ROMANIA'S DEMOGRAPHIC DECLINE – WHAT'S NEXT

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Abstract

Just like many other European countries, Romania is facing a demographic downtrend that accentuates over time. Despite studies show that the world is getting overpopulated as the total number of inhabitants should rise from approximate 6.5 billion to over 9 billion, Romania's problem is completely different: Romania has been experiencing a negative population growth for the last decades. This article is modeling Romania's demographic evolution and presenting an outlook of how the future looks for this country in terms of demographic stability, total population, evolution of average and median age, with an emphasis on the expected consequences of this evolution.

Keywords: Population, Fertility, Mortality, Demographic Decline

JEL Classification: E27, R2, J13, J14.

1. Introduction

The demographic evolution of a country has been studied from different angles by sociologists, geopolitical researchers, politicians and economists. The special interest granted for demography by representative experts of many areas, is due to the overwhelming importance of this topic. For example, in economics, the population is important for at least two aspects: first it is part of the aggregate production function of a country by labor input, thus resulting in a state importance in the international trade and, on the other hand, is part of aggregate demand function, resulting in prices changing. In these circumstances, given the importance of this subject, a subfield of economics called "Demographic Economics" appeared in the economic literature.

This is a Demographic Economics article that models the evolution of Romanian Population on long term, in order to raise questions regarding where Romania is heading.

2. Stage of Research

Demographic Economics or Population Economics is defined by the latest edition of Palgrave Dictionary of Economics as "application of economics specific methods in demography, in the study of size, growth, density and distribution of human population."(Allen C. Kelley and Robert M. Schmidt, 2008)

Demographic evolution of a country is mainly depending on two fundamental phenomena: the evolution of birth rates and death rates.

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Birth rate is a demographic indicator showing the average number of children a woman gives birth throughout life. The advantage of this indicator versus the indicator "born alive per 1000 inhabitants" would be that it can be easily compared with the value "2", the minimum threshold to maintain the same population or with the value 2.1-2.2, to maintain constant population considering child mortality. The disadvantage of this indicator is that the real information can be found only at the end of a person's life and thus, information about the average number of children a woman had would be a biased indicator with the difference of few decades before their birth moment. Such an indicator cannot be used for economic policies as data is coming too late to change anything.

Therefore, the calculation of this indicator was simplified: the female population of a country is divided by age or age ranges and it is observed the number of women who gave birth in each age range. To include in this indicator the options of twins, triplets, etc. birth, it is divided the number of children born by a certain class of women to the number of women in that age group, in this way resulting a certain percentage. All age related percentages are summed to provide a general overview of the average number of children born by a woman. The difference versus the first indicator is that to reach the percentage of births on age ranges, there should be made a weighted sum of the number of birth depending on the number of the women in that age range.

Economic and Social Research showed us that birth is influenced by several factors, among which is worth mentioning: the importance of family and social trends on the relationship between men and women (Vlăsceanu Lazăr, 2007), the degree of altruism of the family head and the optimal number of children which leads to family utility maximization (Becker Gary S., Robert J. Barro, 1988), long-term interest rate and growth rate per capita consumption between generations (Barro Robert J., Becker Gary S., 1989), per capita income, human capital stock and profitability indicators associated with costs of family planning (Rosenzweig Mark, 1990), social programs to protect women or single parents such as AFDC and Medicaid (Schultz Theodore, 1994), differences in wages between men and women seen as the opportunity cost of rearing a child (Butz W.P., Ward M.P., 1979) and many other factors.

Mortality rate is a measure of the number of deaths among the population, compared to population size (deaths / 1,000 inhabitants) and is influenced mainly by developments in medicine and improvement of living conditions and hygiene. To simplify our approach, we will consider mortality through its relationship with per capita income, using the Preston curve (Preston Samuel H., 2007). Preston curve is an economic theory that dates back to 1975, observed and tested on empirical data from several countries for 1900 ', 1930' and 1960 ', which shows that there is an inverse relationship, strong and sustainable over time between per capita income and life expectancy. The connection observed by the American economist is concave: an increase in living standards leads to a significant increase in life expectancy if the

standard of living is low, and while its level is increased, the marginal influence of life expectancy is decreased.

Preston curve itself has been amended over time by exogenous developments in medicine, like the vaccinations of population, the findings of efficient treatments for diseases that were incurable a century ago and improvements in the performance of health systems. All these led to the Preston curve moving, leading to an increase in life expectancy and thus, to a decrease in age-specific mortality or an increase in the probability of survival for each age range.

Combined, all these theories will lead us to choose the context in which Romania is located in what is called The Theory Of Demographic Transition (Thompson Warren S, 1929). Demographic transition theory is an historical approach to demographic changes occurred during over 200 years in several countries, being an appropriate benchmark for future developments.

The theory is based on a series of four stages of development influencing population trends: the first stage is a pre-industrial one, characteristic for Western European economies from eighteenth century, when, due to the lack of family planning methods and drugs, the population changes are characterized by high rates of both birth and mortality. This is the stage in which changes in the population are best determined by the amount of food available, closely following the trend in the Malthusian paradigm. Currently, countries like Niger are still in the first stage of demographic transition.

The second stage is characteristic for developing countries and is based on economic growth and implementation of sanitary measures, whose effect is reducing mortality, while maintaining high rates of birth. In the second stage, we usually meet a demographic explosion and the population increases dramatically in a relatively short time. In this situation are most of Sub Saharian African countries, the main contributor to world population growth in recent years.

The third stage transmits the impact of falling mortality and birth rates, by decreasing the need for children to maximize family utility function while increasing survival probability at an early age. During the same time a large-scale propagation in family planning methods takes place decreasing fertility. Also very important at this stage is the entry of women into the labor market and society urbanization as factors which change the role of women in society and family. Now the focus moves from traditional family with women whose fundamental role is to raise children to the modern family in which women work to bring incomes in the family.

This third stage, in which both fertility and mortality are low, leads to an aging population which in turn results in an increased dependency in old ages and a decrease in the degree of old people dependence to young people.

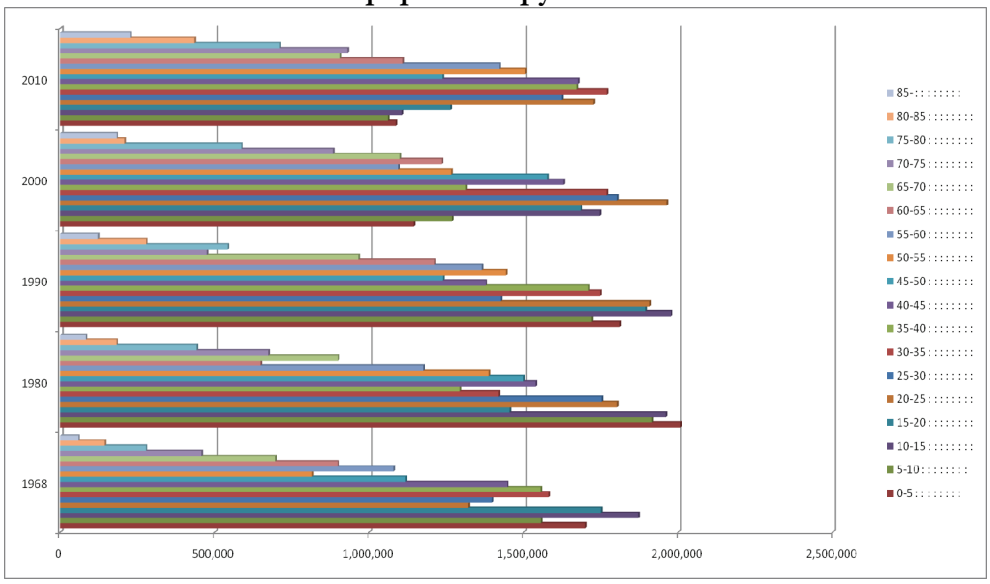
The fourth stage, the last of the initial study, presents a stable population characteristic to many developed economies with a replacement fertility rate of approximately 2.1. Countries that are in this stage have the great advantage of the stability, which provides the possibility of making longer term plans as young population replaces old population in the workforce.

Lately, new stages of this transition following the fourth stage appeared and were observed in various developed countries (Oded Galor, 2005). For example, Western Europe and Japan are clear examples of stage five in which, after a long period of demographic stability, mortality remains at low rates but birth rate continues to decline persistently, leading to a decrease in total population, an aging population and a strong degree of dependence in old age.

3. Demographic evolution in Romania

For our country, we see in Chart 1., that the share of certain age groups in total population changed dramatically between 1968 and 2010, due to changes in birth and death. Thus, while the 1980 population pyramid shows a large number of young people of our country, the situation changes dramatically by 2010. In these circumstances we can say that the share of youth population is constantly decreasing from 35% (3,900,000 people) under 20 years in 1968 to 21% (4,515,000 people) under 20 in 2010. Also, notice how the weight of old age groups (over 65) increased significantly from 8% (1,633,000 persons) in 1968 to 15% (3,206,000 persons) in 2010. However, Romania is better in this respect than countries like Italy and Germany (over 20% of total population).

Chart 1. Evolution of the population pyramid between 1968-2010



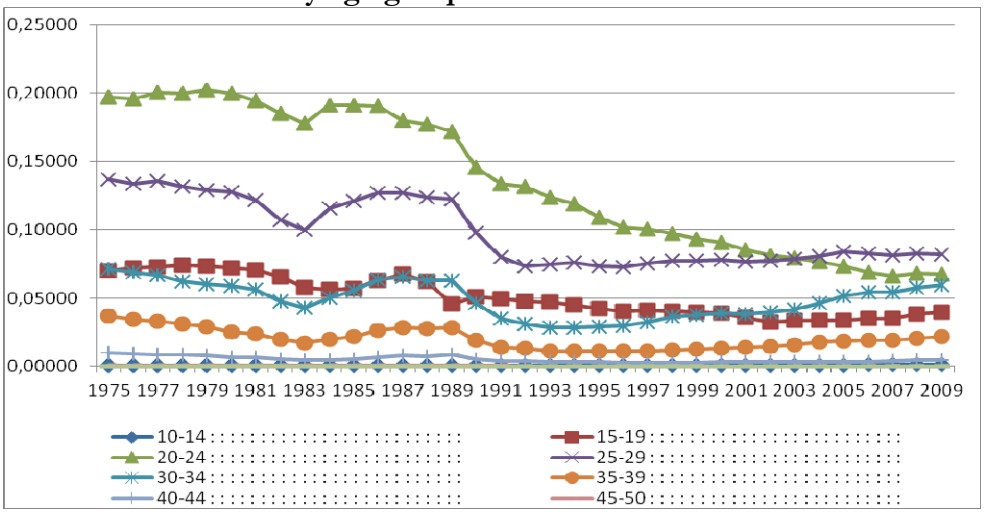
Source: own processing of *Eurostat* data

Apparently, declining birth rates and mortality put us in the fourth stage of demographic transition theory. However, if we note that Romania's population decreased by about 10% from 1990 until today, we realize that in fact our country is in the fifth stage. The fifth stage is probably the most dangerous, because the small number of young people is the base for the future fertility, which is expected to drop

even the current level of 1.37 children per woman. With the population already declining and mortality's impossibility to fall sharply if there is no revolutionary breakthrough in the medical field, a further reduction of fertility can lead to rapid depopulation of the country without an increased flow of immigrants. Knowing that Romania is still an emigration country where the standard of living is significantly lower than in other European countries, Romanian leaders must find solutions to attract a flux immigrants needed for demographic stability.

To predict future demographic trends of our country, should be started from modeling of number of people born and the number of people who die. Modeling the number of newborns is traditionally based on the age fertile female population and birth rate for each age interval. The fertility rate should be modeled according to central tendency and factors such as differences in wages between women and men, the evolution of the income and consumption, interest rate, the tax on consumption and intergenerational transactions or return on investment in human capital. Because men and women incomes began to be monitored only in 2003, overall revenues only in 1995, the number of hours worked by men and women were monitored from 1998, Gender Pay Gap in 1994, the interest rate has a significant but low influence on fertility, according to studies published in the past and the aggregate level of taxes has just began to be calculated by the INS, we have chosen for this study to use only the central tendency of fertility rates.

Chart 2. Birth rates by age group in Romania

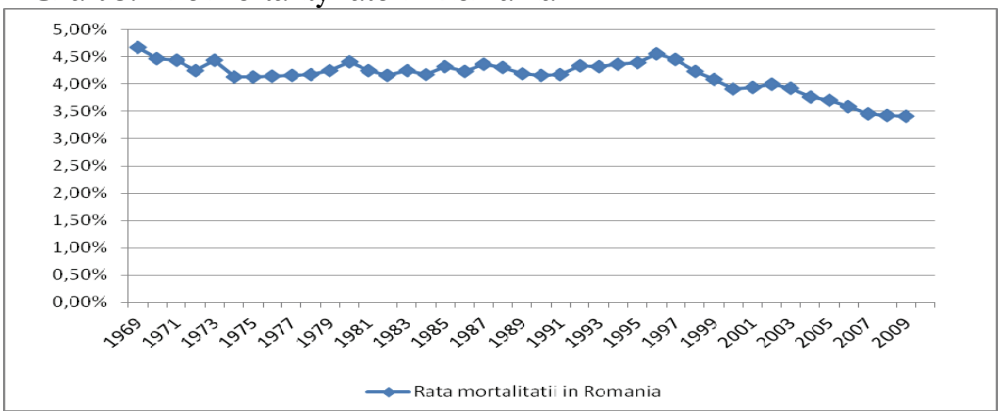


Source: own processing of data from Eurostat

We can see in Chart 2 that the birth rate had fluctuated during 1975-1991 and then stabilized with central tendency. Therefore, in the analysis, we considered only the fertility trends occurring since 1991, in order to discard the legislative and political changes influence occurring before this time.

Modeling deaths traditionally goes from the demographic structure of population and the probability of survival for each age group. Survival probability, in its turn, depends on the standard of living according to the Preston curve, which depends on the investments in healthcare, on the discoveries in medicine and external factors such as wars, disasters, epidemics.

Chart 3. The mortality rate in Romania



Source: own processing of data from *Eurostat*

As seen in the graph above, after a period of stability that lasted until the mid-90s, the benefits of Western medical discoveries have begun to be seen in Romania, together with the easier access to food resulted in higher living standards. Because modeling of living standards and of investments in healthcare will be useful for population growth scenarios not covered by this article, we will limit only to predict the probability of survival according to central tendency.

Following calculations based on central tendencies of fertility and death lead to the conclusion that the Romanian population is declining sharply. The main reasons for this are the overall birth rate well below replacement (1.37 children / woman in 2009 instead of 2.1), rapidly decreasing birth rates in the age group with the highest number of children / woman determined by the incentive to continue studies and delay marriage. Yet, probably the most important factor is the the base effect of the smeller sized younger generation that reached the age group considered to be the most fertile period.

The model contains:

$Ent_k = Sum (Fert_i * Fem_i)$

Where Ent_k represents the number of entrances (children born) in year k, considered to be half girls, $Fert_i$ represents the fertility for age group I computed as age specific fertility trend and Fem_i represents the number of females in age-group i.

$Ex_k = Sum (Mor_i * Inh_i)$

Where Ex_k represents the exits from the population model (deaths) in year k, Mor_i represents 1- survival probability for age group i computed as trend of age specific mortality rate and Inh_i represents the number of inhabitants in age group i.

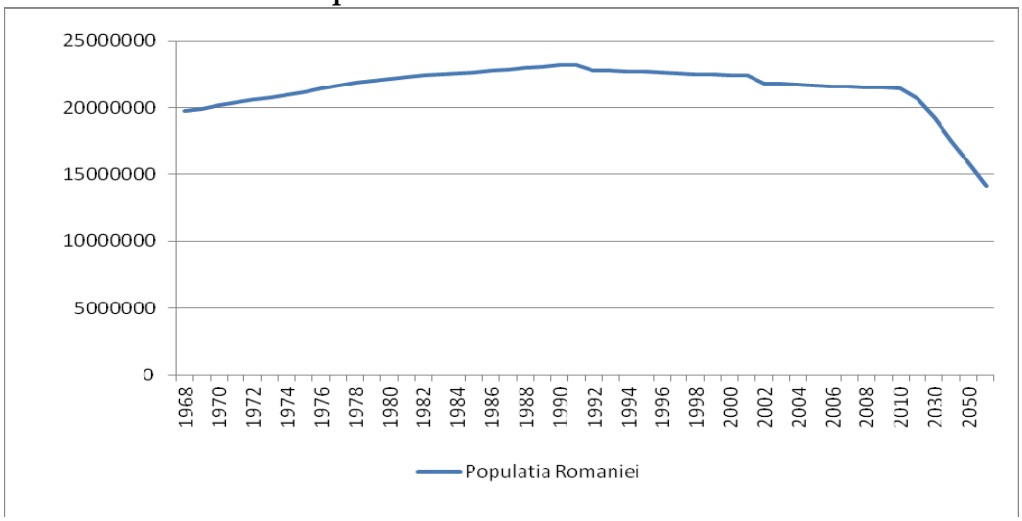
$Inh_k = Sum\ (Inh_i) + Ent_k + Ex_k$
Where Inh_k is the total population in year k.

The model helps us compute both the total population for each year and the population in a specific age group, allowing us to make further calculations regarding how the average age of the Romanian population will evolve. Population was considered according to the certain data before the 2011 Population Census as the census figures are not final and will represent a major outliner in the data, making all modeling more difficult.

According to these calculations, Romania's population would rapidly shrink from 21.4 million in 2010 to 20,700,000 in 2020, 19.2 million in 2030, 17.3 million in 2040, 15.9 million in 2050 and 14.1 million in 2060, as seen in Chart 4. Values are even lower than the pessimistic scenario in the 2007 model forecasts conducted by V. Gheţău (Gheţău Vasile, 2007), which estimated that Romania will reach 16.7 million inhabitants in 2050 if the fertility rate will not recover, scenario that was confirmed by the model in 2011.

Yet, the results are in line with the 2011 Census provisory data that show Romanian population has already decreased to 19 million inhabitants and also with other studies (Bărbulescu Răzvan, 2010).

Chart 4. Evolution of population in Romania between 1968-2010 and estimates for the period 2010-2060



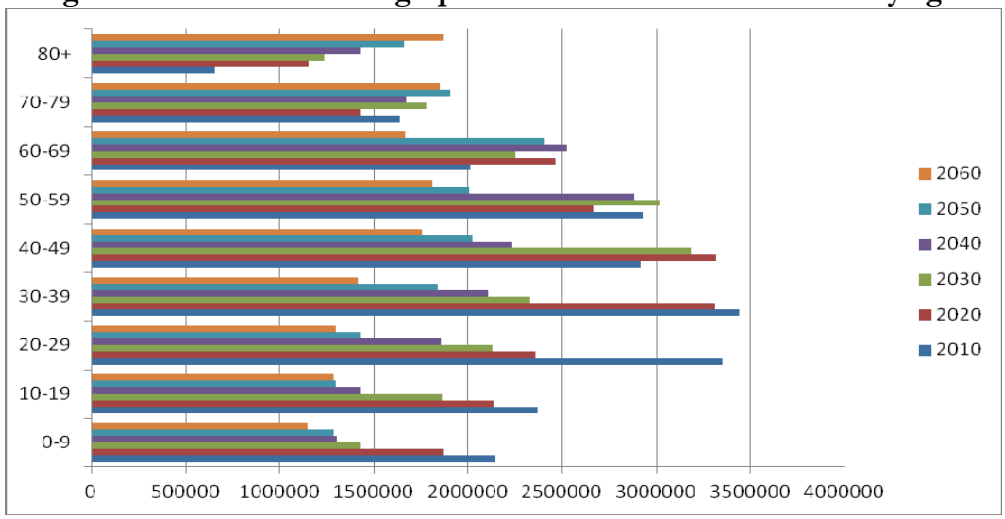
Source: own processing of *Eurostat* data until 2010 and own estimates after 2010

Even worse than the modeled population's decline is the effect on the population distribution by age group. The effect of lower young generations leads to reduced fertility, while older generations nowadays are ageing under low mortality conditions. Thus we see in Figure 5. that the young population decreases as time passes, while the population over 80 years old is increasing.

Increasing older population and decreasing young populations can cause numerous problems for the sustainability of pension funds and social security for the payment of public debt and economic growth in general.

However, estimates made in this article are based on linear modeling and estimated central tendencies, generating a forecast for long periods of time, despite the low number of observations.

Figure 5. Estimated Demographics of Romania - distribution by age



Source: own estimates

4. Conclusions and future research proposals

Romania is, definitely, on a downward trend in terms of population, observed in the last 20 years and with an increasing rate of decline. The main reason for population decline and aging is the basic effect of "missing generations" characterized by a chronic extremely low fertility rate among a decreasing fertile population. Romania is already in the fifth stage of demographic transition, but in the early years the effects were less visible due to the beneficial effects of low fertility and mortality, as average life expectancy was growing and population was quite stable, at least according to the official estimations prior to the 2011 census. Therefore, until now, the population has been on a decreasing slope, but the impact on the budget was small due to the Romanian Baby Boomers who kept working.

In the future, the effects of demographic changes will increase as the "missing generation" reaches fertile age and the generations between 1966 and 1989 reach retirement age. The expected result is an even steeper fertility decrease leading to

even lower child birth ratios, less people in labor prone age groups, while more people reach the retirement age.

In order to find solutions for the future economic issues, modeling should include migration and factors affecting fertility and death rates to find the levers that can help rehabilitate the demographic.

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References

Allen C. Kelley and Robert M. Schmidt, 2008, *The New Palgrave Dictionary of Economics*, 2nd Edition.

Bărbulescu Răzvan, 2010, "Risks and Consequences of Demographic Changes in Romania", *The Romanian Economic Journal*, nr. 6(36) June 2010, pp 99-110

Bărbulescu Răzvan, 2009, "Îmbătrânirea populaţiei şi dinamica aşteptată a resurselor umane", *3-rd International Symposium - Globalization And Convergence In Economic Thought*, Bucharest, December 2009

Bărbulescu Răzvan, Dobre Mihaela, 2011, "Criza care va veni: O analiză pe termen mediu şi lung a modificărilor demografice şi a efectelor acestora asupra pieţei muncii şi a stabilităţii sistemelor de securitate socială", *Oeconomica*, nr. 4/2011

Barro Robert J., Becker Gary S., 1989, "Fertility Choice in a Model of Economic Growth Fertility Choice in a Model of Economic Growth", *Econometrica*, Vol. 57, No. 2 (Mar., 1989),

Becker Gary S., Robert J. Barro, 1988, "A Reformulation of the Economic Theory of Fertility", *The Quarterly Journal of Economics* Volume CII Issue 1 (February 1988)

Butz W.P., Ward M.P., 1979, "The Emergence of Countercyclical US Fertility" *American Economic Review*, vol 69/1979

Dobre Mihaela Hrisanta, Barbulescu Razvan, 2011, "Changes In Males' And Females' Work Time During The Economic Crisis", *Revista Economică* Nr. 2(55)/2011 ULB Sibiu

Gheţău Vasile, 2007, "*Declinul Demografic Şi Viitorul Populaţiei României - O perspectivă din anul 2007 asupra populaţiei României în secolul 21*", Editura ALPHA MDN

Negrea Bogdan, Ţâţu Lucian, Ţâţu Delia, Bărbulescu Răzvan, 2007, "Social welfare and development index", *Revista Analele Universităţii din Oradea*, tom XVI, volumul I/2007

Oded Galor, 2005, "The Demographic Transition and the Emergence of Sustained Economic Growth." *Journal of the European Economic Association*, 3/2005, pp. 494-504,

Preston Samuel H., 2007, "The changing relation between mortality and level of economic development". *International Journal of Epidemiology* 36 (3/2007), Pg. 484,

Rosenzweig Mark, 1990, "Population Growth and Human Capital Investments: Theory and Evidence", *The journal of Political Economy* vol 98 no 5 part 2/1990,

Schultz Theodore, 1994, "Marital status and fertility în the United States: Welfare and labor market effects", *Journal of human resources*, 29/ 1994

Thompson Warren S., 1929, "Population". *American Journal of Sociology* 34(6), Pg. 959-975,

Vlăsceanu Lazăr, 2007, *"Sociologie şi modernitate; Tranziţii spre modernitatea reflexivă"*, Editura Polirom, Bucureşti,