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FERTILITY AND WELL-BEING IN THE ITALIAN REGIONS

Abstract: We analyse the association between fertility rates and well-being in the Italian regions in the period 2012-2017. Well-being is measured by the indicators of Equitable and Sustainable Well-being (BES), collected by ISTAT since 2013 with the aim of evaluating the economic, social and environmental development of the society through measurement of citizens' life quality. We expect that the regions performing better in terms of well-being conditions are also those with the highest levels of fertility. Both graphical and panel data regression analyses support our main hypothesis, but also reveal that in different clusters of regions the intensity and direction of the relationship significantly change. Our results also stress the need of taking the different domains of well-being into account while explaining reproductive behaviour of resident population at territorial level.

Keywords: Fertility, Well-being, Italian regions, panel regression

1. Introduction

After a slight recovery in the first decade of the New Millennium, the Italian period fertility level (TFR) - measured by the average number of children per woman – has reached the very low level of 1.32 in 2017, further estimated on decrease (ISTAT, 2019a). The level is very far below the one ensuring the replacement level (TFR=2.1), and equally distant from the ideal number of children that the Italians would like to have, that remains around two (Mencarini and Vignoli, 2018). For these reasons, it is considered as an indicator of a serious demographic malaise. Although the traditional North-Centre-South differences are attenuated, there are notable distances among regions as far as fertility is concerned, ranking from the highest and increasing TFR in the autonomous Province of Bolzano (1.74) to the very low level in Sardinia (1.06). These same territories are found in very distant positions in the ranking of the regions by well-being as measured by the indicators of Equitable and Sustainable Well-being - BES from now on (ISTAT, 2018). One cannot but wonder about an association between the two phenomena and the role played by the context in which individuals live on their reproductive attitudes cannot be ignored as well as that of the implicit and explicit policies that, improving the citizens quality of life, also favor the realization of their reproductive expectations. This, in turn, makes the aggregate level of fertility increase with a positive effect on population balance and structure.

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The goal of this work is to study the association between well-being, measured at territorial level in terms of economic, social and environmental conditions, and the reproductive behavior of the population measured by the fertility rates. The main hypothesis is that the regions with the highest level of well-being are also those with the highest level of fertility. The novelty of our approach is that we define the territorial context based on the well-being measures established within the ambitious BES project and which are based on the synthesis of a very large number of elementary indicators. Thus, a challenge of this work is also to verify the contribution of these well-being dimensions in explaining a complex phenomenon such as the reproductive potential of a territory.

2. Background and hypotheses

Spatial aspects of fertility in Western countries and their underlying drivers have always attracted the scholars' interest. The historical fertility transition happened in all the European countries has been accompanied by distinct inter-regional differences (Coale and Watkins, 1986). Even after Europe's second demographic transition, substantial regional variations in fertility has continued to exist (van de Kaa, 1987). Many studies try to explain the persistent regional variability of fertility (see for extensive reviews: Basten et al., 2012; Kulu and Boyle, 2009; Fiori et al., 2013). These studies differ from each other with respect to their approaches (micro, macro, micro-macro), the geographical scale of their analyses and the theoretical approaches. The variability in fertility observed at the local level might be interpreted according to three main hypotheses (Fiori et al., 2013). The first one, *compositional hypothesis*, argues that the territorial differences are only the reflection of the residential sorting of the population, and of the polarization of childbearing behaviour according to the demographic and socio-economic characteristics of individuals. Thus, fertility level differs only because different groups of people live in different places. However, more refined geographical analyses partially challenge this simplistic view suggesting the need to look at more complex system of mechanisms and factors (Boyle et al., 2007). The second explanation – *selection hypothesis* - refers to the idea that individuals or households with certain fertility expectations 'select themselves' into a given territory by moving there just in order to have a child. For instance, those intending to have large families would move to areas that are perceived as more suitable for raising children (for example, smaller town with more organized services to the families and a better environmental quality), whereas those willing to be child-free may choose to live in larger urban areas. The third hypothesis – *contextual hypothesis* – directly posits that aspects of the area where individuals live may encourage or discourage their childbearing. For instance, the availability and affordability of housing, family-oriented services and infrastructure, or economic opportunities and constraints which affect the direct and indirect cost of children are often reported as contextual factors which might account for observed spatial variations in fertility. Also, the cultural factors such the values system, gender roles or other social norms, as well as the extension and power of the social networks, can differ among territories even within the same country and can account for the local environment which are thought to shape fertility. Many studies evaluate the role of the contextual factors on population reproductive behaviour (see for a review: Entwisle, 1991). Meggiolaro (2011), in a study on Milan, found that the characteristics of the place where people live influence their reproductive behaviours, even after controlling for individual factors.

The changing social and economic conditions proved to play a fundamental role in explaining differences in fertility at territorial level in Italy (Vitali and Billari, 2017; Salvati et al., 2020). The recent economic downturn drew further attention to the reaction of fertility to the economic conditions (Goldstein et al., 2013). Cazzola et al. (2016) found that, while in Northern and Central Italian regions the rise of unemployment rate during the economic crisis related to a reduction in fertility levels, in the South the relationship has been weaker.

Any speculation on contextual effects on childbearing behaviour requires a thorough reflection on how the 'context' is defined and measured (Fiori et al., 2013: Kulu and Washbrook, 2014). Here we qualify the context in terms of territorial well-being. Well-being is a complex and multidimensional concept that involves many economic, social and environmental dimensions. It is linked to the available resources, the quality of life, subjective well-being, equity and sustainability. One single indicator – namely GDP - is not enough to represent it and it is necessary to assess a measurement system based on several indicators. For

over 20 years, many international organizations such as OECD, European Commission, United Nations, World Bank have been promoting initiatives to sensitize the national governments to go beyond the economic production dimension (OECD, 2020; Stiglitz et al., 2009; DSI4EU, 2016). The rationale is to measure the well-being by a multidimensional approach that includes, in addition to the objective socio-economic conditions, also indicators of the subjective evaluation of people's life quality, as well as measures of environmental sustainability.

Italy is ahead in defining and estimating well-being indicators. In 2011, the National Council for Economics and Labour (CNEL) and ISTAT began a collaboration, involving many social actors (institutions, citizens, companies, labour unions). The result was the definition of a system of indicators of the quality of life, measuring Equitable and Sustainable Well-being (BES), which are organized in 12 thematic domains and measured at the regional and provincial levels. Since 2013, ISTAT annually publishes the BES Report; in 2019 the seventh edition has been released (ISTAT, 2019b).

The association between the geographical variability of the BES composite indicators and that of fertility rates has been illustrated in a recent paper by means of a detailed mapping of the data and a rank association analysis through the Spearman correlation coefficient (De Rose et al., 2019). The results of those analyses confirm the existence of a positive association between ranking of the regions according to BES levels and the one based on TFR levels: the regions where all the well-being indicators are at the highest value (i.e. the two provinces of Trento and Bolzano) show the highest level of fertility, while those with the lowest fertility level (with Sardinia among them) perform worse as far as many BES indicators is concerned. However, both TFR and BES indicators show significant variations through time. Thus, both the territorial and the temporal dimensions must be considered in the analyses.

In this paper, we build our analyses on region-year units and test the linear dependency of the regional TFRs on the BES composite indicators by performing a panel regression analysis. We hypothesize a positive relation between the level of fertility at regional level and the regional context of well-being measured by the BES indicators. We also expect that the distinct domains of well-being play different roles in explaining the variability of fertility at regional level.

3. Data and methods

In the BES proposal, well-being is treated like a multidimensional concept and measured by means of a huge number of elementary indicators (around 130) grouped in 12 domains, each dealing with a dimension of human well-being. It is a dynamic measurement system: every year the indicators are updated (confirmed or substituted) to account for any change in their trends or in the data source. The 12 domains concern: health; education and training; work and life balance; economic well-being; social relationships; politics and institutions; safety; subjective well-being; landscape and cultural heritage; environment; innovation, research and creativity; quality of services (ISTAT, 2019b). For every domain, we use the effective synthesis of the BES indicators proposed by ISTAT, that is the composite indicator built with the AMPI method[1] (Mazziotta and Pareto, 2016).

Our focus is on changes occurred right after the first decade of the New Millennium which has been a crucial period for fertility in Italy (ISTAT, 2019a). Thus, we selected the BES composite indicators at regional level as provided by ISTAT for the period 2010-2016, and the regional TFRs for the years 2012-2017. We lagged the well-being indicators of two years in order to account for the time length which is needed for a certain contextual variation to produce an effect on fertility decisions (De Rose et al., 2019). Following Kolk (2019) the unit of analysis is the region-year, with yearly information available for all regions from 2012 to 2017. In total, the data for the study refers to 21 regions (including the two autonomous provinces of Trento and Bolzano) and 126 region-years.

Data are first analysed using bivariate scatter plots which enlighten the association among TFR, BES and year, within and across regions. This is followed by a correlation analysis and, finally, by a regression

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1   The Adjusted Mazziotta-Pareto Index (MPI) is a non-compensatory composite indicator based on a standardization of the individual indicators.

analysis in order to identify the BES domains that show a significant effect on TFR. Recently, a series of studies has been published which apply modern panel regression techniques to analyse the impact of different socio-economic variables on fertility in the long term (Sánchez-Barricarte, 2017 and references wherein). Panel studies offer many advantages over time series and cross-sectional analyses. Having multiple years of data increases the sample size and may lead to more reliable estimates. Also, having multiple observations for each territorial unit enables researchers to include possibly territory-specific fixed effects, thereby controlling for a wide range of time-invariant characteristics whose omission might otherwise bias the estimated relationship between the variables (Hondroyiannis and Papapetrou, 2005: 145). We apply this kind of technique to the database constructed for this study. Specifically, we utilize a panel data regression model with individual fixed effects that is a model that captures the variability of fertility both among individuals (regions) and time:

$$y_{it} = x'_{it}\beta + \varepsilon_{it} \qquad\qquad i = 1, ..., 21; \ t = 1, ..., 6$$

where y_{it} is the TFR level and x'_{it} is the array containing the BES composite indicators values.

The error term is specified as:

$$\varepsilon_{it} = \alpha_i + u_{it}$$

where α_i are individual fixed effects to take into account the inter-regional heterogeneity due to not observed characteristics, whereas u_{it} is the usual stochastic noise term.

4. Results

A descriptive evaluation of the association between each BES composite indicator and TFR through years and regions is provided by the scatterplots reported in the Appendix. At a first glance, all the pictures suggest that fertility is positively related to all the BES domains except for the safety dimension as incidence of burglaries, pick-pocketing, robberies. However, for certain domains (i.e. education and training, employment, economic inequalities, politics and institutions, landscape) distinct patterns of the relationship above emerge within groups of regions, in some cases even in the opposite direction. This clearly indicates the presence of local association models which must to be taken into account. Namely, three distinctive clusters of regions are identifiable: 1) Trento and Bolzano – "virtuous" regions with high fertility and well-being; 2) other regions of Northern and Central Italy along with Abruzzo (Aosta Valley, Piedmont, Liguria, Lombardy, Veneto, Friuli Venezia Giulia, Emilia Romagna, Tuscany, Marche, Umbria, Lazio, Abruzzo); 3) South (excluding Abruzzo) and Islands (Molise, Campania, Apulia, Basilicata, Calabria, Sicily and Sardinia) - regions with the lowest levels of well-being and among them the lowest fertility area in the country (Sardinia). These three clusters present different correlation schemes between TFR and BES.

Table 1 shows the linear correlation coefficient values between TFR level at year t and the domain composite indicator (average of the values of the 2 previous years) calculated on the 3 clusters of regions. The same composite index can be positively correlated with the fertility level within one cluster of regions and negatively in the others: for instance, the index measuring the well-being as to the employment level is positively correlated to fertility in the two first clusters (North and the Centre), but negatively so in the cluster of South and Islands. Indeed, almost all the composite indicators in the South and Islands show a negative relationship with fertility that is the better the contextual conditions the lower is the average number of children.

The results suggest that to study the relationship between TFR and BES it is appropriate to keep the different areas separated. Since the number of cases observed in the first cluster, that includes only the two provinces of Trento and Bolzano, are too few for a regression analysis, we obviously dropped this first cluster.

Table 1. Linear correlation coefficient values between TFR and BES composite indicators.

DOMAIN	TRENTO AND BOLZANO PROVINCES	NORTHERN AND CENTRAL REGIONS + ABRUZZO	SOUTHERN REGIONS AND ISLANDS
HEALTH	0.09	-0.15	-0.61
EDUCATION AND TRAINING	-0.52	-0.75	-0.56
EMPLOYMENT	0.89	0.55	-0.89
QUALITY OF WORK	0.00	0.66	-0.76
INCOME AND INEQUALITIES	0.94	0.61	-0.80
BASIC CONDITIONS	0.30	0.51	-0.80
SOCIAL RELATIONSHIPS	0.85	0.45	-0.83
POLITICS AND INSTITUTIONS	0.66	-0.14	0.07
SAFETY – HOMICIDES	0.42	-0.04	-0.38
SAFETY-BURGLARIES ETC.	0.03	0.03	-0.75
SUBJECTIVE WELL-BEING	0.72	0.58	-0.33
LANDSCAPE AND CULTURAL HERITAGE	0.88	0.33	-0.70
ENVIRONMENT	-0.24	0.03	-0.48
INNOVATION AND RESEARCH	-0.78	0.00	0.50
QUALITY OF SERVICES	-0.80	0.62	-0.81

Source: own calculation on Istat data

A panel regression analysis has been performed separately for the other two clusters of regions. Table 2 and Table 3 show, respectively for the North-Centre and the South and Islands cluster, the output of the model with fixed regional effects which has obtained the highest goodness of fit value. Other results are available on request. In the case of Northern and Central regions (excluding Trento and Bolzano and including Abruzzo), the composite indicators of work quality, income and economic inequalities and the quality of services show a positive and significant association with fertility, while the effect is negative for education and training, as expected, but also for employment: all the other domains controlled, the higher level of employment does not favour a higher fertility.

In the South and Islands, fewer and different contextual conditions matter for fertility: education and training well-being indicator still play a role in decreasing fertility (even if its effect is statistically significant only for significance levels greater than 6 per 100). Only in the South and Islands, the development indicators matter: both the population well-being in terms of economic basic conditions (measured as low level of deprivation index and low level of financial difficulties, among others) and the investment in research and innovation could have a positive influence on reproductive behaviours. As opposite as in the North-Centre, the quality of services is negatively associated with fertility.

Table 2. Panel regression analysis – TFR versus BES composite indicators. North-Centre regions.

DOMAIN	Estimate	Std. Error	t-value	Pr(>|t|)
EDUCATION AND TRAINING	-0.00329	0.00129	-2.5538	0.01357 *
EMPLOYMENT	-0.00965	0.00362	-2.6649	0.01018 *
QUALITY OF WORK	0.00899	0.00236	3.8062	0.00037 ***
INCOME AND INEQUALITIES	0.00496	0.00231	2.1441	0.03663 *
BASIC CONDITIONS	-0.00045	0.00135	-0.3363	0.73798
INDIVIDUAL WELL-BEING	0.00100	0.00122	0.8220	0.41476
QUALITY OF SERVICES	0.01198	0.00365	3.2849	0.00181 **

Note: * Coefficient significant at p-value<=0.010; ** coefficient significant at p-value<=0.005; *** coefficient significant at p-value<=0.001. R-Squared: 0.7977; Adj. R-Squared: 0.58719
Source: own calculation on Istat data

Table 3. Panel regression analysis – TFR versus BES composite indicators. South and Islands.

DOMAIN	Estimate	Std. Error	t-value	Pr(>|t|)
HEALTH	-0.00210	0.00193	-1.0881	0.28735
EDUCATION AND TRAINING	-0.00754	0.00383	-1.9690	0.06060
EMPLOYMENT	0.00265	0.00265	1.0009	0.32686
QUALITY OF WORK	0.00077	0.00249	0.3095	0.75962
INCOME AND INEQUALITIES	0.00068	0.00126	0.5375	0.59585
BASIC CONDITIONS	0.00237	0.00111	2.1454	0.04225 *
SOCIAL RELATIONSHIPS	0.00149	0.00248	0.6005	0.55379
SAFETY-BURGLARIES ETC.	-0.00244	0.00214	-1.1415	0.26494
LANDSCAPE	-0.00147	0.00225	-0.6546	0.51896
INNOVATION AND RESEARCH	0.00483	0.00152	3.1800	0.00403**
QUALITY OF SERVICES	−0.00955	0.00448	-2.1322	0.04343 *

Note: * coefficient significant at p-value<=0.010; ** coefficient significant at p-value<=0.005; *** coefficient significant at p-value<=0.001. R-Squared: 0.65831; Adj. R-Squared: 0.37618
Source: own calculation on Istat data

5. Discussion and conclusions

The main purpose of this work is to study the relationship between fertility and the different well-being dimensions in the Italian regions. Our analysis is limited to the aggregated data, which implies that we cannot express ourselves about the influence of the contextual situation in which individuals live on their reproductive choices in a causal perspective. However, we cannot deny that there is a discrete statistical association between the life quality of the citizens and the average number of children they express, as well as a persistent geographical variability in the association itself.

Results from panel regression analyses confirm the education and training are factors discouraging fertility. Women aiming to reach high education levels tend to postpone childbearing and often the postponement becomes renunciation. In the North-Centre, also any increase in employment can penalize fertility, but this negative effect is compensated by the positive impact of the quality of work, which include measures favoring the conciliation between family care and work, safety at work and work stability, too. This does not occur in the South and Islands, probably because here women are less involved in the labor market and the quality of the work itself has no impact on fertility decision. Moreover, they are more likely receiving help from grandparents and relatives than women in other areas (Barbagli et al., 2003; Del Boca et al., 2005). Economic condition is a key factor both in the North-Centre and in the South and Islands. Specifically, in the Northern and Central regions the domain which has shown a positive significant effect on TFR is that concerning income and economic inequalities, whereas in the South and Islands is that regarding the basic economic conditions. Overall, in order to improve fertility level, it is necessary to promote economic and social policies that decrease poverty level, improve households' income levels, reduce economic inequalities.

The quality of services plays an opposite role on fertility between North-Centre and South and Islands. In fact, this domain includes services like residential welfare, house assistance and health facilities for elderly people, public nursery schools and efficient public transport system. In the Northern and Central regions these are all important factors that can help women in reconciling family care and work; their lack or inefficiency could induce employed women to abandon their reproductive intentions and maintain their job. Instead, in the South and Islands, these kinds of social services are often lacking and inadequate. Here, employed women with children count mainly on help from their parents or relatives; this fact could encourage them to pursue their intentions in fertility (parents and relatives' help is free and often considered of better quality compared to public services).

Finally, investments in research and innovation seem to be a factor favoring the increase in fertility in the South and Islands. The composite indicator of this domain includes aspects (i.e., employment in cultural and creative professions, research and development expenses, share of university-educated people

employed in scientific professions) that can contribute to enhance both social inclusion and cohesion in a population and to promote economic development, and this, in turn, favors fertility.

Overall, our results demonstrate the importance of defining the "context" of fertility in a comprehensive manner, without focusing on a single aspect at a time. Thus, it has to be emphasized the usefulness of a database on well-being at territorial level, rich and articulated on many different domains such as the one offered by the Equitable and Sustainable Well-being (BES) system of indicator provided by ISTAT every year.

The study is based only on aggregate data and this is its main shortcoming. The ecological analysis of the relationship between fertility and the well-being of the territory tells us nothing about the profound causal links between contextual conditions and individual choices. Only a multilevel analysis strategy can adequately grasp these links, and this will be the object of a subsequent development of this work.

A further aspect, partly linked to the previous point, is the territorial aggregation scale of the data. Many of the interregional differences in fertility could certainly be better explained on an urban / metropolitan-non-urban / rural / peripheral scale of analysis and it would certainly be more appropriate to carry out the analysis at a more refined territorial level, for example provincial if not municipal. However, to date ISTAT provides BES information on only 24 provinces, 7 metropolitan cities for a total of 12 regions, entirely excluding crucial areas of the country as to fertility is concerned (for example, the major Islands, Trento and Bolzano). One of the future developments of the research is to replicate this analysis by focusing on some significant territorial contexts.

Even acknowledging the limitations of the study, our results clearly evoke the existence of a non-negligible relationship between the well-being of the territory and the reproductive behavior of the population. The message for the policy is quite straightforward: increasing people's quality of life enables them to carry out their projects in terms of family building.

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Appendix

Figure A1. Scatterplots of the association between each BES composite indicator and Fertility by region-year

Quality of work and TFR

Employment and TFR

Income inequalities and TFR

Economic basic conditions and TFR

Politics and Institutions and TFR

Social relationships and TFR

Burglaries & Pick-pocketing & Robberies and TFR

Homicides and TFR

Landscape & Cultural Heritage and TFR

Subjective Well-being and TFR

Innovation & Research & Creativity and TFR

Quality of Services and TFR

Environment and TFR

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