Friulian Journal of Science **22.** 2016, 25-38

The population of Friuli Venezia Giulia. Future scenarios (2016-2040)

ALESSIO FORNASIN*

Abstract. In a recent conference, which took place in Udine in June 2016, the case of the demographic dynamics of Friuli Venezia Giulia in the near future has been brought to the attention of the public. My aim is to foresee some of the features of the population of Friuli Venezia Giulia in the near future and its main problems related to the regional productive system's demand for manpower. In this paper, I will present a series of scenarios concerning the evolution of the population in Friuli Venezia Giulia from 2016 to 2040. All the scenarios have been built applying the cohort component method.

Key-words. Friuli Venezia Giulia, demographic dynamics, population, near future, evolution of the population.

1. Introduction. In a recent conference on the relation between demography and economic development, the case of the demographic dynamics of Friuli Venezia Giulia in the near future has been brought to the attention of the public[1]. The press published reports of the various speeches, especially focusing on the evolution of the labour force in the near future and the needs of the regional economic system[2]. Of course, foreseeing the development of the labour market within the region is impossible, if not only vaguely. Similarly, being able to tell what professionals the economic system will require in 10 or 20 years is just as hard. Anyway, hypothetically, in order to offer an adequate response to the future demand of manpower, the amount of human resources should correspond more or less to that of the present. That is a reasonable hypothesis, also giving that the population of Friuli Venezia Giulia has not varied so much and, even

* Department of Economics and Statistics, University of Udine, Udine, Italy.
E-mail: alessio.fornasin@uniud.it

though the structure has gone through substantial transformations, the consistency of the most affected age ranges has remained quite unaltered over time[3].

Following the considerations that transpired during the convention, I will present here a series of scenarios concerning the evolution of the population in Friuli Venezia Giulia from 2016 to 2040. Some of these scenarios are plausible whilst others are only theoretical. My aim is to foresee some of the features of the population of Friuli Venezia Giulia in the near future and its main problems related to the regional productive system's demand for manpower.

2. National and regional demographic forecasts. Before addressing the topic of the possible future developments of the population a distinction must be made between projections and forecasts. They both use the same methods, but projections are mere computational exercises in which, on the basis of some features of the analysed population, which are usually considered invariable, the results of more or less complex calculations are projected into the future, whilst forecasts includes hypotheses made by the researcher and concerning the possible trend of some demographic variables (Terra Abrami 1998; Salvini et al. 2006).

In Italy, the demographic forecast main provider is ISTAT. ISTAT forecasts are carried out on both a national and a regional scale. Results are presented with different scenarios: the "central" one presenting the most probable evolution of the population, the "low" and "high" scenarios considering various evolutionary models based on mortality, fertility and migration.

The authority of ISTAT as a regional forecast provider discouraged the production of independent forecasts on a regional level, with the exception of the recent study by Esposito (2012) about Sardinia. As for Friuli Venezia Giulia, except for an important but old study by Silvio Orviati (1985) concerning only the province of Udine, no recent forecasts about the whole regional territory have been published, except for studies on single municipalities and territorial districts (Chiavon, Fornasin 2008; Fornasin, Tillati 2009; Fornasin, Breschi 2010).

The most recent ISTAT regional forecasts are about the 2011-2065 period, with a base population composed by the residents, both Italians and foreigners[4], as at 1 January 2011. One of the most critical points of those forecasts is choosing the base population corresponding to the data of latest Population registers before the census. As I have already explained elsewhere (Fornasin 2015), that choice inevitably and negatively influences the results of the forecast. It is very well known in literature that the Population registers tend to overrate the number of the inhabitants because of the amount of errors due to the difficulty in creating a correspondence between a change in the legal residence and a change in the permanent residence (Livi Bacci 1999). Also the analysis of the information of the 15th census of the population, being the best for the evalua-

Table 1. Confrontation as at 1 January 2016 between the resident population in Friuli Venezia Giulia and the population according to the 2011 ISTAT forecasts.

	N.	*Diference*
Register data	1,221,218	–
Low scenario	1,250,765	29,547
Central scenario	1,256,302	35,084
High scenario	1,261,556	40,338

Source: http://demo.istat.it/.

tion of the amount of Friuli Venezia Giulia's population in all the districts, shows that the Population registers data collected 9 months earlier and dating back to 1 January 2011, are definitely higher than the real data[5]. There is no solution to the divergence between register and census, and the wider the time gap from the census data collection, the bigger the register data distortion. In the case of the latest ISTAT forecasts, the distortion is at the highest level. Clearly, the latest forecast released by the National Institute of Statistics is the document on which the reconstructions of the future populations of the Italian regions are based.

As for Friuli Venezia Giulia, the confrontation of the resident population as at 1 January 2016 to the forecast corresponding to the same date according to the low, central and high scenarios is illustrated in Table 1.

In all scenarios, the expected population number is approximately higher by 3% than the data of the Population register[6]. Apparently, that is a negligible percentage but, once translated into absolute figures, it corresponds approximately to 35,000 units in the central scenario that is exactly the case of the population of Gorizia (34,844), the fourth municipality of the region in terms of number of inhabitants.

In addition to the absolute figures, some issues concerning the recent historical evolution of the population, whose dynamics obviously can only be analysed through an ex post evaluation, must be pointed out. Especially it must be highlighted that between 2014 and 2015 the population decreased, contrary to all expectations, and the trend is confirmed also for the 2015-2016 period. In Table 2, the post-census trend of the regional population and the main flow information may be observed.

The acceleration in the downswing of the number of residents between 2015 and 2016 is a brand new phenomenon. Also ISTAT's historical series evaluating the population resident in Friuli Venezia Giulia in the gap between the 2001 and the 2011 censuses, shows a slight decrease in the number of inhabitants from one year to the next in the second half of the decade; but the two consecutive downswings registered in 2014-2015 and 2015-2016 are relevant, also because they find confirmation in the "real" Population register data that,

Table 2. Demographic balance sheet of the population resident in Friuli Venezia Giulia (2012-2016).

Year	*Pop*	*Births*	*Deaths*	*NB*	*Registered*	*Deregistered*	*NM*	*Net Tot.*
2012	1,217,780	9,824	14,426	- 4,602	46,895	38,213	8,682	4,080
2013	1,221,860	9,408	14,222	- 4,814	50,987	38,670	12,317	7,503
2014	1,229,363	9,177	13,764	- 4,587	38,297	35,951	2,346	- 2,241
2015	1,227,122	8,575	14,807	- 6,232	36,482	36,154	328	- 5,904
2016	1,221,218	-*	-	-	-	-	-	-

Source: http://demo.istat.it/. * Data not yet available.

as I said earlier, tend to overestimate the population year after year. That drop is part of a decreasing trend ongoing for some years. Speaking of which, the considerable increase in the net migration recorded in 2013 should not mislead the reader, as it is the result of adjustments in the number of the resident population carried out by the municipal offices during the revision of the register after the census[7]. The number is still high thanks to the entry "other registered" that is usually residual, but during 2013 it rose to almost 14,000 units, more than twice the number of the registered people coming from abroad.

The decrease in the population recorded in the last year is due to three concurrent causes, even though they may not be necessarily linked:
1) Increase in mortality rate;
2) Decrease in birth rate;
3) Decrease in the number of registrations.

Let us examine separately those three phenomena.

1) In 2015 the number of deaths increased significantly, especially among the elderly. That may be caused by many factors, like the particularly strong effect of flu in the winter and the unusually hot temperature in the summer (Michelozzi et al. 2016). The rise of the number of deaths has been even more significant, since the previous year it was lower than expected thanks to a series of elements that in 2015 were all adverse whilst in 2014 were favourable.
2) The number of births in 2015 was of only 8,475 units, almost 8% less than the previous year.
   That is a significant decrease due to a trend already going on for some years. The sharp drop coincided with the number of births going under the threshold of 9,000 units reaching therefore its lowest point of the historical regional series. In this case the factors are very well known, like the decrease in the total fertility rate from 1,38 to 1,33 births per woman; but the most important factor by far is the decrease in the number of women in their reproductive age because of the structure of the population.
3) The decrease in the number of registrations and the sharp rise of the number of inhabitants who were granted citizenship (Fornasin 2015) caused on one side a

drop in the net migration and on the other side a downswing in the foreign population (-358 from 2014 to 2015; -2,337 from 2015 and 2016). It is worth noting that as at 1 January 2015, for the first time the number of foreign residents was lower than that of the previous year[8], and as at 1 January 2016 it was even lower.

3. Forecasts. In this paper I will present four different types of future scenarios. The first one is a simple projection in which, with reference to 2015, I kept constant the demographic parameters of mortality and fertility and I set the net migration value to 0, not so far from the data collected in 2015 (+ 328). In the second scenario, which can be defined as "increasing", I included the values of the parameters coherent to that trend. The third one is a real forecast in which I tried to see the future evolution of the demographic parameters on the basis of hypotheses I consider plausible with relation to the recent history of the regional population. The fourth scenario shows instead the evolution of the population with the objective of keeping the labour force at the same level as it was as at 1 January 2016 (this scenario is called "objective"). For the labour force, I considered, clearly in an approximate way, the total amount of the male and female population aged between 20 and 65. To carry out the calculations I started from the mortality and fertility parameters from the forecast scenario and worked the net migration so as to keep the population in that age range constant over time. All the scenarios have been built applying the cohort component method. In particular, I used, with some modifications, a scheme I already applied for a previous essay to which I refer for the technical details (Chiavon, Fornasin 2008)[9]. The basic data and parameters used in the construction of the forecasts are illustrated below as population data, mortality, fertility, and migration rates.

3.1. Population data The first step to carry out demographic forecasts is collecting as much information on the population as possible concerning the so-called "base year". The most recent data on the population, divided by gender and age, date back to 1 January 2016[10]. Since they are Population registers data, the same warning already pointed out earlier should be kept in mind: the number of the counted population is almost for sure larger than that of the effective resident population.

3.2. Mortality. The necessary background data to carry out the forecasts about mortality are of course the deaths divided by gender and age. That information allows to build two life tables (one for men and the other for women) whose data can be used to calculate the probabilities of surviving any year of age of the population per year of age. I used the regional life tables released by ISTAT, whose most recent version dates back to 2014[11]. Obviously, the characteristics of mortality, which can be summarized in the life expectancy at birth

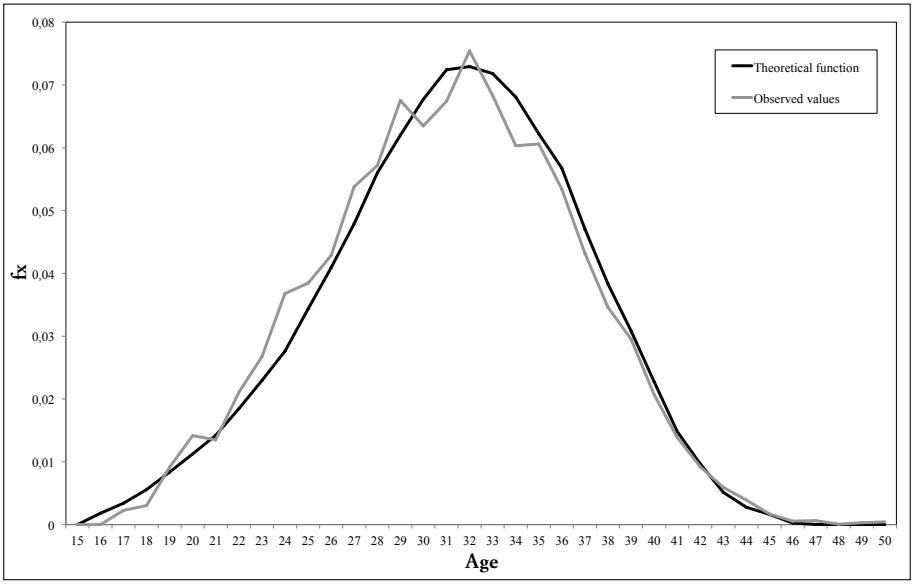

Figure 1. Specific fertility rates (Friuli Venezia Giulia 2014) and theoretical function adapted to the different scenarios. (Sources: http://demo.istat.it and analyses carried out by the author).

(e0), are not constant over time. The historical experience of our country in the last century and a half, but also in the last years, shows that the life expectancy is following a constantly increasing trend, except for some exceptional circumstances, the last of which happened right in 2015. That leads us to think that not only the value of e0 has long increased until 2014, but it will also keep on rising in the future.

The procedure to rebuild the evolution of mortality over time is, with some changes, the same procedure that was used for the forecasts of the Italian populations as at 1 January 1988 (ISTAT 1989), based on the Brass method (UN 1983, 17-18).

In the projection, I kept constant the e0 parameter by indicating the 2014 value as the basic value. I preferred not to use the 2015 data, although more recent, as the value must be considered anomalously low given the exceptional death rate recorded that year. In the case of both the real "forecast" and the "increasing" scenario, which describes a general improvement of the demographic parameters, I adapted the life expectancy trend to that of the ISTAT forecasts, which foresee a value of 84.2 years of age for men and 89.1 for women by 2040.

3.3. Fertility. As for the fertility rate, the information needed for the forecast is the mother's age-specific fertility rates (f_x). Those data are released yearly by ISTAT. The most recent series dates back to 2014[12]. For the average number of children per woman

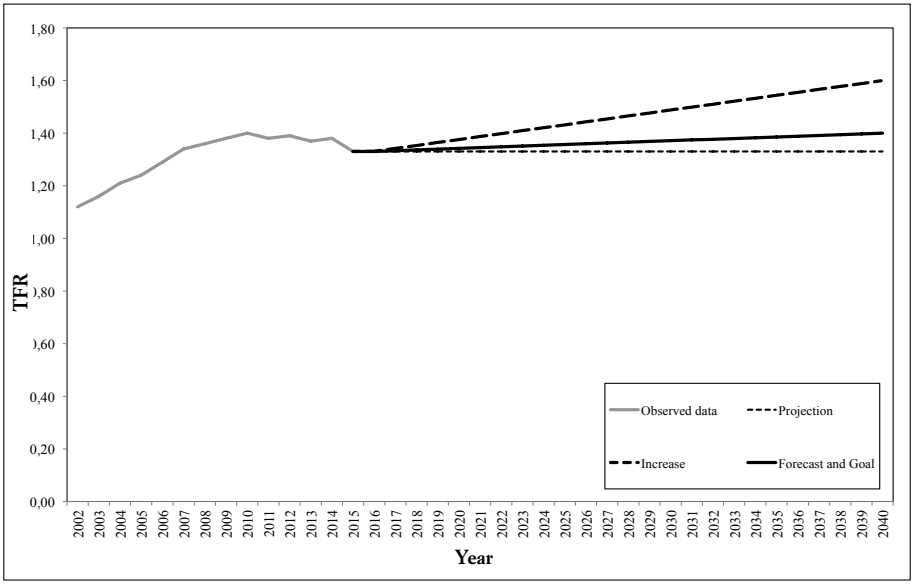

Figure 2. The evolution of the TFR in the three different scenarios. (Sources: http://demo.istat.it and analyses carried out by the author).

(also called total fertility rate, or TFR) the most recent data date back to 2015[13], in which the estimated TFR is 1.33. That same year, the average age of mother at birth is 31.8 years.

To proceed with the forecasts I built a specific fertility rates' curve by adapting the 2014 data to the 2015 TFR values and the 2015 average age of mother at birth. Then the series has been normalized so that the sum of the f_x gives a value of 1. The resulting curve is represented in Figure 1, where it is compared to the curve based on 2014 empirical data, which have been normalized as well.

So, for every year of the forecast, the sets of f_x was evaluated on the basis of the expected value of the average number of children per woman. As for the evolution of fertility over time I chose three different models (Figure 2).

From 2002 to 2015 the historical series of this index, except for its growth that reached its peak in 2010, does not have a clear trend, therefore foreseeing its evolution is hard. Even on the basis of the moderate swinging observed in the latest years it is hard to envisage a radical change of level even in the future. For the projection, I adopted a TFR like the one observed in 2015 for the whole span taken into account. In the increasing scenario I assumed its gradual increase starting from 1,3 and reaching 1.6 in 2040, a value never reached in decades both on a regional and national scale. In the forecast and objective scenarios, starting from the 2015 data, I assumed an increasing TFR

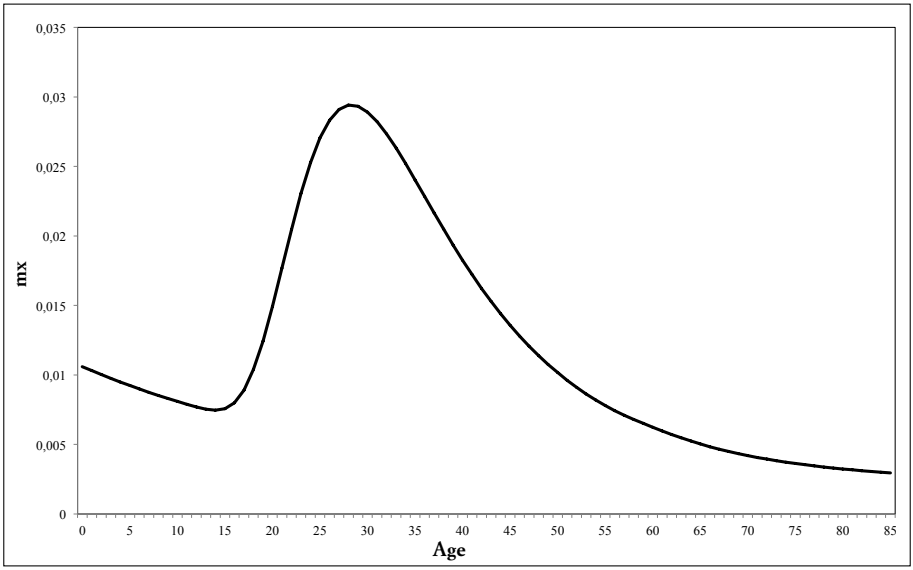

Figure 3. Specific migration rates in all the scenarios. (Source: analyses carried out by the author).

value reaching 1.4 by 2040, the same value of 2010 and also the highest value ever recorded since 1979. As for the average age of mother at birth, in the projection and the increasing scenarios, I took into account the age of 2015 (31.8 years of age) whilst in the forecast and "objective" scenarios I assumed a rise in the average age in line with that of the ISTAT central forecasts, set at 32.8 as a 2040.

3.4. Migration. As I mentioned earlier, to carry out a forecast concerning the migration I chose a simplified model based on the sole net migration value, without specifically analysing inflows and outflows. That is due to the lack of sufficiently detailed data concerning the age of the registered and deregistered people at the time of migration. In the event of a positive net migration value, the curve is supposed to follow a trend which is typical of a series of specific migration rates[14]. That is undoubtedly the most problematic part in all my analysis and therefore the accounting aspect of migrations should be examined in depth with the help of more precise data.

So I built a function adapted to the data concerning the registrations only from other Italian regions[15]. A significant part of foreigners is also included in these movements, which are by the way the most considerable ones. The curve of the age-specific migration rates is much more complex than the curves of fertility and life expectancy. I used a model developed by Rogers and Castro (1981) describing the curve of the age-specific migration rates. That model expresses the specific rates as a direct func-

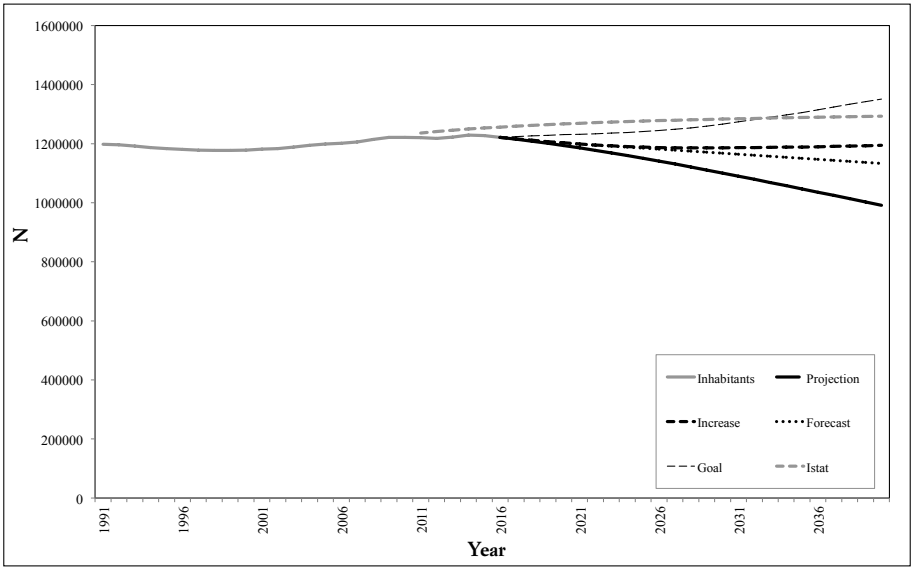

Figure 4. Evolution of the demographic scenarios and the ISTAT central forecast. (Sources: http://demo.istat.it and analyses carried out by the author).

tion of the years of age to which they refer, but the 11 parameters on which it depends, make it more complex. However, it can be easily understood looking at figure 3 that shows the migration law used for this essay.

As opposed to fertility and mortality, migration is a phenomenon, which is erratic and also linked to circumstances that last for short periods. Hence, it is difficult to predict its trend with a certain degree of reliability and therefore some simplifications are required.

In the projection I set the migration net value to 0. In the increasing scenario I assumed a migration net value of 1,000 units in 2016, increasing with a linear progression and reaching 7,000 units by 2028 and then remaining constant right until 2040. On the other hand, in the forecast scenario I assumed a migration net value of 1,000 in 2016 with a linear progression that reaches 4,000 units in 2022 and then maintain the same level in the following years. In the "objective" scenario, as I have already explained, migration has been altered so as to keep constant the consistency of the 20-64 aged class.

4. The results. The results of the analyses briefly described in the previous paragraphs can be summed up in Figure 4.

In the graphic, the continuous gray line describes the trend of the regional population from 1991 to the present. The dashed gray line represents the ISTAT forecast starting from the basis of the forecast that is

Table 3. The population of Friuli Venezia Giulia as at 1 January 2016 and as at 1 January 2040 according the different scenarios.

	Pop. 2016	*Projection*	*Increasing scenario*	*Forecast*	*Objective*	*ISTAT forecasts (central scenario)*
M Population	591,324	482,386	585,169	554,370	663,260	631,940
F Population	629,894	508,775	608,953	578,488	688,136	660,686
MF Population	1,221,218	991,161	1,194,122	1,132,858	1,351,395	1,292,626
b	6.8	6.6	8.3	7.1	7,8	8.2
d	11.5	18.0	12,0	13.6	11,9	11.3
Pop 20-64	706,975	490,754	592,311	559,175	706,975	658,601

Sources: http://demo.istat.it and analyses carried out by the author.

to say 1 January 2011. As I said earlier and as is shown by the graphic, this provision has an already "high" starting point. 2016 is the spreading point of the different hypotheses of the evolution of the population that I elaborated. All the scenarios, with the exception of the scenario I called "objective", show a decreasing regional population. Clearly, in the case of the objective scenario, the migration flows are more consistent than those indicated in the forecast and the increasing scenarios. As we can see, the rise of those flows might cause the population to increase significantly. Anyway, I do not think this kind of evolution of the population is plausible. Therefore, I think it is much more probable that in the future we will have to deal with a scenario placed right between the two dashed black lines. So, the descending trend the regional population has taken, will almost surely last for a rather long time, unless significant migration flows occur. The numerical data are summed up in Table 3.

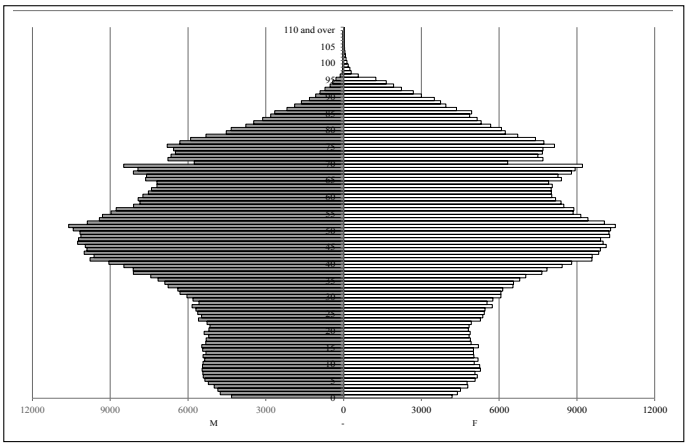

Figure 5*a*. 2016.

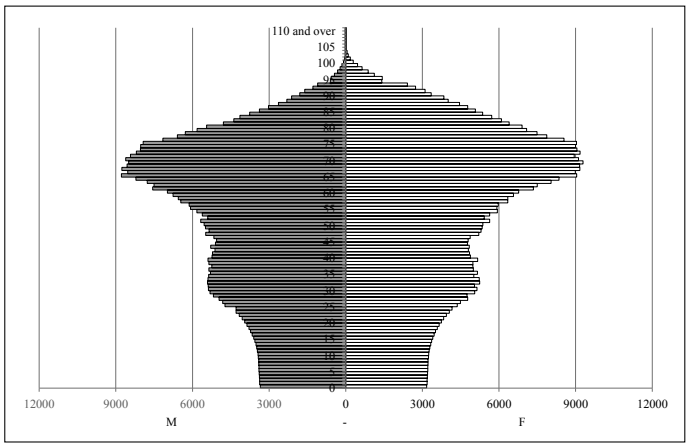

Figure 5*b*. Projection.

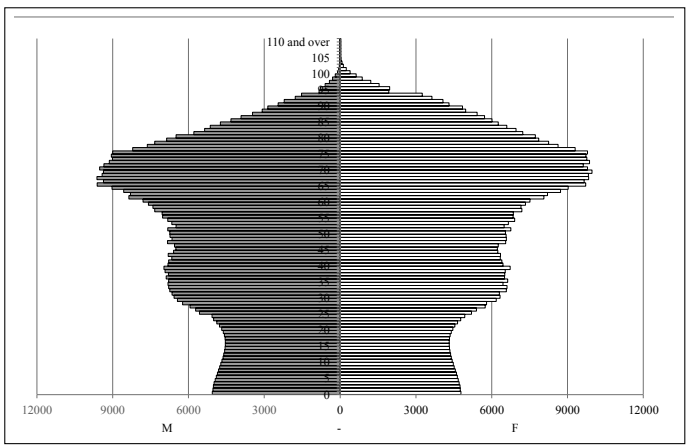

Figure 5*c*.
Increasing scenario.

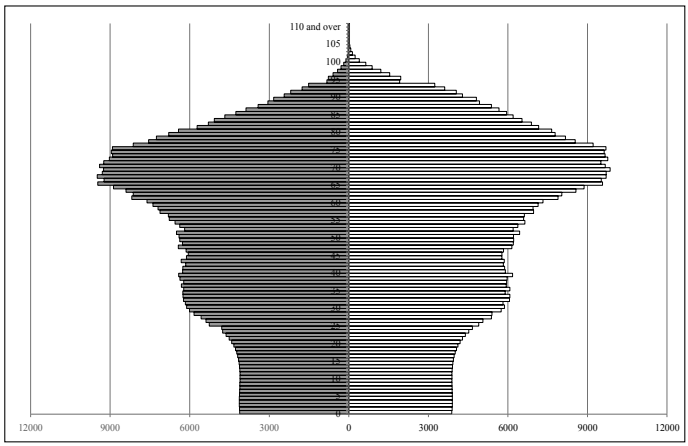

Figure 5*d*. Forecast.

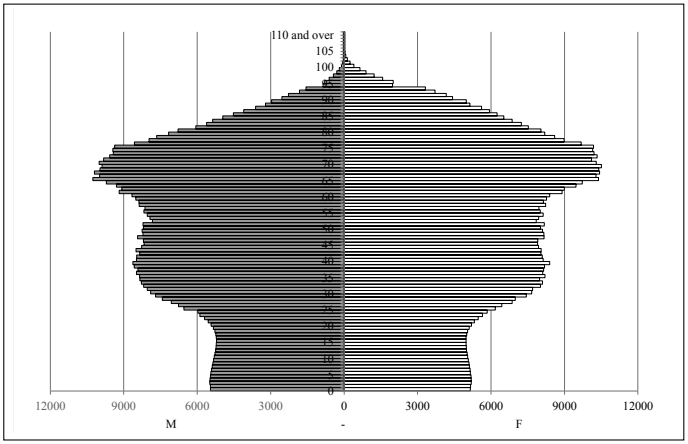

Figure 5*e*. Objective.

Figure 5*a-e*. Population pyramids of Friuli Venezia Giulia in 2016 and 2040 according to the different scenarios.

In addition to a decrease in the population, the scenarios I elaborated show an increase in the birth rate (b), with the exception of the projection, and an increase in the death rate (d), with the exception of the "objective" scenario. Although the rise of the death rate is expected, as it is connected to the increase in the number of the elderly, the same cannot be said for the birth rate that, I must insist, is based on the hypothesis of the TFR evolution I introduced.

The population aged between 20 and 64 is destined to decrease according to all the scenarios, obviously with the exception of the scenarios in which the value has been kept constant. That decrease, even in the increasing scenario, exceeds 100,000 units.

Lastly, I will present the population pyramids according to the four scenarios and compared to the pyramid of 2016 (Figure 5a-e). All the scenarios I built have some elements in common that are quite obvious. The first element that must be highlighted is that in all the outlined futures, thanks to the high levels of life expectancy, the generation of the *baby boomers* will still be the most significant part of the population in almost 25 years.

Another important element is the fact that the sharp drop of the birth rate we noticed in the latest years, will leave a deep and long lasting mark in the structure of the population of Friuli Venezia Giulia. The various hypotheses concerning the migration do not affect the form of the pyramid although the results in terms of numbers of the population, are quite diversified according to the different scenarios.

The differences in the form of the low areas of the pyramids are pretty substantial. Although the different fertility hypotheses do not alter the

structure of the projection and the forecast scenarios significantly, the increasing and the objective scenarios show an upswing of the birth rate, which is supposed to start in the 2020s and gain power over time. That phenomenon must be connected to the migration flows which include men and women in their reproductive years and which are quite considerable in all the scenarios, especially in the objective one. Lastly, the combined increase in fertility and migration could lead to a positive population net value by the end of the 2010s, even in the increasing scenario.

[1] The conference "Il futuro demografico e dello sviluppo della regione Friuli Venezia Giulia tra immigrazione forzata ed emigrazione delle nostre energie giovanili (The Future of Demography and Development of the Friuli Venezia Giulia Region between Forced Immigration and the Emigration of the Young)", organised by AFE e ISCOS took place in Udine on 7 June 2016.

[2] For a report on the conference, see G. Zanello, Senza immigrati, addio pensioni. *Il Messaggero Veneto*, 8 June 2016, p. 14 and the webpage of the Friuli Venezia Giulia region http://www.regione.fvg.it/rafvg/comunicati/comunicato.act?dir=/rafvg/cms/RAFVG/notiziedallagiunta/&nm=20160607/205531010.

[3] For instance, according to the census of 1971, the population aged between 20 and 64 was of 729,005 inhabitants, whilst on 1 January 2016 was of 706,975. http://dati-censimentopopolazione.istat.it/Index.aspx.

[4] The term "foreigner" is used for all residents without Italian citizenship.

[5] Register data of 1 January 2011: 1.235.808, Census of 9 October 2011: 1,218,985. See. http://demo.istat.it/ e http://daticensimentopopolazione.istat.it/Index.aspx.

[6] At a five year distance from the basic forecast, the differences between the scenarios are still very small.

[7] That includes the registration of people erroneously deregistered since they were untraceable but found again later, and the registration of people who were not censused, and therefore not included in the calculation of the legal population, but were in fact resident.

[8] Since 2002 at least, that is to say since when the "correct" register data between two censuses is available. Even on a national scale, a slowdown in the increase of foreign residents has been observed, but especially in Friuli Venezia Giulia, the situation seems particularly significant.

[9] The most relevant modification concerns the analysis of the migrations (to be considered as registrations and deregistrations). The present scheme only uses the net migration instead of the registrations and deregistrations separately considered.

[10] http://demo.istat.it/.

[11] The chart has been posted on the website http://demo.istat.it.

[12] http://dati.istat.it/. The fx is the result of the *Nx/Px* formula, where *Nx* is the number of births per women aged x and *Px* is the average female population aged x.

[13] http://demo.istat.it/altridati/indicatori/index.html

[14] Generally, the assumption is not far from the truth, even though in this case the curve maintain a positive (or negative) value for every year of age, whilst we can observe a positive value for some years of age and a negative value for other years of age because of the differences between registrations and deregistrations.

[15]http://dati.istat.it/.

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