

Some Considerations About the Evolution of Fertility in Italy

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Abstract: The evolution of fertility in Italy has been characterized by significant structural changes, which led to the current situation. Starting from the second post-war period, fertility is gradually increased in our country reaching a peak at the so-called baby-boom in the mid-sixties, where economic/social factors have induced a significant grow in births and, at the same time, a consistent reduction of infant mortality, bringing the TFR to reach a value of 2.69. This period was followed by several years of low fertility, known as *lowest-low fertility*, due to several factors including, of course, a new working role of women, a higher education and a radical transformation of lifestyles of post oil crisis society. These changes have prompted a strong delay in the entrance of women in the reproductive life, causing a collapse of the reproduction rate to levels of 1.2 children per woman. However, in order to analyze the evolution of Italian fertility one of the main aspects is certainly the different age structure of the reproductive rates. Indeed, by analyzing the time series of specific fertility rates at different ages, we show that:

- women about 30 years old play a central role in the behavior of fertility in Italy instead of those of 25 years old;
- in 2014, the modal age at delivery becomes 31.5 years;
- the contribution to the fertility of women about 20 years old, which played a crucial role for the TFR in the past, tends to vanish, reaching extremely low levels in the recent years.

In the light of these considerations, we observe the performance of the gross rate of reproduction built longitudinally: despite the lowest-low fertility characterizing the evolution of fertility in Italy, from the nineties onwards the value of this rate has never fallen below 1.6 children per woman. This occurs despite the observed delay in fertility, where the parental experience tends to be approached after 30 years; therefore, it could express its full potential in the next 10 years, when all women who have not yet experienced the parental experience will approach the ages between 30 and 40 years.

In order to check the above-mentioned behavior, we also apply a suitable class of ARIMA models to estimate the evolution of the specific fertility rates at different ages. This analysis points to a consistent grow of the fertility in the age of 30 to 40, showing also how in the next 10 years this improvement could affect the transversal TFR, which will tend to the longitudinal one in a medium term period.

Key words: population growth; fertility; ARIMA models

JEL codes: J0, J1, J6

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1. Introduction

The evolution of fertility in Italy has been characterized by significant structural changes, which led to the current situation. Assuming the post-war period as a baseline of modern fertility, it is easy to observe since then periods in great contrast to each other, associated with many changes of socio-economic nature.

Starting with the economic boom, a period characterized by a great development, fertility has gradually increased in our country until it reaches a peak at a so-called baby-boom in the mid-sixties, where economic/social factors have led a significant grow in terms of births and a drastic reduction of infant mortality, that induced the TFT to reach a value of 2.69 (1964).

It was followed by a long period of depression, known as the lowest-low fertility, associated with both i) the stormy economic changes that led to the great oil crisis of the seventies and eighties, and ii) factors of social nature, including a new job role for woman, a higher education level and a radical change in lifestyle of the post oil crisis society. These changes have prompted a strong delay in the entrance of women in the reproductive life, causing a collapse of the rate of reproduction.

In this context, a very interesting question concerns the possibility for Italian women to reconcile or not their family expectations with the socio-economic realities. Although cross-sectional analysis can apparently provide a negative response, noting a systematic reduction of the TFT, which reaches the level of 1.2 children per woman (1.18 in 1996); however, the longitudinal analysis shows that the collapse of the synthetic index of fertility is the result of the later entry into reproductive life of Italian women and not a real deterioration of their breeding perspective.



Indeed, by observing the specific fertility rates by age from 1952 to 2015 (ISTAT, referring to all orders, so without discrimination on birth order), they clearly show how the entry into the reproductive life of Italian women is shifted forward, showing at the same time a recovery of fertility in adult ages.

Taking into account for instance the year 1964 as a benchmark, the gross rate of total reproduction — calculated in a transversal analysis — reached its maximum with 2.69 children per woman; under this scenario, 181 Italian women of twenty-five year per 1000 brought into the world a child; this age plays a central role in terms of procreation: indeed, women of thirty-five years old do not reach half the reproductive rate of women of twenty-five years old, while the forties did not come to a fifth, despite the birth of orders over the second.

Now, in 2015, only 52 women of twenty-five years old live the same condition; moreover, to support the thesis of a recovery of fertility in adult age, notice that the current contribution in terms of reproduction at different ages was substantially reversed: the women of twenty-five years old contribute minimally to the overall dynamics, while the women of 35 years present 80 maternities per 1,000 women. This behavior becomes more significant for age 40.

By taking into account the time series of individual ratios at ages 20, 25, 30, 35 and 40 (see chart below), it is possible to show several noteworthy features. Age 25, which plays the fundamental role of procreation of Italian women for several years, loses its primacy already at the end of the eighties, supplanted by age 30, where the decline was contained by the passage of second geniture to first geniture, ensuring therefore an important contribution to the overall reproduction rate.

Not surprisingly, in 2015, the average age at childbirth is equal to 31.5 years; this distribution also presents high values up to age 35, whereas approximately 10% of women of these ages are able to live parenthood.

ARIMA Model Type for age			R-squared
Model ID	<18	ARIMA(0,1,0)	,965
	18	ARIMA(0,2,1)	,989
	19	ARIMA(1,2,0)	,994
	20	ARIMA(0,2,0)	,995
	21	ARIMA(1,2,0)	,996
	22	ARIMA(0,2,1)	,997
	23	ARIMA(1,2,0)	,997
	24	ARIMA(1,2,0)	,996
	25	ARIMA(0,2,1)	,995
	26	ARIMA(0,1,0)	,994
	27	ARIMA(2,1,0)	,991
	28	ARIMA(0,1,5)	,979
	29	ARIMA(0,1,0)	,954
	30	ARIMA(0,1,0)	,949
	31	ARIMA(0,1,0)	,934
	32	ARIMA(0,1,0)	,960
	33	ARIMA(0,1,0)	,981
	34	ARIMA(0,1,0)	,989
	35	ARIMA(0,1,0)	,990
	36	ARIMA(0,1,0)	,986
	37	ARIMA(0,1,0)	,991
	38	ARIMA(1,2,0)	,991
	39	ARIMA(2,1,0)	,992
	40	ARIMA(0,2,1)	,992
	41	ARIMA(0,2,1)	,979
	42	ARIMA(0,1,0)	,967
	43	ARIMA(0,2,1)	,963
	44	ARIMA(0,1,0)	,903
	45	ARIMA(2,2,0)	,933
	46	ARIMA(0,1,0)	,571
	47	ARIMA(0,1,0)	,628
	48	ARIMA(0,1,0)	,944
	49	ARIMA(2,1,0)	,959
	50 +	ARIMA(0,1,0)	,833



As showed by the previous graph, the time series the specific fertility rates for age 20 present a singular path. The contribution to the Italian fertility of the twenties, which was crucial for the overall synthetic index, tends to vanish in the last decades, reaching now extremely low levels. This demonstrates that, currently, the fertility of Italian women is basically addressed at age 30.

Observing the series of specific fertility rates between 20 and 40 years, it is clear that the ages 30 and 35 are the most relevant in the transverse index computation, while the women of 40-years old has a significant increment, although with smaller values in the absolute terms.

In the light of these considerations, one can observe the performance of the gross rate of reproduction built longitudinally. It clearly shows how, despite the lowest-low fertility that has characterized Italian fertility, the value of the latter has never fallen below 1.6 to 1.7 children per woman; this is due in the presence of a fertility delay so that, presumably, it will express its full potential in the coming years, when women who have not yet experienced the parenting experience will reach the ages between 30 and 40 years, i.e., by approaching the ages at which that experience is now technically difficult/impossible to carry on.

In order to explain the behavior and the evolution of the Italian fertility, taking also into account a forecasting goal, we decided to model the matrix of specific fertility rates by age through regression models with correlated observations and ARIMA models, particularly suitable in the presence of time-series with potential non-stationary (Giorgi-Viola, 2003). The primary objective is clearly to be able to interpret their evolution, empirically testing the hypothesis of an expected increase in the values of the specific fertility rates in adult ages, also focusing on prediction of Italian fertility behavior in the medium term. The analyzes were performed with SPSS software.



Several analyses were carried out with the time series started by 1980, in order to find the solution with the best possible fit. The future development of the Italian fertility is not disastrous in terms of specific fertility rates: for the next 10 years we could expected a strong recovery of the higher age indices, which will impact also on the index cross-synthetic that will tend to align themselves to the value of the longitudinal synthetic index in the medium term.

This might make a recovery of births in Italy in absolute terms: however, this evolution would be possible if there were substantial share of women of childbearing age, and this event has become more and more away from the experience because of the previous wave of women born in the baby boom.

More than one author has hypothesized the trap of fertility, which incurs when the continued low fertility exceeds such a long time so it is no longer possible a population recovery, and the outlook for Italy is not very

different. We must act quickly, with appropriate policies in support of birth if you do not want to enter a path with no way out.

The ARIMA models, built with the SPSS software, with the search for the best model for each age, were produced using the time series truncated to 1970, so as not to depend on the results since, very soon, an explosion of fertility linked at the time of the baby boomers.

Looking at the results, it is deduced that the older age classes are the ones that will benefit from the growth opportunities of the index of fertility, the age threshold is age 35, from 36 onwards, the forecast is for growth, while until age 35 forecasts are all downhill.

This confirms the initial thesis (the resumption of fertility), affected, unfortunately, only by the amount of available mothers, who now will become increasingly smaller, coming into the classic trap of fertility, which states that despite an increase in the propensity to procreate, the actual number of births is a function dependent on the amount of available mothers. In addition, under 35 years of age, the trend of declining fertility is always present, to another where the amount of play children is substantially higher.

This is supported by the synthetic index of fertility that always remains in decline, both in the transverse calculation, and in the longitudinal extent, the latter, which, however, has been shown to keep pace always remaining at attractive levels.

In conclusion, therefore, the tendency to shift to higher ages event motherhood is certainly sealed by empirical evidence, to the point that, most likely, in a more distant future, become mothers will be increasingly the preserve of the adult age

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