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Hristo KARAKASHEV, Hristo MALESHKOV, Marin BACHVAROV*

GEO-DEMOGRAPHIC PROJECTION OF THE POPULATION OF BULGARIA UNTIL 2020 – ASSUMPTIONS AND MAIN RESULTS

1. INTRODUCTION

Most of the basic indicators characterising the geo-demographic situation in Bulgaria reached extraordinarily unfavourable values with the intensification of the economic crisis. Since the beginning of the 1980s TFR (total fertility rate) is continuously below the simple reproduction level of 2.1 births per woman and in 1995 it is at a record low level – only 1.23 births per woman. As a result of the unprecedented low fertility, unfavourable population age structure (with low reproductive potential), rising mortality, spontaneous emigration and large decrease in the volume of the population has been registered in the country during the last several years. Between 1989–1995 the total population number decreased from 8,892 million to 8,380 million.

The geo-demographic projection presented anticipates the future population reproduction in the country as a whole and by regional units. The assumptions about the specific levels of fertility, mortality and migration depend mainly on trends already formed during the prior period.

The methods and approaches used in earlier population forecasts of the population of Bulgaria (Naoumov, 1992; Naoumov, 1995) have been applied in this study to the new population information together with some new assumptions for the development of the demographic processes singled out after additional research and analysis.

* Hristo KARAKASHEV and Hristo MALESHKOV, University for National and World Economy in Sofia, Bulgaria. Marin BACHVAROV, Sofia University and University of Łódź, 90-418 Łódź, al. Kościuszki 21, Poland.

2. NATIONAL LEVEL ASSUMPTIONS

Current population projection is calculated according to the Leslie matrix reproduction model, or more specifically to its modification taking into account the age specific net migration rates. Additionally, the cohort-component approach developed by the American demographers Keyfitz (1968), Preston *et al.* (1972) and Rogers (1975) was used in formulation of the projection assumptions. Actually, the cohort-component technique uses data about the population distribution by age and sex and allows explicit assumptions about probabilities of survival and migration by age and sex groups. Fertility assumptions are expressed by TFR. They are specified for each regional unit – district (bulg. *oblast*) reflecting the ongoing differentiation in respect to fertility, age group shares, average motherhood age and their dispersion.

The projection results are presented in four variants, conventionally labelled as 'optimistic', or variant A, 'realistic'– variant B and 'pessimistic' – variant C. The last, forth variant D takes into account the migrations under the assumption for 'realistic' fertility.

2.1. Mortality assumptions

Historically, until the end of the 1960s the life expectancy in our country rapidly reached high levels comparable with those in the developed countries of Europe. The next decades were marked by stagnation and reduction of life expectancy for both sexes. The levels of life expectancy and the evolution of the standardised mortality rates shown in table 1 clearly underline this unfavourable trend. Male life expectancy at birth declined by 1.8 years in the period 1970–1995. The growth of life length has ceased by the end of the 1980s and since a reduction is observed.

The epidemiological profile of mortality is increasingly formed under the cardio-vascular diseases and neoplasms. The SDR shows a significant rise in mortality especially of males caused by cardio-vascular diseases. Here the increase reaches 223 points while that of female mortality is only 31 points higher (cf. table 1).

The experience of the developed countries teaches that even if the share of elderly population is high, a reduction of mortality is possible. Moreover, an elongation of working life in good health and without tough restrictions in daily living did take place. For the reversal of the unfavourable trends of mortality in the developed countries crucial was the role of the long-term policies towards better quality of the environment, hygiene, better prophylactics and medical care, higher living standards and promoting health driven motivation and habits.

Table 1. Life expectancy and standardised death rates (SDR) from neoplasms and cardio-vascular diseases, Bulgaria 1970–1995[1]

Indictor	1970	1979	1984	1987	1993	1995
Males life expectancy in years	69.2	68.5	68.5	68.3	68.5	67.4
SDR (per 100,000 population yearly)						
Cardio-vascular diseases	455	560	602	645	657	678
Neoplasms	157	155	161	168	169	173
Females life expectancy in years	73.5	73.9	74.7	74.6	74.9	74.8
SDR (per 100,000 population yearly)						
Cardio-vascular diseases	420	449	445	463	442	451
Neoplasms	100	101	102	98	100	109

It is not realistic however, to expect rapid similar results in our country. The mortality assumptions represent a continuation of the period of stagnation and reduction in life expectancy for both sexes up to 2005–2010 year. Only at the end of the projection period a return to a more balanced demographic development can be expected.

2.2. Fertility assumptions

Irrespectively of the thorough and profoundly elaborated analytical approaches, the geo-demographic theory still cannot secure a high reliability of the fertility forecasts. Due to the impossibility to encompass and measure all the influencing factors, these assumptions are often regarded as subjective judgements.

The approach here used could be justified, first – by the fertility assumptions reflecting the historical experience of the most developed countries during the last stages of their demographic transition, and second – by supporting investigations of the geo-demographic decline in some European countries in periods of economic recession and high unemployment.

The extremely deep economic crisis in our country, the helplessness of the institutions and the difficult restructuring during the transition to a liberal economy, do not allow even a slight optimism about the future recovery of the fertility in Bulgaria. Moreover, it is quite reasonable to expect intensification of the fertility decline till the end of the century and reaching of record low levels in the recent history of the country, in contemporary Europe and possibly in the world.

[1] The SDR for each sex is computed using a stable population distributions Coale-Demeny 'West' model as adopted by Preston, Keyfitz and Schoen (1972).

Under this expected continuation of fertility decline, the assumptions formulated by regional units (*oblasti*) were generalised for the country as follows:

Variant A – 'optimistic' – stagnation from 1995 until the beginning of the new century and slow increase until 2020, when reproduction level of TFR will be reached.

Variant B – 'realistic' – continuation of fertility decline with a minimum at year 2000 and an increase slower in comparison with variant A. By the end of the projection period the total fertility will slightly exceed the level of 1.84 births per woman.

Variant C – 'pessimistic' – decrease of TFR till the end of the century at levels under 1 birth per woman. The expected increase after is very slow and in 2011 the TFR will be on the 1993 level and at the end of the projection period – at the fertility level in 1992 year.

2.3. Assumptions about the international migration

It is well known that this type of hypotheses is most risky and unreliable for making geo-demographic projections. The absence of specific external migration statistics during the post-communist transition led to a poor comprehension of the emigration flows from the country.

Following the recommendations of the international organisations we tried to assess realistically the future out-migration based on the variant D. The assumption concerning external migrations envisages gradual decrease in absolute values of the net out-migration from the current levels (of about 50–60 thousand per year) to 20–25 thousand per year by the first years of the coming century.

3. RESULTS OF THE POPULATION PROJECTION FOR THE COUNTRY IN GENERAL

The size of the Bulgarian population will decline in the projection period by 1,076 thousand, 1,269 thousand, 1,451 thousand, or 1,419 thousand according to variants A, B, C and D. The data presented in table 2 displays a systematic increase of the annual decrease rates for all variants including the optimistic one, in which no further fertility decline is envisaged after 1995.

If the future, negative net migration is taken into account (variant D), it will aggravate the decline of the Bulgarian population to levels unprecedented in the modern history of peace-time reproduction of the population in a single country.

Table 2. Size and growth of the total population in Bulgaria 1995–2020
(population in thousands and growth rates per 1000 of population)

Years	Variants:							
	A		B		C		D	
	population	average annual growth	population	average annual growth	population	average annual growth	population	average annual growth
1995	8,385		8,385		8,385		8,385	
2000	8,166	–5.3	8,144	–5.8	8,113	–5.9	7,964	–10.3
2005	7,969	–4.9	7,904	–6.0	7,857	–6.4	7,727	–6.0
2010	7,770	–5.1	7,644	–6.7	7,588	–7.0	7,473	–6.7
2015	7,536	–6.1	7,394	–6.7	7,275	–8.4	7,232	–6.6
2020	7,309	–6.1	7,116	–7.7	6,934	–9.6	6,966	7.5

The number of women in fertile age in the year 2020 is expected to be only 81% of the 1995 value, and its evolution will be determined by the number of those entering and leaving the fertility age group. For example, after 2005 the generation born in the low fertility years 1990–1994 will enter this group, while those born during the compensation period after the Second World War will be leaving it. In the same period after 2005 a sharp reduction (by 8.3%) of the young women share (15–30 years old) out of all women in fertile age could be expected. If the expected negative net migration is taken into account (variant D), then the degradation of the age structure of all women in fertile age is even more striking – the percentage of young (and most fertile) women will fall by almost 10%.

The data presented in table 3 illustrates the evolution of the population in working age. Its reproduction will be characterised by significant and progressive annual decrease rates (in absolute values) after 2005–2009 period. As in the case of the women in fertile age, the main cause for such labour force deterioration is the expected reduction of the number of those entering, versus those leaving this group. Under variant D a significant decline of this group is expected since 2000.

The presented future behaviour of the Bulgarian population will have a number of crucial economic, social and strictly geo-demographic consequences. The most significant and challenging among them is connected with the deep perturbation in the age structure in the next decades. The ageing of the Bulgarian population is expected to continue intensively both at the top and the bottom of the age pyramid. The proportion of the young population (0–19 years old) will decrease substantially from 25.1% in 1995 down to **8.1**–21.5% by the end of the projection period. The percentage of the elderly (above 60 years) will increase from 21.4% in 1995 to 24.1–25.5% in 2020 (the variance reflects the 'optimistic' and 'pessimistic' fertility assumptions).

Table 3. Population in working age[2] in Bulgaria from 1995 to 2020
(in thousands, annual growth in ‰)

Years	Variants:							
	A		B		C		D	
	population in work age	average annual growth	population in work age	average annual growth	population in work age	average annual growth	population in work age	average annual growth
1995	4,739		4,739		4,739		4,739	
2000	4,741	0.1	4,741	0.1	4,741	0.1	4,576	–7.0
2005	4,650	–3.9	4,650	–3.9	4,650	–3.9	4,498	–3.4
2010	4,447	–8.9	4,447	–8.9	4,447	–8.9	4,313	–8.4
2015	4,212	–10.9	4,195	–11.7	4,172	–12.8	4,083	–11.0
2020	4,031	–8.8	3,976	–10.7	3,932	–11.8	3,889	–9.7

4. GEO-DEMOGRAPHIC PROJECTION OF THE POPULATION OF THE BULGARIAN ADMINISTRATIVE REGIONS

The radical instability of reproduction of the Bulgarian population is resulting in progressive depopulation in the country as a whole. In the same time a respective parallel differentiation is growing between the regional units. The present geo--demographic projection has been prepared for each of the 9 districts under the assumed set of hypotheses.

The distribution of the population by districts and some conventional parameters of the geo-demographic situation for the basic year 1995 are presented in table 5. The population growth is negative for each of the 9 districts for the period 1985–1995. The most populous and densely populated districts – the City of Sofia, Plovdiv district, as well as Bourgas and Sofia districts have registered relatively smaller negative annual growth rates, while districts Haskovo and Rousse are on the opposite pole. The level of the decrease rate in Haskovo district is impressive – if it does not change in the future its population will halve in less than 50 years.

The causes of this unfavourable annual growth could be traced back far behind – already at the end of the 1960s closely related to the other elements of geo-demographic decline. These elements include on one hand the rising mortality, declining fertility (which in all districts in 1995 is about only the half of the simple reproduction), as well as massive emigration generated by the country during the last years.

[2] The working age in Bulgaria is from 16 to 59 years of age for men and from 16 to 54 years for women. The number of population in working age is calculated using an interpolation procedure for estimating the number of those 15 years old.

On the other hand, we have witnessed high intensity of the internal migration in the whole post-war period, marked by rapid industrialisation and urbanisation. This has affected the regional population size and age structures, so that their potential for geo-demographic reproduction became regressive (age structures with large relative shares of old people and reduced reproductive potential, for which depopulation is irreversible).

Generally speaking, the characteristics of declining population are expressed at different hierarchic levels – at the low (municipality) level, but have striking representatives at the district level as well (Naoumov, 1992). Lovech and Montana are demographically the most declining districts, disclosing unfavourable age structures, high mortality, low birth rate and quite large natural decrease rates (table 4).

Table 4. Some geo-demographic indicators in Bulgaria by districts 1985–1995

District	Population (thousands) 1995	Density (people per sq.km) 1995	Average annual growth 1985–1995 (%)	Birth rate	Death rate (in%)	Natural increase	Total fertility (children per woman)
City of Sofia	1,193	910.1	–0.1	7.9	11.9	–4.0	1.02
Bourgas	847	57.8	–0.3	9.6	12.8	–3.2	1.39
Varna	901	75.5	–0.8	9.3	12.8	–3.5	1.28
Lovech	990	65.3	–0.9	7.7	16.5	–8.8	1.22
Montana	616	58.1	–0.9	8.1	18.5	–10.4	1.37
Plovdiv	1,214	89.1	–0.3	8.6	12.1	–3.5	1.22
Rousse	760	70.1	–1.1	9.0	14.1	–5.1	1.32
Sofia	966	50.9	–0.5	8.3	13.9	–5.6	1.24
Haskovo	898	64.6	–1.4	8.7	12.5	–3.8	1.29
Total	8,385	75.5	–0.6	8.6	13.6	–5.0	1.23

The mortality assumptions are formulated according to analyses of mortality tendencies by cause of death in Bulgaria. The comparisons with the developed countries showing highest levels of life expectancy and record low levels of infant mortality indicate that similar developments in Bulgaria cannot be expected (Naoumov, 1992; Buettner, 1995).

Thus, the mortality assumptions suggest a continuation of the period of stagnation and small decrease of the life expectancy until 2000–2005 when the lowest length of life is to be reached – 65.5 and 73 years, respectively for men and women. Then, till 2020 the high levels characterising the period prior to the economic crisis will be gradually attained for both sexes (66.8 years for the males and 74.9 years for the females).

Research on the variation of age specific mortality in the districts (cf. figure 1) has disclosed that about 30% of the differences in the life expectancy between the districts is due to infant mortality (Maleshkov, 1996). It could be seen from the data shown in figure 2, that the lowering of infant mortality in all Bulgarian districts is smaller and slower after 1980. Moreover, increases of infant mortality in most districts and in the whole country were observed in the last years.

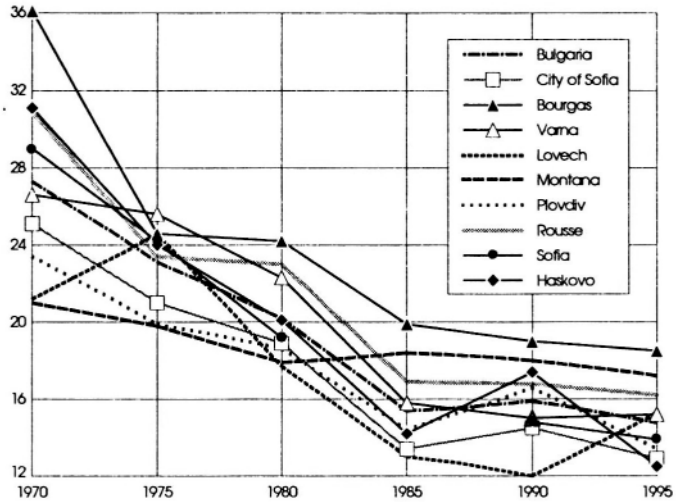

Fig. 1. Infant mortality in the districts of Bulgaria 1970–1975
(deaths per thousands live births)
Source: *Statistical yearbook of Bulgaria 1971–1996*

Three groups of districts could be clearly identified according to the level of infant mortality. In the first group are the districts: City of Sofia, Plovdiv, and Sofia, for which after 1970 the infant mortality is continuously below the country average. On the other pole are districts with steady higher mortality among children – Bourgas, Montana and Rousse. In the remaining districts – Varna, Lovech and Haskovo the infant mortality is close to the country average. In respect of the future development of infant mortality, we expect relatively high levels – between 14–15‰ live births up to 2005–2010. Afterwards the infant mortality is to decrease slowly, reaching in 2020 about 10‰ live births in the country as a whole.

The fertility also differs significantly at the district level. The expected average for the country is 1.63 children per woman by year 2020 according to the 'realistic' forecast. Due to the significant problems in the statistical registration of external migration at a district level, and the absence of

information which could be used for the construction of well founded assumptions, the geo-demographic projection at this stage is restricted to the presentation of population reproduction under the assumption of zero net external and internal migration.

5. RESULTS OF THE REGIONAL ANALYSIS

The projection reveals an intensive decrease of the population in all districts of the country (cf. figure 2). In two of the districts – Lovech and Montana, the reduction of the population is very significant – by 21% by the end of the projection period. The decreases are lowest in the districts Bourgas, Varna, and Plovdiv. Here the degradation of the age structure goes along with low fertility and despite the anticipated slight fertility increase will unconditionally lead to a further depopulation. A special case is City of Sofia. The population development here is favourably influenced by the young age of the internal migrants.

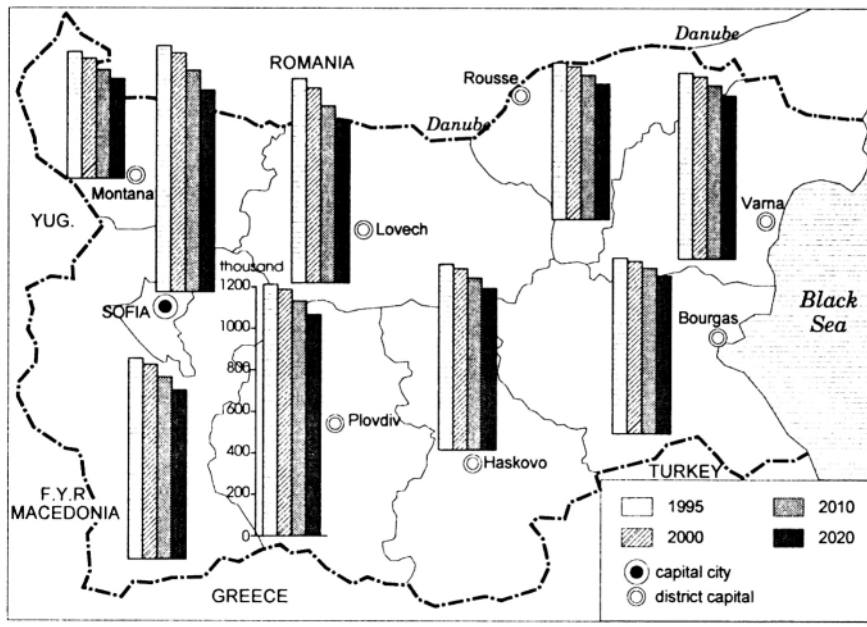

Fig. 2. Number of population in the Bulgarian districts of 1995 and its projection up to year 2020 (in thousands)
Source: *Statistical yearbook of Bulgaria 1996* for the 1995 data

The population reduction will intensify in the period after 2010, when the reproductive age will be joined by women born in the period of low fertility 1990–2000. Most dramatical is the decrease in the group of women in the City of Sofia – by 31% and in Lovech – by 23%. In six of the remaining districts (Bourgas, Haskovo, Varna, Rousse, Sofia and Montana), the expected reduction in the shares of fertile age women are lesser than for the whole country. The expected reductions fertile age women share in all districts will be bigger than the decrease of the total population, the only exception being district of Montana. This means that the geo-demographic reproduction with continuously decline in the next 25 years and the reproductive potential of the country will decay.

When characterising the ageing of the regional populations of a great interest are the changing shares of the young (below 20 years) and old contingents (above 60 years) displayed as percentage of the overall population. These tendencies with important long-term social and economic implications are especially pessimistic for Bulgaria (cf. table 5).

Table 5. Relative share of the young and old people in Bulgaria by districts in 1995–2010 (in % of the population)

District	1995		2000		2020	
	0–19	60+	0–19	60+	0–19	60+
City of Sofia	22.8	19.8	19.7	20.3	15.7	27.1
Bourgas	27.1	19.9	24.2	20.7	22.1	23.2
Varna	26.1	19.2	23.1	19.9	19.9	24.2
Lovech	23.0	25.2	20.6	25.1	18.7	26.7
Montana	23.0	27.6	21.2	27.0	21.2	25.2
Plovdiv	26.0	19.9	23.2	20.7	20.6	24.1
Rousse	25.6	20.8	23.0	21.3	20.6	24.2
Sofia	25.4	21.5	22.6	22.2	19.4	24.7
Haskovo	26.7	20.8	23.6	21.5	20.4	23.8
Total	25.0	21.4	22.3	21.8	19.7	24.8

An intensive process of population ageing in the future from the bottom of the age pyramid in all districts, is mainly due to the low fertility in the last years and in the proction period. The districts Lovech and Montana have attained highest degree of age structure degradation. More dramatic is the respective assumption for the City of Sofia, where the share of young people is to reach record low levels – down to only 15.7% of the population.

The ageing at the top of the age pyramid will be less intensive than the ageing at its bottom. Again, the most striking critical values are anticipated at the end of the period in the districts City of Sofia, Lovech and Montana – respectively 27.1%, 26.7% and 25.2% old people of the total population. Let us

not forget however that this picture is counter-balanced in Sofia and other urban centres by the concentration of young immigrants from the provinces.

6. CONCLUSIONS

First of all, the negative growth rates of the total population, the reproduction and labour potential of the country and the ageing of the population should not be dramatised. In a world of intensive scientific and technical innovations the negative geo-demographic growth is not an obstacle for development. New concepts of development in a democratic society are gaining importance – the quality of human capital, its education, entrepreneurial abilities, adaptability to changing economic circumstances, creativity and healthy living.

Nevertheless, the above geo-demographic projections reveal quite alarming tendencies in the development of the Bulgarian population. The economic crisis and the limited possibility for implementation of effective geo-demographic policies should not be an excuse for ignoring the geo-demographic problems. It is true that the adaptive solutions are hard to attain but nevertheless are urgently needed and could be realistically successful.

The predominant share of the unfavourable phenomena characterising regional population reproduction together with the set of complex aspects of internal migration, urbanisation, commuting and present settlement networks are mutually interrelated and influenced by many economic and social variables (Karakashev, 1993).

Summarising, the present and future geo-demographic development of our country is loaded with many new and complex obstacles. Their solution, although very difficult, can be achieved only through an adequate long-term geo--demographic strategy. The elaboration of such a strategy is one of the most important challenges for the geo-demographic studies during the times of crisis and profound economic, demographic and social changes (Naoumov, 1995).

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