Sub-national Differences in Leaving Lowest-low Fertility in Italy

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Abstract This paper makes use of spatial econometric techniques to unravel the spatial and temporal mechanisms behind recent fertility change in Italy, using data for Italian provinces from 1999 to 2008. Results show that there exists spatial association in provincial fertility rates. This association suggests that the diffusionist perspective to fertility change might still be helpful in explaining sub-national fertility differentials.

1 Introduction

The European Fertility Project [2] explains the fertility decline during the First Demographic Transition with the diffusion of new attitudes and ideas towards the value and cost of children, and new behaviours due to acquired knowledge regarding birth control techniques, spreading among people and places [4]. This paper uses a similar perspective on diffusion of new attitude and ideas to explain the recent fertility recuperation in Italy in association with a series of indicators of marital behaviours, female occupation, contribution of foreign fertility and economic development.

After reaching its lowest level in 1995, fertility has been increasing slightly at the national level, but Italian provinces have shown different geographical patterns of leaving lowest-low fertility, with regions in the North acting as the forerunners in fertility recuperation.

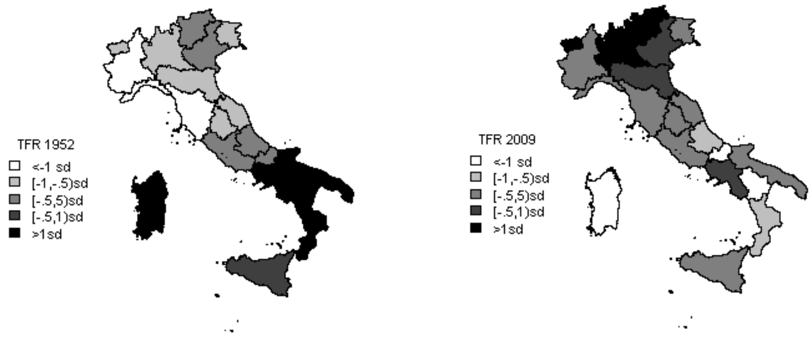
2 How many Italies are there? A look at sub-national fertility differentials

The story of Italian regional heterogeneity dates back in history and is not confined to a North-South divide [3,5]. Historically, fertility was considerably higher in the South of

Italy than in the Centre and North. During the economic recovery following the Second World War fertility increased in most regions, but not in all of them. In Southern Italy, fertility was already high during the 1950s, and it remained quite stable thereafter, while in most Northern and Central regions it experienced a steady increase [6]. The fertility trend reversed during the mid-1960s and the decline came to a halt in 1995, when a TFR of 1.19 was recorded. During the 2000s, fertility increased in most regions while in a few others it continued to decline. In very recent years there has been a reversal in that it is the North which now shows the highest regional fertility, something that used to characterize the South. Regional fertility also appears more heterogeneous than it was in the past because we no longer observe a clear divide between Northern and Southern regions. For instance, fertility levels in the Southern region of Campania are more similar to those observed in North-Eastern regions than to other Southern regions.

Figure 1 maps the period total fertility rate (TFR) in the twenty Italian regions for the two years marking the beginning and the end of the period for which the National Statistics Institute (Istat) provides available data at the regional level. The figure shows two main features of Italian regional fertility: first, there is sub-national variation and second, there is spatial clustering, in the sense that close regions tend to show similar fertility levels.

Figure 1: TFR in the 20 Italian regions in year 1952 and 2009

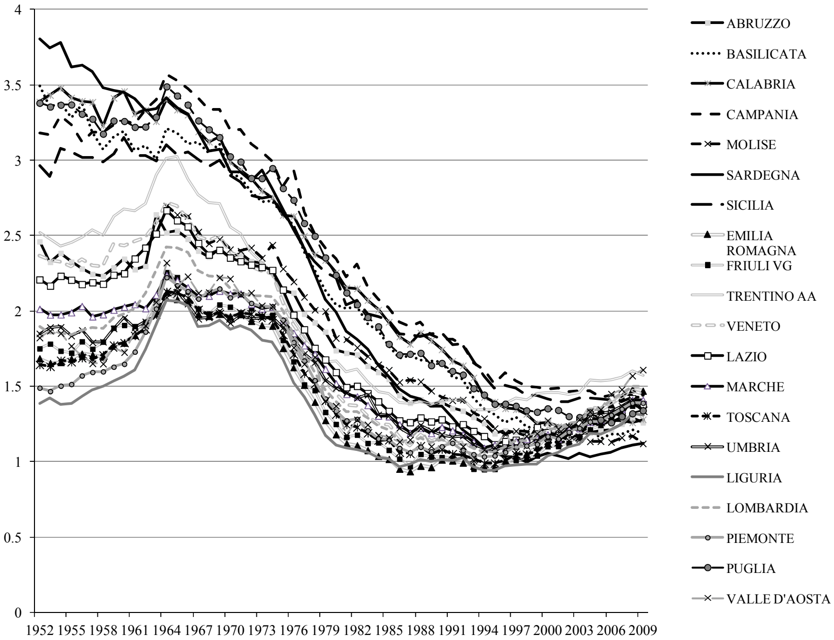


Note: The legend is to be read in terms of standard deviations (sd) from the mean: ">1 sd" indicates regions whose TFR is one sd above the mean; "[.5;1)" between .5 and 1 sd above the mean; [-.5;.5) .5 sd around the mean; [-1;-.5) between .5 and 1 sb below the mean; "<-1" 1 sd below the mean. Mean and standard deviations were 2.39 and 0.74, respectively in 1952 (a) and 1.37 and 0.13 in 2009 (b). Panel (a) considers Molise and Abruzzi as a unique region since Molise became an autonomous region only in 1964.
Source: Istat, "Tavole di Fecondità della popolazione italiana per regione di residenza" for 1952, and Survey on Live Births for 2009.

If in the early 1950s there was a (although not perfect) core-periphery pattern with high levels of TFR observed in Southern regions and low values observed in Northern regions, in 2009 the picture is completely different. In 2009 all Southern regions show a TFR below the national average, Campania and Sicily being the only exceptions; conversely, all Northern regions have a TFR above the national average, with the exception of Liguria. Of course regional differentials in fertility levels in 1952 were not the same as they are today. In 1952 in fact, Italian TFR was equal to 2.34 children per woman, with huge regional variations ranging from a maximum of 3.8 in Sardinia to a minimum of 1.39 in Liguria. In 2009, when the national TFR was 1.41, variations around the mean were very moderate, ranging from 1.12 in Sardinia and Molise to 1.61 in Valle d'Aosta.

Figure 2 shows the evolution of the TFR over the period 1952-2009 for the 20 Italian regions. Liguria held the lowest regional TFR in Italy for almost the whole period, with a value as low as 1.39 already in 1952. A very low fertility level was observed also for the North-Western region of Piedmont where the TFR was 1.49 children per woman in 1952.

Figure 2: Evolution of TFR in the 20 Italian regions, 1952-2009



Source: Istat, "Tavole di Fecondità della popolazione italiana per regione di residenza" for 1952, and Survey on Live Births for 2009.

In the same year, the TFR in Sardinia was 3.8 children per woman –almost three times that of Liguria. The TFR was above 3 children per woman also in the Southern regions of Basilicata, Calabria, Apulia and Campania (3.49, 3.39, 3.38 and 3.18, respectively). Liguria and Emilia Romagna were the first two regions to cross the lowest-low fertility threshold of 1.3 in 1979 (with a TFR of 1.18 and 1.28, respectively), followed by Friuli-Venezia-Giulia (North-East) in 1980 (1.25), Piedmont, Tuscany and Valle d'Aosta in 1981 (1.27, 1.25 and 1.18). The same threshold was crossed more than 10 years later in Southern regions, starting in 1991 with Sardinia (1.29) followed in 1993 by Abruzzi (1.3), while Calabria (1.25) and Apulia (1.3) reached below replacement fertility in 1999 and 2003, respectively. Campania, Sicily and the North-Eastern region of Trentino-Alto-Adige remained above the 1.3 threshold throughout the whole period. By 2008 all Northern and Central regions, with the exception of Trentino-Alto-Adige, had exited from lowest-low fertility, the forerunner regions being Veneto, Lombardy, Valle d'Aosta, Emilia-Romagna and Umbria in 2004 (with TFR equal to, respectively, 1.36, 1.35, 1.33, 1.32 and 1.31). With only few exceptions, Southern regions instead registered lowest-low fertility levels still in 2009. Particularly noteworthy is the case of Sardinia, which, during the 1950s was the region with the highest fertility, above 3.5 children per woman, and then, during the 1970s and 1980s experienced the fastest reduction in fertility among Italian regions until the 2000s, when it became the region with the lowest fertility with 1.12 children per woman in 2009. Italian regional data therefore suggest that the aggregate level hides great intra country variation.

3 Data and Methods

For our analyses, we focus on a more disaggregated dataset, with data for 99 Italian provinces over the period 1999-2008 (the eight provinces of Sardinia are excluded they provinces underwent administrative changes which impeded to have a balanced panel). We study fertility (TFR) in relation to four indicators: GDP and its square, immigrant fertility (proportion of children with foreign parents), gender gap in employment (equals to one minus the proportion of working women on the total female population aged 15 and over, relative to the same proportion calculated for the male population), and proportion of civil marriages on total marriages (considered as an indicator of secularization).

Spatial panel models with provincial fixed effects [1] allows the TFR in a given province (y_{it}) to depend on the TFR observed in neighbouring provinces. Using the notation in Elhorst (2010) the model is formally described as follows:

$$y_{it} = \delta \sum_{j=1}^{N} w_{ij}\, y_{jt} + \boldsymbol{x}_{it} \boldsymbol{\beta} + \mu_i + v_t + \varepsilon_{it} \quad i,j = 1,\dots,N;\ t = 1,\dots,T$$

where i indexes the provinces and t the time periods. The dependent variable y_{it} is the TFR observed in location i at time t, y_{jt} is the TFR observed in province j at time t, δ is a scalar parameter, $\boldsymbol{x}_{it}$ is the vector of independent variables measured in province i, of dimension 1xk, $\boldsymbol{\beta}$ a matching vector of fixed unknown parameters, while μ_i and v_t denote province-specific and time-period fixed effects, respectively. The difference with respect to the fixed effects panel model is the term $w_{ij}\ y_{jt}$, which is the spatial lag of the dependent variable (Cliff and Ord 1973), with w_{ij} equal to the weight assigned to province j. Spatial dependence operates through a pre-defined, user-specified spatial weight matrix (W). The spatial weight matrix is constant over time, has dimension NTxNT and is a non-stochastic row-standardized spatial weight matrix which takes into account the neighbouring structure of the spatial units. Its entries, the weights, are specified as follows:

$$w_{ij} = \begin{cases} \eta_i & \text{if } j \in N(i) \\ 0 & \text{otherwise} \end{cases}$$

where N(i) defines the set of all neighbours to the spatial unit i and η_i is the cardinality of N(i) (i.e. the number of neighbours to spatial unit i) and it is assumed that a unit cannot be its own neighbour i.e. $w_{ii} = 0$. In this case neighbours are defined on the basis of a contiguity criterion, according to which two locations are neighbours if they share a border or an edge (queen criterion). The coefficient δ measures the spatial autocorrelation in the dependent variable. A positive and statistically significant estimate of δ has to be interpreted as spatial autocorrelation in the TFR or, in other words, that provinces with similar values of the TFR tend to cluster together in space, which is evidence in favour of spatial diffusion of fertility. The models are estimated by a two-step Maximum Likelihood procedure using the “splm” library (Econometric Models for Spatial Panel Data) in R.

4 Results

Table 1 reports coefficient estimates for the traditional panel model and the spatial panel model with provincial and time-period fixed effects. Disregarding spatial dependence leads to overestimating the effect of all indicators chosen to explain fertility. For instance, if we estimate the effect of provincial GDP on the provincial TFR using the traditional fixed-effects panel model, we find that a one standard deviation increase in the indicator leads to a 1.02 standard deviation reduction in the TFR. This effect weakens to -0.71 when we account for spatial dependence across neighbouring provinces, using the spatial panel fixed effects model. A similar reduction in the estimated coefficient exists for fertility of foreigners (from 0.60 in the traditional panel model to 0.45 in the spatial panel model), gender gap in the labour market (from 0.08 to 0.07) and secularization (from 0.21 to 0.1).

Table 1: Results from the fixed-effects panel and spatial panel models

	Fixed-Effects Panel Model			***Fixed-Effects Spatial Panel Model***		
	β		***s.e.***	***β***		***s.e.***
GDP	-1.024	***	0.233	-0.707	***	0.208
GDP2	1.320	***	0.189	0.903	***	0.173
Fertility of Foreigners	0.597	***	0.045	0.446	***	0.042
Gender Gap	0.079	*	0.036	0.074	*	0.032
Secularization	0.214	***	0.057	0.109	*	0.051
δ			0.233	0.329	***	0.037

Note: All variables are standardized. p-value: *** < 0.001; ** < 0.01; * < 0.05.

The estimated spatial autocorrelation coefficient of the TFR (δ) is equal to 0.33, indicating a positive spatial dependence of fertility across provinces. Basing on the selection of indicators chosen, GDP is the most important predictor of fertility in Italian provinces, followed by fertility of immigrants. If the contribution of fertility of immigrant increases by one standardized unit, the provincial TFR would increase by 0.45 standardized units. It should be noted that the effect of foreign fertility is probably underestimated. If we consider that illegal immigration is a widespread phenomenon in Italy, the true contribution of fertility of foreigners on total fertility is expected to be more important than what we are actually estimating. We find a positive association between fertility and gender gap in the labour market on average across Italian provinces. Provinces where secularization is more widespread tend to have higher fertility with respect to provinces where it is less widespread.

5 Conclusion

This paper contributes to the demographic literature on diffusionist perspective to fertility transition by studying the temporal and spatial dimensions of Italian provincial fertility trends simultaneously. Results show that spatial dependence in provincial fertility persists even after controlling for the usual correlates of fertility. In the study of demographic behaviours, spatial modelling is advisable when there are reasons to believe that the influence of neighbouring contexts is important. Contexts and spatial effects are embedded in individual decisions. Individuals shape and are shaped by the context in which they live. This paper shows that disregarding contextual influences and spatial effects leads to biased estimates, hence inaccurate conclusions about the outcome being studied.

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