent families through time, a confirmation that these are among the most secular areas in the Veneto (Caltabiano & Dalla-Zuanna, 2015). Micro-level analyses targeted at this area may shed light on the relevant mechanisms.

4.5 | Probabilities for one-parent families

This section describes the maps of the predicted probability of one-parent families in the three censuses analysed, thus bringing together fixed effects, time and space main effect, and interaction effect (Figure 5). On average, the results point to an increase of the probability of one-parent families occurring between 1991 and 2011. For Italy as a whole, the mean value of the probabilities changes from 0.1181 in 1991 to 0.1523 in 2011, reflecting a relative increase of about 29%. This overall trend masks substantial regional, subregional, and subprovincial heterogeneity, however. For instance, focusing on the densely populated Italian towns, by moving from North to South, we note that in Turin, Milan, Genoa, Rome, Naples, and Palermo
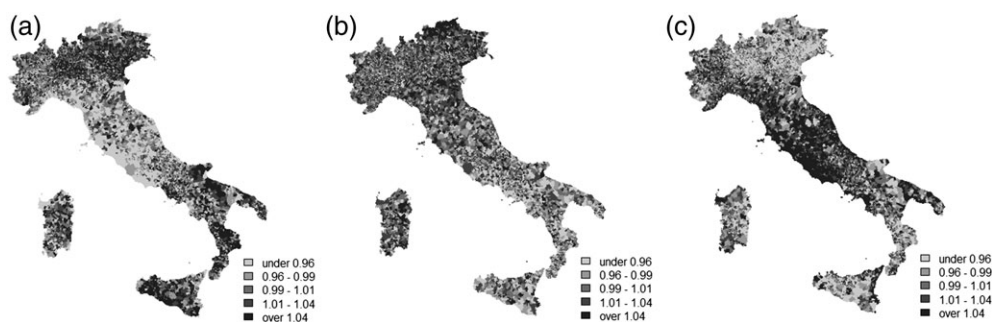

FIGURE 3 Space–time interaction (multiplicative) effects on the odds to be one-parent families. The effect for each municipality and each period, respectively: (a) 1991, (b) 2001, and (c) 2011. Estimates of exp (φ_{it}) from the GLMM
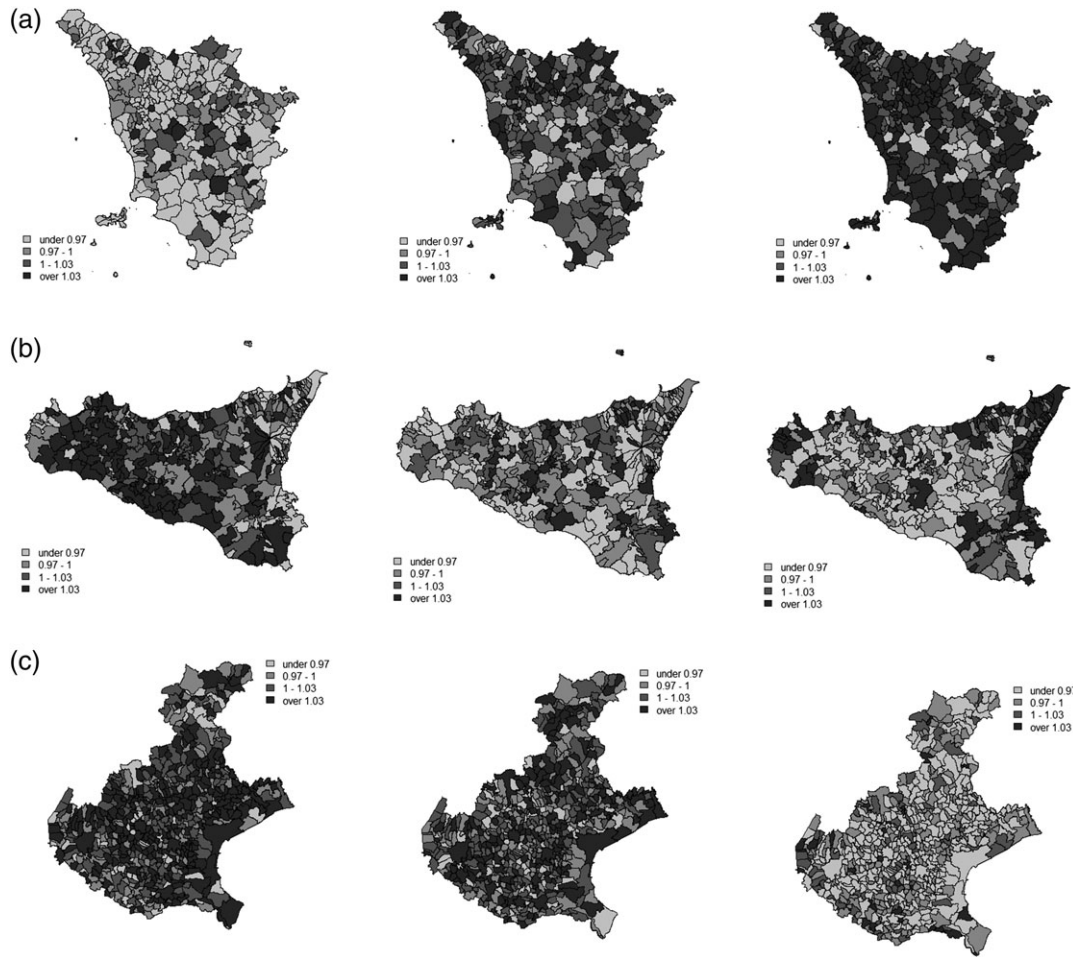
FIGURE 4 Space-time interaction (multiplicative) effects on the odds to be one-parent families. Estimates of exp (φit) from the GLMM. Focus on (a) Tuscany region, (b) Sicily region and (c) Veneto region, for the periods (left) 1991, (center) 2001 and (rigth) 2011
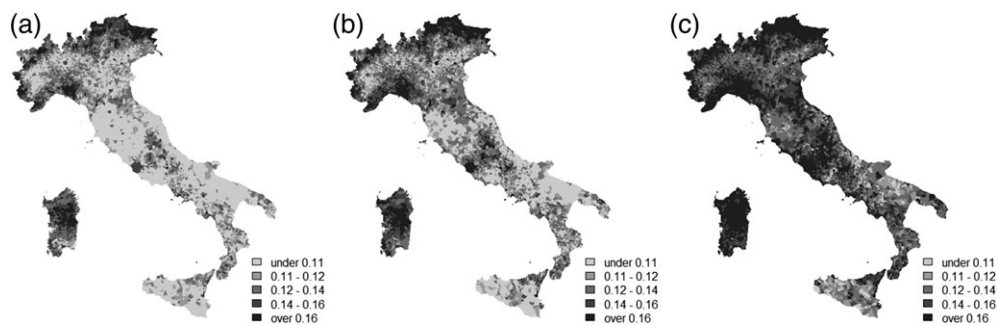

FIGURE 5 Probabilities to be single parent family π_{it} estimated from the GLMM for (a) 1991, (b) 2001, and (c) 2011 census year

(respectively the capital cities of the regions of Piedmont, Lombardy, Liguria, Lazio, Campania, and Sicily) the probability of one-parent families increased over the two decades by, respectively, 33%, 23%, 44%, 61%, 29%, and 23%. These relative increases do not necessarily accord with the old-fashioned North–South Italian divide. For example, the variation observed in Milan is much more similar to that of

Palermo than to that of Turin. More generally, in several municipalities in the northwest of Sicily in 2011, the probabilities of being a one-parent family reached similar values to those of other municipalities located in the north of Italy; these Sicilian municipalities included Messina, Taormina, and Catania. In addition, similar probabilities of being a one-parent family are not necessarily limited by the same

administrative boundaries of provinces and regions. For example, in central Italy, we note that the municipalities of the southernmost province of Tuscany, Grosseto, are more similar to the municipalities of the neighbouring province of Viterbo, in northern Lazio.

Finally, it is worth noting that the generalised rise in the probabilities of one-parent families occurring depended on the levels observed at the beginning of the period. By dividing the Italian municipalities according to the quartiles of the probabilities observed in 1991, it appears that the mean 1991–2011 variation was about the 39%, 31%, 27%, and 23%, respectively, for the municipalities of the first, second, third, and fourth quartile. Hence, the diffusion was more pronounced in those municipalities with lower initial levels than in those at the higher end of the spectrum. This has clearly reduced the differences between municipalities in terms of the probabilities of one-parent families occurring over time. The coefficient of variation of the probabilities (at municipal level) in 1991 was 0.21, while it stopped at 0.19 in 2011.

5 | CONCLUDING DISCUSSION

This article focuses on the diffusion of one-parent families in Italy, acknowledging that variation cannot be broken down into temporal and spatial (main) effects because space–time interaction is at the very heart of this phenomenon. Italy is a perfect laboratory for studying internal demographic differences, but the historical change in family structures in this country has been, for the most part, unexplored. We employed a smaller than typical unit of analysis in the study of the diffusion of family typologies, the municipality. New evidence emerges from our analysis.

First, we delineated territorial-historical contexts and cultural continuities, which mark out stable regional subcultures; these were often related to territorial characteristics, for example, mountainous or otherwise isolated areas, which have varying degrees of accommodation or resistance to demographic innovations. We found that spatial dependence in the level of diffusion of one-parent families persists even after controlling for demographic and socio-economic correlates. The key predictors of the SDT—the diffusion of tertiary education and (women's) labour force participation, and the increased concentration of employment in the industrial sector—hold best in the North of Italy, where the SDT is most clearly connected to urban life and to economic development. Nonetheless, traces of SDT innovations can be seen in the South, too, in those areas with more favourable employment distribution and with higher rates of tertiary education.

Second, we suggest that both modernization factors and strain factors are at play. Modernization factors might have contributed to the diffusion of a new family typology, namely an unmarried or divorced lone parent with young children (Dalla-Zuanna & Righi, 1999; Livi Bacci, 1977). On the other hand, a more dynamic marriage market, shaped by an increased number of migrants, and the falling off of restraint factors on young adults' intent to leave the parental home may have contributed to a decline in the model of a parent (widow) with a co-resident adult child (with no children). Nevertheless, the recession of 2008, which brought downturns in both the financial and the labour market, may again have discouraged adult children from "leaving the nest," especially in the more socially and economically disadvantaged southern Italian regions. In any case, all too often, discussions have been conceptualised and phrased in terms of socio-economic or structural versus cultural or ideational explanations. In our opinion, there are very good reasons why this kind of duality is outdated, as after all, within the same region or the same provinces, we often uncovered proof of the operation of both forces.

Third, our article places Italy in a moment of transition, in which the municipality evidence indicates a strong increase in one-parent families, and this kind of family typology is no longer confined to certain areas. Hence, our meticulous municipality-level analysis of new family patterns clearly opposes the idea of a static Italian context: new family patterns have spread through the country. By using a Bayesian approach that retains small geographic units and borrows data from neighbouring areas, we have directed attention towards patterns that would have been invisible in larger geographic aggregates. In fact, traces of family changes can be located in any part of the country. Indeed, even within more traditional regions, pockets of innovation are demonstrably gaining ground. The traditional "Southern model"—a lá Reher—does not apply any longer in several areas of Southern Italy.

Admittedly, our study has limitations. First, all interpretations are restricted to the aggregate levels under consideration and correspondence correlations. It is necessary here to avoid the "ecological correlation" fallacy, or the extrapolation of correlations measured at the aggregate level for the individual level. Second, our indicator of one-parent families mixes two different situations, namely, one-parent families of unmarried/divorced parents with a young child and of widowed parents with a co-resident child. Unfortunately, we are unable to distinguish between these two family types because publicly available municipality-level data do not include the marital status and the age of the adult member of these families. Hence, we have to analyse them jointly, trying to disentangle the role of the two different types from contextual data and background information. Third, the focus on one-parent families offers just one key to understanding the temporal and spatial diffusion of new types of family-related behaviour. Note that detailed data on family typologies were collected for each census since 1991, but for reasons of privacy they are not available for the municipality level. This research can serve as a starting point for more contextual and place-specific future investigations that will explore a wider set of demographically appropriate measures for family composition. This would, in turn, be sensitive to the effects of variation in both population composition and kin availability.

Despite these limitations, our article offers important insights into time–space change in family forms for Italy. Although we can confirm the importance of the North–South divide, we have also shown that this divide masks substantial subregional and sub-provincial heterogeneities in the spatial organisation of family systems. We do not suggest that convergence will occur through all Italian municipalities. Nonetheless, we have documented that family change around the country accumulates, and that traditional, post-war family

arrangements have already lost ground. These patterns might have gone undetected had only larger territorial units of analysis been considered. Overall, this paper challenges the all too common idea of Italy as a monolithically family-oriented country.

CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

ENDNOTES

[1] Census data published by Istat refer to nuclear families, in which a unique conjugal and/or parental relationship exists. They are classified into four types (type a: both parents without children; type b: both parents with at least one child; type c: lone mother with at least one child; and type d: lone father with at least one child). Published data does not allow us to separate families including other cohabiting relatives (lacking their own family) from those without.

[2] However, for privacy reasons not all the variables collected are made available at municipality level in their full classification. For example, the only variable available by age and sex is the number of residents.

[3] In total, we operated 79 changes over 8,178 municipalities (0.97%).

[4] We considered only the votes for the lower House because the electors of the upper House (Senato della Repubblica) must be aged at least 26, thus excluding younger citizens.

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APPENDIX A

TABLE A1 Descriptive analysis on the response and covariates included on the GLMM

Variables		Time		
		1991	2001	2011
Proportion of one parent family	Min	0.000	0.000	0.000
	25th percentile	0.097	0.106	0.127
	50th percentile	0.113	0.122	0.146
	75th percentile	0.134	0.144	0.171
	Max	0.625	0.714	0.588
	Mean	0.119	0.129	0.154
	SD	0.036	0.038	0.041
Old age dependency ratio	Min	5.148	8.223	7.539
	25th percentile	19.845	24.479	28.286
	50th percentile	25.997	30.881	33.845
	75th percentile	33.519	39.286	41.063
	Max	182.500	180.000	178.125
	Mean	28.283	33.613	36.024
	SD	12.346	13.693	12.259
Crude birth rate	Min	0.000	0.000	0.000
	25th percentile	6.800	6.800	6.500
	50th percentile	8.900	8.600	8.500
	75th percentile	11.300	10.500	10.200
	Max	43.800	43.500	43.800
	Mean	9.147	8.622	8.404
	SD	3.862	3.368	3.322
Crude death rate	Min	0.000	0.000	0.000
	25th percentile	8.200	8.000	8.200
	50th percentile	10.500	10.200	10.400
	75th percentile	13.700	13.300	13.600
	Max	78.400	65.600	66.000
	Mean	11.631	11.348	11.565
	SD	5.467	5.327	5.488
Share of tertiary educated residents	Min	0.000	0.000	0.000
	25th percentile	1.090	3.220	5.810
	50th percentile	1.640	4.250	7.290
	75th percentile	2.340	5.558	9.050
	Max	19.430	37.400	29.410
	Mean	1.870	4.641	7.680
	SD	1.257	2.216	2.850
Share of low educated residents	Min	18.230	15.700	10.530
	25th percentile	49.553	37.640	28.940
	50th percentile	54.315	41.775	32.120
	75th percentile	58.950	46.180	35.758
	Max	96.150	79.510	71.160
	Mean	54.193	42.047	32.602
	SD	7.352	6.631	5.438
Percentage of individuals employed in the industry	Min	3.300	4.300	2.800
	25th percentile	28.900	27.300	22.800
	50th percentile	38.900	36.900	30.900
	75th percentile	49.300	46.500	38.800
	Max	85.800	79.400	75.000
	Mean	39.475	37.370	31.206
	SD	13.568	12.453	10.806
Percentage of vote for centre-left	Min	0.940	2.310	3.160
	25th percentile	18.513	25.000	27.240
	50th percentile	27.565	31.375	33.695
	75th percentile	39.008	38.558	41.030
	Max	80.210	75.740	73.270
	Mean	29.486	32.244	34.393
	SD	14.262	10.542	10.466
Share of individuals in search for a job	Min	0.000	0.000	0.000
	25th percentile	6.793	3.850	5.770
	50th percentile	10.280	5.840	7.710
	75th percentile	24.020	14.965	13.570
	Max	69.710	51.320	42.180
	Mean	15.936	10.000	10.085
	SD	12.283	8.770	6.281

TABLE A1 (Continued)

Variables		Time		
		1991	2001	2011
Crude rate of immigration	Min	0.000	0.000	0.000
	25th percentile	15.400	15.800	22.100
	50th percentile	21.900	25.500	32.800
	75th percentile	30.900	36.000	42.600
	Max	174.000	214.300	205.100
	Mean	24.902	27.446	33.755
	SD	14.378	15.606	16.017
Crude rate of emigration	Min	0.000	0.000	0.000
	25th percentile	14.400	16.425	22.000
	50th percentile	19.300	22.200	30.500
	75th percentile	25.700	29.800	38.700
	Max	290.700	267.100	316.900
	Mean	21.667	24.329	31.593
	SD	12.560	12.435	13.981

FIGURE A1 Maps of Italian Regions (NUTS-2)

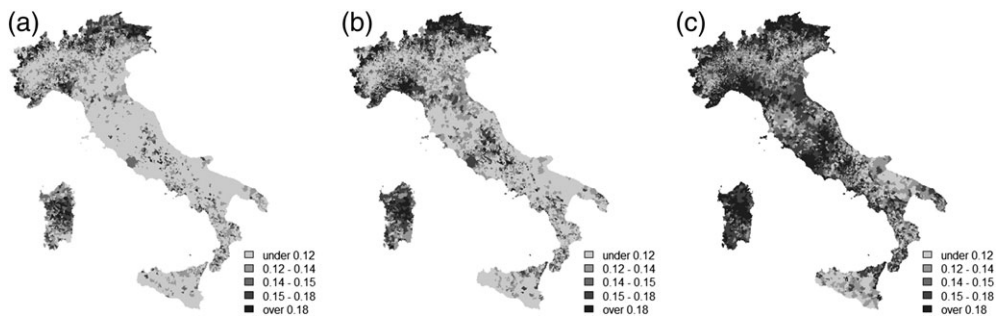**FIGURE A2** Raw rates to be a single parent family: (a) 1991, (b) 2001 and (c) 2011