



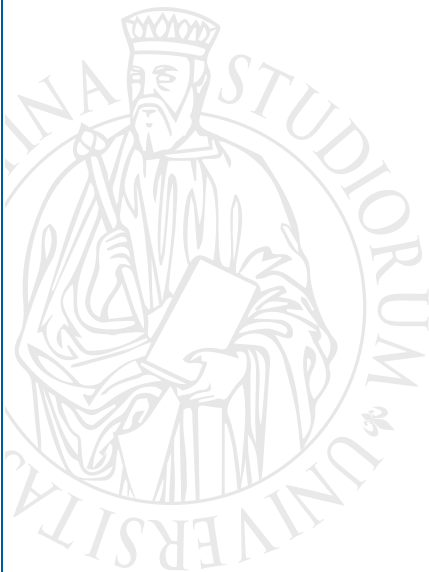
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**A subregional space-time
exploration of family change:
Italian municipalities, 1991-2011**

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A subregional space-time exploration of family change: Italian municipalities, 1991-2011

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Abstract

This paper posits that the *municipality level* offers important insights into the study of temporal and spatial patterns of family change. We focus on the diffusion of one-parent families in Italy: variation in the structure of co-resident domestic groups is a crucial indicator of changing diversity in family patterns. We apply a hierarchical Bayesian spatio-temporal model to the data of the last three Italian Population Censuses, at the municipality level. Our results show substantial sub-regional and sub-provincial heterogeneities in the spatial organization of family systems. These patterns might have gone undetected if larger territorial units of analysis had been considered.

Keywords: Family change; one-parent families; municipality level; Bayesian spatio-temporal model; Italy

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1. Introduction

Since the mid twentieth century, family typologies have diversified everywhere in Europe. 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 over time). Despite decades of debate about the geography and history of family and household composition, there has only been a limited use of spatial analysis (Ruggles, 2012). In a series of recent articles, Steven Ruggles (2009, 2010, 2012) has argued that family scholars should study historical changes in spatial variations in families and households, paying special attention to transformations such as the decline of intergenerational co-residence and the increase in one-parent families.

We hope to contribute to the literature on the diffusion of new family patterns by offering here a study of the temporal and spatial dimensions of the diffusion of one-parent families in Italy, for 1991-2011. The diffusion of one-parent families represents a valid marker of family changes as variations in the structure of co-resident domestic groups are the best indicators of diversity in family patterns (Gruber & Szoltysek, 2012). In addition, diversity in living arrangements reflects a variety of preferable or achievable residential patterns and likely indicates differential notions about living together as a family. By documenting the variability of one-parent families, this study also offers a new understanding of Italian demographic processes, as residence patterns are intimately linked to parallel demographic forces, such as increasing longevity, declining fertility, postponed exit from the parental home, and marital disruption trends. Importantly, Italy is, for these purposes, particularly interesting as the country has undergone secularization and revolutionary family changes over the last decades (Gabrielli & Hoem, 2010; Salvini & Vignoli, 2011).

When conceptualizing how family composition might be related to the social context and socioeconomic conditions, one has to note that there can be links across multiple social and geographic dimensions (Klüsener et al., 2013). At the community level, they can operate in a dyadic form in household and family contexts, or within neighbourhoods or social networks (Meggiolaro, 2011). Previous authors found important distinctions in fertility and nuptiality in eastern and western 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 to map family-related behaviour is that spatial units have often been quite large (Potter et al. 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 regional or provincial level, are however deeply rooted in individual municipalities. Here they produce effects that alter the general population structure, sometimes profoundly. In addition, a focus on the municipality level allows researchers to distinguish between *mountain areas* and *valleys* and between *interior* and *coastal areas* that have traditionally had, in Italy, different familial and demographic patterns (Breschi, 1985; Golini et al., 2000). We substantiate these considerations by performing a detailed reconstruction of family typologies at the municipality level, based on the last three Italian Population Censuses, investigating, there, 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.

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 estimate of the level of diffusion of one-parent families. This article proposes a unified framework for a Bayesian spatial analysis of the diffusion of one-parent families in space and time, in which the spatial structure of regions can be used to “borrow strength from neighbours” when estimating the trajectories of individual municipalities. In our approach, both spatial and non-spatial considerations arise, and spatial-temporal interactions may, as such, become an important factor. By empirically describing sequences of temporal and spatial change, we provide a historical foundation for understanding the ongoing transformation of Italian family demography.

2. Background and related works

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

Demographic change does not occur in temporal or spatial isolation. Rather it is influenced by prevailing contextual conditions (e.g., Coale & Watkins, 1986). Individuals are, by their very nature, nested in households, wards, administrative regions, countries, etc., 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

can 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 nineteenth and the first half of the twentieth century. However, regional variation within countries was and has continued to be substantial through and beyond this period (Klüsener et al., 2013). Regional borders can demarcate not only socioeconomic, 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 (Coale & Watkins, 1986; Bongaarts & Watkins, 1996), and more formal spatial analyses (e.g., Bocquet-Appel & Jakobi, 1998), have documented the emergence of regional sub-cultures 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 et al., 1994). They claimed, indeed, that a more fine-grained analysis would produce a different picture of transition timing and flag up the relevance of socioeconomic covariates. We follow this recommendation by looking at the shaping of patterns of one-parent families at the municipality level in Italy.

It is worth remembering that while this paper examines macro-level processes, the decisions that produce these aggregates occur at the micro-level. Perhaps the best established theoretical framework on the diffusion of diverse family forms is the Second Demographic Transition (hereafter SDT; Lesthaeghe & van de Kaa, 1986). The rise of individualism and secularization have, according to this theory, led to shifts in the moral code that have allowed for major changes in family behaviour (Lesthaeghe & van de Kaa, 1986; Lesthaeghe & Surkyn, 2006). 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). 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 et al., 2015; Vitali & Billari, 2015).

2.2 *The Italian setting*

At the end of the 1970s, with some delay compared to most other Western European countries, family changes also began in Italy. These changes intensified in the 1990s, and accelerated in the first decade of the twenty-first century (Castiglioni & Dalla-Zuanna, 2009). Although the incidence of new family behaviour is still less evident in Italy than in other Western European countries, marriage dissolution is now pervasive and informal unions have reached surprisingly high levels; at the same time, Italian fertility has been blocked at very low levels since the 1980s.

In addition, Italy represents an interesting laboratory in light of the extraordinary territorial differences in the temporal and spatial distribution of families. Nonetheless, 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 and Righi (1999). Individual data is generally used to describe and verify behavioural assumptions, particularly survey data (e.g., De Sandre et al., 1997), which are not statistically representative at the municipality level. However, sub-provincial Italian differences are culturally rooted, and the local environment represents one of the main sources shaping family behaviour (Breschi et al., 2014). Ancient territorial divisions generate new differences, inhibiting or facilitating the spread of new behavioural patterns in family life.

The focus on the local dimension is necessary because of a remarkable variability at the sub-provincial level and the way that homogeneous areas do not respect regional and provincial borders (Golini et al., 2000). 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 et al., 2013; Rettaroli & Scalone, 2012). The rationale for the community approach has been that local conditions have a powerful influence on residence decisions. These historical studies are, by their very nature, geographically confined. A notable exception is recent research by Caltabiano and Dalla-Zuanna (2015) based on the Veneto region, which showed the relevance of the local community in shaping demographic

change. Overall, most of these studies focus on the seventeenth to the nineteenth centuries. Yet, the greatest period of family change proved to be the late twentieth century.

2.3 *The focus on one-parent families*

To analyse household and family composition in a temporal and spatial key, we must use demographically appropriate measures that are sensitive to the effects of variation in both population composition and kin availability (Ruggles, 2012). In this article, we consider the diffusion of *one-parent families* as a valid marker for family change. Such an indicator embodies two different situations: (1) a divorced¹ parent with a young child; and (2) a parent (widow) with a co-resident adult child (without his or her own family).

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 for almost half a century by Catholic-oriented governments (De Rose et al., 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 diminishing importance of marriage and because of the spread of divorce. These multiple waves of change follow the same geographical gradients of literacy, wealth, secularization, and female participation in the labour force (Livi Bacci, 1977; Castiglioni & Dalla-Zuanna, 2009).

The second category may be linked to *restraint factors*. Young Italians find themselves forced to remain at home due to a series of material constraints, not least high unemployment, underemployment with temporary jobs, a scarcity of available housing with reasonable rents, and a lack of governmental support in helping sons and daughters leave the parental home at a young age (Livi Bacci, 2001; Billari & Rosina, 2004). The cost of weddings remains a restraining factor, too (Vignoli & Salvini, 2014). Finally, there is the difficulty of finding a partner with adequate characteristics (age, 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).

This kind of multi-faceted theoretical framework cannot be comprehensively dealt with by the kind of territorial analysis offered below. However, by looking at matters with a

¹ We use the term “divorced” for simplicity, but we also refer to unmarried parents who experienced spells of cohabitation over their life course.

strong focus on the territory, we are able to document how these dynamics coexist even within the same region and 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 in Italy.

3. Analytical strategy

3.1 The model

The generalized linear mixed model (GLMM) is one of the most useful constructions in modern statistics. It allows an extraordinary range of complications (related to multiple levels of dependency and different data types) to be handled within the familiar linear model framework. Building on the model proposed by Knorr-Held (2000), a GLMM is used for studying the temporal and spatial dimensions of one-parent families in Italy. The hierarchical Bayesian approach is taken and a Markov chain Monte Carlo (MCMC) procedure is used for estimation and inference.

Our response measurements denoted as y_{it} are the number of “one-parent families” for municipality i -th at the census t -th. 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 i -th municipality and t -th census.
- π_{it} is the probability for a family in i -th municipality and t -th census to be 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 socioeconomic 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:

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

where:

- x_{itk} ($k=1, \dots, K$) is the value of the k -th covariate for municipality i and census time t .
- $\beta_0, \beta_1, \dots, \beta_K$, 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 (ICAR) model.
- 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 refers only to three censuses.
- ϕ_{it} is a space-time heterogeneity effect. This interaction can represent all kinds of – non persistent – circumstances that can cause a slight increase or decrease in the probabilities in a specific region-period. This allows for random – independent – oscillations around expected global probability.

In the Bayesian approach, all unknown functions and parameters can be treated within a unified general framework by assigning appropriate prior distributions 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 .
- The prior distribution for each u_i is an intrinsic autoregressive conditional (ICAR) 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 $1/n_i \sum_{\{i \sim j\}} u_j$, 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. In our model, we assumed that the interaction term is structured in space and not in time. 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 has been given 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 the calculations have been done using Open BUGS (Lunn et al., 2000).

Given the high number of terms in the models, convergence has only been assessed on a subset of the identifiable parameters. Gelman and Rubin (1992) test and partial autocorrelation plots have been used to check for achieved convergence of probabilities and τ hyperparameters.

3.2 Data and covariates

Italian population censuses are carried out by Istat (the Italian National Institute of Statistics) every ten years, and the corresponding socio-demographic data are available for the municipality 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 municipality level (about 8,000 administrative units), a territorial level rarely considered in Italian studies (for an exception, Salvati & Carlucci, 2016). 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, 2016). If two municipalities merged between 1991 and 2011, we consider them as always being one. Conversely, if a municipality split in two or more new administrative units in the same period we continued to consider them as a single unit.

The dependent variable consists in the share of one-parent families (lone mothers and lone fathers with children).

As independent variables, we considered a range of demographic, socioeconomic, and cultural characteristics. We retained, in the final model, those playing a statistically significant role. Living arrangements are highly sensitive to age structures across populations. Hence, we included in the model the *aging index*, computed as the ratio between the share of individuals aged 0-14 over those older than 65. Beside age structure, demographic conditions also affect family composition by determining the availability of kin for co-residence. For instance, co-residence with a parent is possible only if one of the parents is still alive. The

² However, for privacy reason not all the variables collected are made available at municipality level in their full classification.

particular configuration of kin available for co-residence in a given population is a direct function of the prevailing levels of fertility and mortality (Ruggles, 2012). Hence, we included two additional statistical controls, namely the *crude birth and death rates*. To account for the residential relocation of individuals and, more generally, for internal Italian migratory movements, we included the *crude immigration and emigration rates* (Pugliese, 2006). All these rates were approximated as the ratio between events in the census year and residents recorded in the census. At the onset of the analysis, we verified that the aging index 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.

In addition to the general demographic characteristics of the population, new living arrangements may mean different socio-economic and cultural conditions. To acknowledge the temporal and spatial economic differentiation of one-parent families we included two additional covariates in the model. First, the *share of tertiary educated people* is considered as a valid proxy of labor-market status and prospects, as well as a general marker of modernization. This indicator was calculated as the share of residents with at least completed secondary education among those aged six or older. Second, the *share of individuals in search of a job* is used as a pointer for economically-disadvantaged and deprived areas.

Accounting for the role of cultural factors in shaping family-related differentials is much more complicated. This is due to the lack of proper municipal-level data. We decided to proxy cultural changes across Italy by considering the *proportion of votes gained by the centre-left coalition* and the *proportion of votes gained by the centre-right coalition* over the last decades. Residents of geographic areas that retain traditional forms of family formation and dissolution, as well as lower levels of secularization, should display centre-right preferences – something that would correspond to a preference for the Republican Party in the United States (Lesthaeghe & Neidert, 2009). In particular, we elaborated the data of the Italian Ministry of Interior's *Eligendo* historical database (<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).³

³ We considered only the votes for the lower House because the electors of the upper house (*Senato della Repubblica*) must be aged 26 at least, thus excluding the political orientation of younger citizens.

We also built in several other variables, such as the share of individuals employed in different economic sectors and the average number of individuals by family. They did not emerge, though, as being significant and were, therefore, omitted from the final models. At the first stages of the research, we introduced the population density of each municipality into the model specification. This, however, did not prove to play a significant role. Note that the municipality size is indirectly considered in the dependent variable by counting the number of one-parent families. Note that we also ran separate analyses distinguishing between regions in the North and South, but the results were not informative.

4. Results

4.1 *Factors associated with changes in the incidence of mono-parental families*

We start the description of our results by looking at the determinants of the likelihood of one-parent families both geographically and temporally (**Table 1**). It is worth recalling that while interpreting the results we have to assume that the effect of each covariate is constant over municipalities and time points.

Our results show that the higher the aging index, the higher the odds of one-parent families. The population is older in Centre-North Italy, where new family models are especially widespread: this suggests the diffusion of a family typology formed by a (divorced) parent with her/his young child. In addition, “older” areas may also have a parent (possibly widowed) with a co-resident adult child, often signs of economic weakness in the locality. In a smaller number of cases an unmarried (divorced) adult child remains (or becomes) co-resident, assisting an elderly widowed parent in poor health.

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. Then, the higher the crude mortality rate, the higher the odds of one-parent families. This indicator is, by definition, a crude rate: the population is older in the Centre-North of Italy, where new family models are more widespread.

As regards the socioeconomic predictors of the incidence of one-parent families, we show that the growth in the number of highly-educated people increases the odds of one-

parent families. Based on theoretical SDT considerations, one might expect the highly-educated to be at the forefront in adopting new forms of behaviour such as cohabitation, because they perhaps have more liberal values and are more resistant to prevailing social stigmas. Moreover, the diffusion of new forms of behaviour is facilitated in better-educated areas (for example, large cities and their residential suburbs) (Rosina & Di Giulio, 2007; see also Coale, 1973). These findings are clearly connected to the emergence of innovative models of family behaviour.

A larger share of people in search of jobs increases, meanwhile, the odds of one-parent families. This finding signals a pattern of disadvantage that is intimately related to economic uncertainty: 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 younger ages, and then get divorced (Ongaro et al., 2009;). As a result, the share of individuals (mostly women) living alone with children increases. After a divorce, men may also be obliged, for financial reasons, to take up residence again with an old (possibly widowed) parent. In addition, in particularly deprived areas, unemployed men with low education may not find a match in the marriage market, and, so, remain at home with a parent.

Surprisingly, the proportions of votes for the centre-left or centre-right coalition are both negatively related to the probability of there being a one-parent family. Possibly, their effects may interfere with one another across the municipalities. Alternatively, the vote for either of the large political coalitions, which dominated Italian politics in the 1990s and 2000s, may point to a centrist position, less favourable to new family forms: alternative and culturally more innovative parties may be more open in this respect. We decided to retain these variables in the final specification because they are statistically significant and may thus control our estimates for changes in the cultural inclinations of residents (De Rose et al., 2008; Lesthaeghe & Neidert, 2009).

Table 1. Determinants of changes in the probability of being a one-parent family. Italy, 1991-2011. Estimates of fixed effects (exponentialized): means of posterior distribution from the GLMM model with their 95% credibility intervals (CI).

Coefficient	mean	lower 95% CI	upper 95% CI
<i>Constant</i>	0.8654	-	-
<i>Share of tertiary educated people</i>	1.0244	1.0232	1.0257
<i>Aging index</i>	1.0003	1.0002	1.0003
<i>Share of individuals in search for a job</i>	1.0031	1.0026	1.0036
<i>Crude birth rate</i>	0.9962	0.9953	0.9972
<i>Crude death rate</i>	1.0080	1.0073	1.0088
<i>Crude rate of immigration</i>	0.9994	0.9991	0.9996
<i>Crude rate of emigration</i>	1.0007	1.0004	1.0009
<i>Percentage of vote for centre-left</i>	0.9956	0.9952	0.9961
<i>Percentage of vote for centre-right</i>	0.9976	0.9972	0.9980

4.2 The time dimension

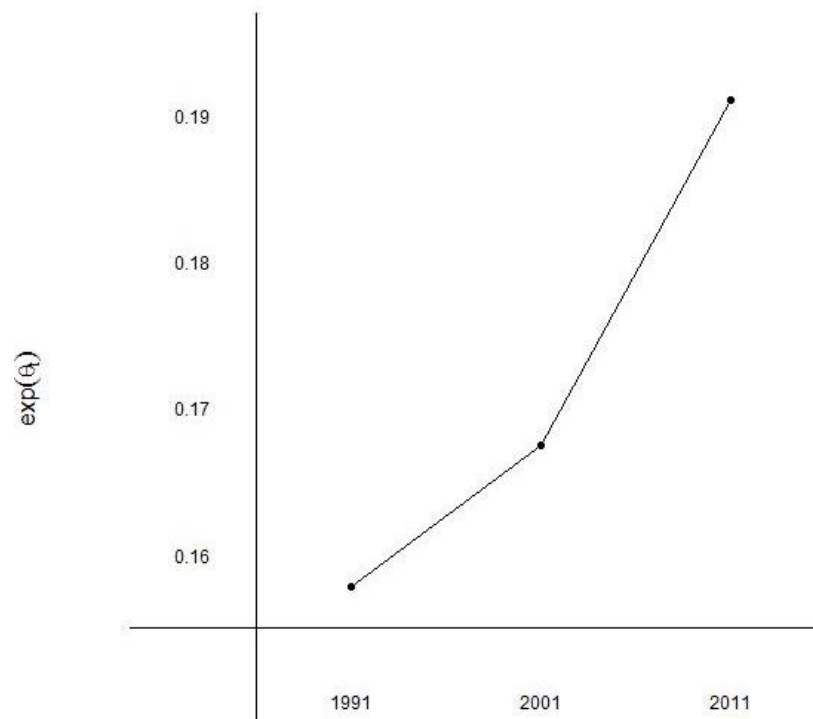
Figure 1 displays the time trend for the period 1991-2011 for the diffusion of one-parent families: averaged across all municipalities and net of all covariates introduced into the equation. The increase in the probability of being a one-parent family grows through these two decades. Demographic factors did play a major role in this context. Mortality declined, and consequently more elderly parents were available for co-residence. Fertility declined, too, so the pool of available elderly parents was shared among a smaller, younger generation. Beside the demographics, socio-economic mechanisms are, also, at play.

We note a clear change upwards in the speed of diffusion in the period 2001-2011, compared to the slower diffusion of 1991-2001. This pattern can be interpreted in two ways. First, the prevalence of a single parent (divorced) with a young child increases as part of a more general socio-demographic trend. 2001-2011 marks a clear acceleration in the diffusion of new family patterns in Italy. Social observers suggested that the cut-off point had been 1995. After that year fertility started to rise again, the popularity of cohabitation increased, and divorce reached unprecedented levels (Castiglioni & Dalla-Zuanna, 2009), being no longer confined to trendsetters (Salvini & Vignoli, 2011).

Second, the prevalence of the single parent (widow) with an adult co-resident child (without their own children) 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. Difficulties included finding a home for reasonable rent; the burden of domestic loans; and the stagnation of public housing development; as well as youth unemployment. Moreover, the recent increase in migrant women in Italy has changed the pattern of assortative mating and the marriage market generally. This has enlarged the possibilities of choice and has created new opportunities for men (usually those who are less educated and on a lower income) who had previously been excluded from the marriage market (Maffioli et al., 2014). The growing presence of foreign women generated an increase in mixed marriages, helping to balance the simultaneous loss of marriages among natives. At the same time, migration often brings a surplus of women, and these women may be a factor in the breakdown of native marriages (Vignoli et al., 2017). Hence, the increasing presence of female migrants facilitates the disruption of established couples and favours the formation of new couples.

Figure 1. Time trend in the diffusion of one-parent families (average across all municipalities). Italy, 1991-2011. Estimates of $\exp(\theta_t)$ from the GLMM model

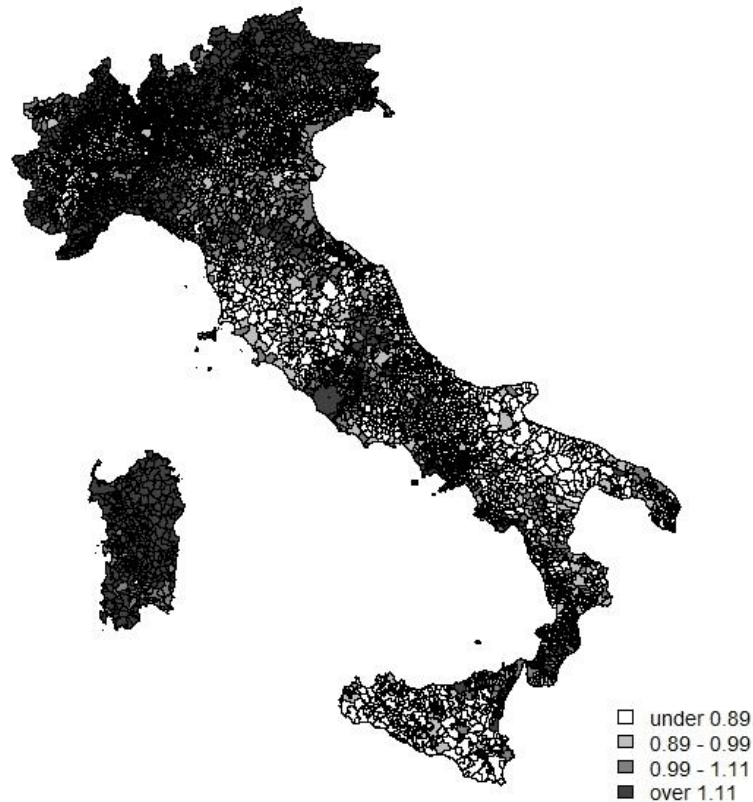


4.3 *The space dimension*

Figure 2 displays the spatial distribution of one-parent families across Italian municipalities: averaged across the period 1991-2011 and net of all covariates introduced in the equation. A map of Italian regions and provinces is displayed in Appendix 1. Clearly, the “innovative” North and the “traditional” South offer two different models here. Thus, at the first glance, the synthetic picture shows a dual-level process. Nonetheless, the whole pattern masks substantial sub-regional, and even sub-provincial, differences. For instance, some regions seem to be characterized by a remarkably heterogeneous pattern: e.g., Apulia, Sicily, Sardinia, and Calabria. Within their borders, pockets of innovations can be found, for example, in the north-eastern municipalities of Sicily.

Demographically vulnerable areas can be noted in the high hills and in the mountains. Take, for example, the mountain municipalities in the Apennines, or in the Abruzzo and Sardinian interior. These Abruzzo and Sardinian municipalities, particularly, appear to be characterized by a “demographic malaise” (Golini et al., 2000) – i.e., a very low crude birth rate, an inverted age structure, and more generally a profound modification of the normal demographic processes, and a deterioration in the local socio-economic environment. Interestingly, the “demographic malaise” involves a substantial number of municipalities, but a small number of people, as mostly these are small or very small municipalities. 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.

Figure 2. Spatial distribution of one-parent families (average across all periods). Italy, 1991-2011. Estimates of $\exp(\omega_i)$ from the GLMM model



4.4 *The space-time interaction*

Figure 3 illustrates the interaction between the spatial and the temporal diffusion of one-parent families. This interaction allows us to disentangle the effect for each municipality and for each period (1991, 2001, 2011). We note a continuous diffusion process in almost all areas to the south of the Po River, which offered a sharp dividing line, especially in 1991 in the Lombardy and Veneto regions. This process is especially visible in the municipalities located in the centre of Italy (especially Liguria, Emilia Romagna, and Tuscany) and in the densely populated plains of the north-west. The temporal and spatial diffusion of the likelihood of being a one-parent family is also remarkably different within regions and provinces: for instance, in the municipalities located along the Po Valley or in the metropolitan area of Naples. These changes can be said to conform to the SDT narrative, showing 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 southern regions and in peripheral areas (Salvini & Vignoli, 2011).

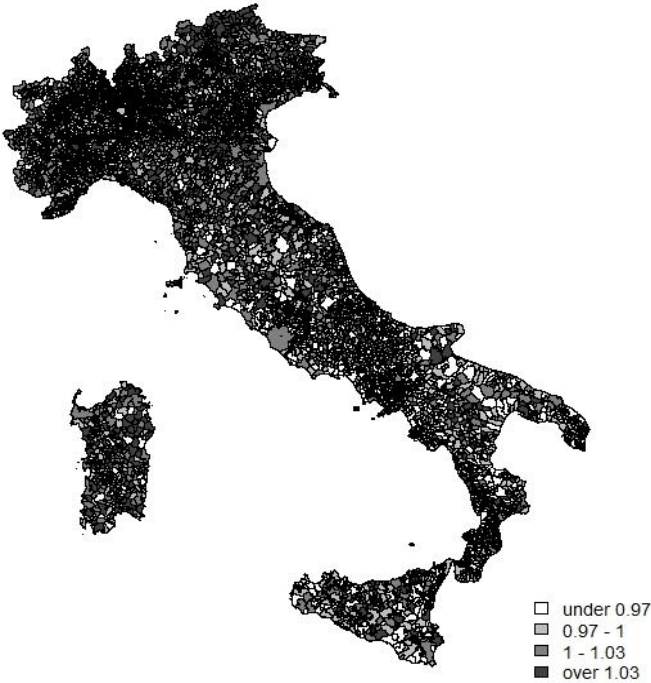
A more complex – U-shaped – dynamic characterizes the South. In the first decade under study (1991-2001), we observe a contraction in the number of one-parent families. This contraction can likely be attributed to the declining prevalence of a parent (widow) with an adult co-resident child (with no children of his or her own). As already noted, the reasons beyond this decline can be explained by young adults no longer being trapped in 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 study (2001-2011), we detect, however, an increase in the likelihood of one-parent families. We ascribe this increase to the diffusion of (divorced) parents with a young child or children. This is the decade in which more innovative forms of family behaviour spread through Italy. This U-shaped pattern is discernible in Sicily, where 1991-2001 the probability of being a one-parent family decreased, especially in the most traditional and economically-deprived southern areas of the island. Then, in the following decade, the increase in the prevalence of one-parent families was especially visible in the more modern and secularized parts of Sicily, such as the metropolitan areas around the coastal cities of Catania and Messina (in the northeast). A very similar story is found within Calabria. Here the secularized north of Calabria contrasts with the more economically disadvantaged south. In Sardinia, too, the innovative west (Sassari) stands against the more traditional east (Barbagia).

The diffusion pattern of one-parent families in the Northeast is more difficult to explain. We notice an overall inclination towards a contraction in the incidence of one-parent families. Is this because of a growing international migratory presence that revitalizes the (re)marriage market, favouring the formation of new (or reconstructed) unions through mixed marriages? The cities of Padua and Venice continue to display higher levels of one-parent families over 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.

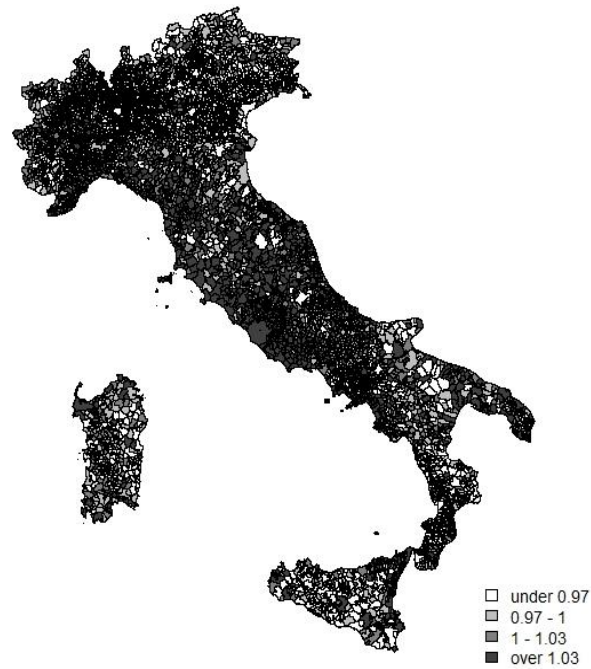
Figure 3. Space-time diffusion of one-parent families. Effect for each municipality and each period respectively: (a) 1991, (b) 2001 and (c) 2011. Estimates of $\exp(\varphi_{it})$ from the GLMM model



(a)



(b)



(c)

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 remains largely 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 help marking out stable regional sub-cultures: these were often related to territorial characteristics, for example, mountainous or otherwise isolated areas. These 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 structural predictors theorized for the SDT should be: value changes; the diffusion of tertiary education and (women's) labour-force participation; and the increased concentration of employment in the tertiary sector. These hold best in the

North of Italy, where the SDT is most clearly connected to urban-life and economic development. Nonetheless, traces of SDT innovations can be clearly seen in the south too, in those areas exposed to more favourable employment distribution and 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 a (divorced or unmarried) parent with young children (Livi Bacci, 1977; Dalla-Zuanna & Righi, 1999). On the other hand, a more dynamic marriage market, shaped by an increased number of migrants, and the falling off of restraining factors on young adults' intent on leaving the parental home, may have contributed to the decline of the model of a parent (widow) with a co-resident adult child (with no children). Nevertheless, the recession of 2008 with downturns in both the financial and the labour market, may have, again, 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 conceptualized and phrased in terms of socioeconomic 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.

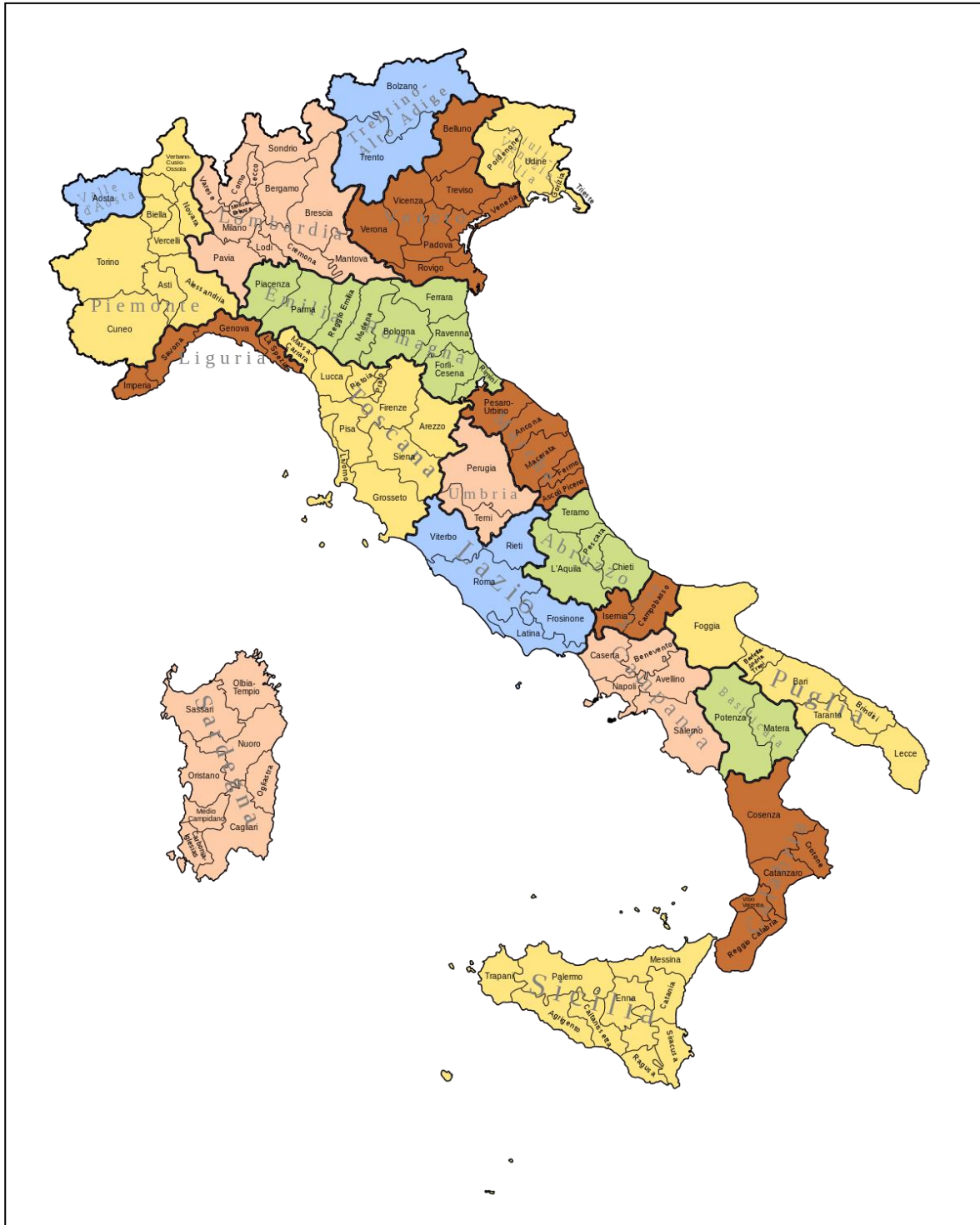
Third, our article also contributes to the debate about the diffusion of new family patterns in Mediterranean Europe. Italy belongs to the so-called "Southern or Mediterranean model", characterized, according to several scholars, by a very low level of social protection and strong family ties (e.g., Reher, 1998). These countries are classified as "traditional" in term of values because of strong Roman Catholic influence (Caltabiano et al., 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 to the rest of Europe (e.g., Reher, 1998; Nazio & Blossfeld, 2003). Other researchers argue that Italy is just a latecomer, as the diffusion of new family patterns is only temporally lagged (e.g., Barbagli et al., 2003; Salvini & Vignoli, 2014). Our meticulous municipality-level analysis into new family patterns clearly opposes the idea of a static Italian context. By using a Bayesian approach that retains small geographic units and borrows data from neighbouring areas, we have directed attention toward patterns that would have been invisible in larger geographic aggregates. Traces of family changes can be, in fact, located in any part of the country. Indeed,

even within the more traditional regions, pockets of innovation are demonstrably gaining ground.

Our study has, admittedly, 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 to the individual level. Second, the focus on one-parent families offers just one key to understanding the temporal and spatial diffusion of new family-related behaviours. Note that detailed data on family typologies were collected for each census since 1991, but for reasons of privacy they are not available at 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 that would be sensitive to the effects of variation in both population composition and kin availability.

Despite these limitations, our article offers important insights into space-time change in family forms for Italy. While we confirm the importance of the North-South divide, we have also shown that this divide masks substantial sub-regional and sub-provincial heterogeneities in the spatial organization 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, suggesting that traditional, post-war family arrangements have already lost ground. These patterns might well have gone undetected if only larger territorial units of analysis had been considered.

Appendix 1. Maps of Italian Regions and Provinces



Source: Wikipedia.

(https://upload.wikimedia.org/wikipedia/commons/thumb/a/a0/Italian_regions_provinces.svg/1200px-Italian_regions_provinces.svg.png)

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