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OF MODERN SCIENCE**
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REGIONAL SPECIAL FEATURES OF DEMOGRAPHIC CONSTITUENT OF NATIONAL ECONOMIC SAFETY OF UKRAINE*

Abstract: The paper provides the issues of determining the demographic security level of the regions of Ukraine as a component of national economic security. To produce the demographic security level and integral regional indicators of Ukraine we analyzed economic and social indicators (the 1995-2017 time series) through multidimensional factor analysis. The result of our research has shown that the current level of demographic security is dangerous for almost all regions of Ukraine. Ukraine economy faced with natural reduction and graying of population, migration crisis and unworkable citizens. Thus, demographic policy of Ukraine must be balanced to protect against negative trends of existing socio-economic citation.

Introduction. Contemporary economic and political state of Ukraine, which is characterized by long-lasting economic crisis and war conflict in the East of the country have challenged reconsideration of approaches to ensuring national safety, which key constituent is economic safety. Economic safety itself is the guarantee of the country's stable development, basis of increasing of its competitiveness in the external environment.

Economic safety formation have been studied from different points of view by scholars. Thus, according to Tretiyak and Hordienko [1], economic safety is one of the most important components of national safety, depicting cause-and-effect

* This work was supported by the Ministry of Education and Science of Ukraine (Project No. 0117U003922 «Innovative drivers of national economic security: structural modeling and forecasting»)

relationship between economical power of the country, its military-economic capability and national safety. According to the other scholars [2], economic safety is interpreted as complicated multifactor category, that characterizes ability of national economy to broad self-restorability for balanced meeting of country's population on definite level, for preventing and eliminating threats and negative consequences of their influence. In research by Holikov [3] economic safety is the state in which such components as financial, information, social-economic, institutionary-legal, technical and technological, intellectual and professional, power and ecological activity are in the state of "absence of danger", "preservation", "protection from threats", "safety", "reliability", "stability", "rest", "independence", "within tolerable limits". On different levels of state system economic safety is defined as vertical-integrated three-level (national, regional and local self-government) system, with developed horizontal bonds (in each of the mentioned levels), which is characterized by system's self-sufficiency and stabilizes economy from negative external and internal actions and promotes its progressive development [4]. Issue of economic safety management on regional level as the constituent of system of administration of social-economic processes is studied by Krylenko [5], Vakhovyc, Denysyuk [6]. Analyzing the essence of economic safety, it is possible to state the main principles, which guarantee it [7], to identify external and internal threats, which appear in scientific, technical, economic and social spheres.

Regulatory basis of definition of economic safety in Ukraine are Methodologic recommendations as to the calculation of economic safety level of Ukraine (2013) [8]. There it is defined that the components of economic safety are: industrial, energetic, international, investment and innovation, macroeconomic, trader, social, financial, and demographic safety. Works of many scientists are devoted to individual aspects of their formation.

Demographic safety is the state of protection of country, society and job market from demographic threats, within which the development of Ukraine considering the complex of balanced demographic interests of country, society and personality according to the constitutional rights of citizens is provided. Studying the issues of

demographic safety, authors Tsvihun and Alexandrova [9, 10] paid attention to the factors that influence its level. Among such factors they distinguished living standard of population, quality of medical care, migration processes in society. Demographic constituent of national economic safety is studied in their works by scientists: Malnar & Malnar [11], Paluchowski P. [12], Herd, Sargsyan [13]. According to the results of research by Malnar & Malnar, [11], which was held factually based on 10 post-soviet countries of South-Eastern Europe of 1980-2010 years. It was found out that between demographic safety and dynamics of economic indexes direct connection exists, that proves the fact that existing unfavorable demographic safety will have constant negative influence on the safety of analyzed countries in particular and on the whole region in general. Authors Herd, Sargsyan [13] analyzed indexes and trends of demographic safety in Russia. Increase of regional demographic and economic differences in Germany and Great Britain was studied by Paluchowski [12], in which the argument was presented that growing differences in demographic and economic conditions are the result of demographic processes, which greatly depend on local and international mobility. Increase of regional demographic and economic differences in Germany and Great Britain was investigated in work by Paluchowski [12], where the argument was presented that growing differences in demographic and economic conditions are the result of demographic processes and greatly depend on internal and international mobility. Despite the great number of publications concerning the problems of demographic safety as the component of national economic safety considering Ukraine less-researched stay regional demographic peculiarities and factors that influence the general level of safety. It proves the necessity and actuality of the further researches in this sphere.

Methodology. The estimation of demographic safety level is necessary to be held with the help of system of indexes, list of which is formed based on the markers' choice, which most fully characterize each of sub-index, considering the previous experience of estimation, results of Ukrainian and foreign scientists in sphere of economic safety, markers of economic safety, defined by the specified international organizations (International Monetary Fund, UN, regulatory documents of EU, etc),

stages defined by national programs of development. According to the Methodologic recommendations for the calculation of economic safety level (Methodologic recommendations for the calculation of economic safety level of Ukraine, [8]), it is foreseen to apply 7 markers which characterize demographic safety:

- 1) quantity of factual population, percentage to the level of 1995 (I_1);
- 2) life expectancy, years (I_2);
- 3) coefficient of children's death, per 1 thousand of born alive (I_3);
- 4) coefficient of natural growth, per 1 thousand of factual population (I_4);
- 5) part of elderly population in the whole number of population, percent (ageing coefficient) (I_5);
- 6) demographic load of unworkable population on workable population, percent (I_6);
- 7) total coefficient of migration growth (shortening) (per 10 thousand of individuals) (I_7). For each marker of components of demographic safety state in Ukraine individual values, which determine its level, are worked out. Range of individual values of each marker (index) is measured within the range 0 -1 (or from 0 till 100 percent) and is divided in 5 intervals [y_0, y_{crit}), [y_{crit}, y_{dang}), [y_{dang}, y_{unsat}), [y_{unsat}, y_{sat}), [y_{sat}, y_{opt}], where y_0 – value of marker, which is characterized as minimal and completely dangerous level of demographic safety; level of demographic safety is equal to 0;

y_{crit} – value of marker, which is characterized as critical level of demographic safety; level of demographic safety is equal to 0,2 or 20% of optimal value;

y_{dang} – value of marker, which is characterized as dangerous level of demographic safety; level of demographic safety is equal to 0,4 or 40% of optimal value;

y_{unsat} – value of marker, which is characterized as unsatisfactory level of demographic safety; level of demographic safety is equal to 0,6 or 60% of optimal value;

y_{sat} – value of marker, which is characterized as satisfactory; level of economic safety is equal 0,8 or 80% of optimal value;

y_{opt} – value of marker, which is characterized as optimal level of demographic safety; level of demographic safety is equal to 1, that is, it is equal to optimal value.

Markers that characterize level of demographic safety can be of two types:

– stimulators, which are characterized by direct link between marker and integral estimation;

– disincentive, which are characterized by direct link between marker and integral estimation.

Regulation of markers is done with the help of linear function so, that typical value of markers was within the frames of intervals, compared by value. Transference from absolute to regulatory values of markers allows measuring of markers according to the scale from 0 to 1 or in percentage: 0 is equal to 0%, 1 – 100%. Thus, received marker regulatory value characterizes by its size the level of approximation to optimal value 1. Each marker has its weight value in general integral index of demographic safety, which is defined by experimental estimation. Calculation of integral index of demographic safety according to Methodologic recommendations for the calculation of economic safety level [8] is done by formula:

$$I_{dem} = \sum_{i=1}^n d_i y_i \quad (1)$$

where d_i – weight coefficient, which defines the level of impact of i-marker into integral index of demographic safety component; y_i – normalized estimation of i-indice. Table 1 presents contents of indexes of demographic safety level, their belonging to stimulators or disincentive, and weight coefficients, that allow to distinguish significance of individual markers in the general marker of demographic safety index. Alternatively to Methodologic recommendations (Methodologic recommendations for the calculation of economic safety level of Ukraine, 2013), while definition of typical values authors made several changes as to the optimal (limit) value of these indexes. It relates to necessity to adopt correspondent indexes to modern Ukrainian and world's trends and realities.

Table 1 Indices of level of demographic safety.

index	Type of index	weight	individual values of each index					
			y_0	Y_{crit}	Y_{dang}	Y_{unsat}	Y_{sat}	Y_{opt}
I_1	stimulator	0,1265	<85	$\geq 85 \dots 90$	$\geq 90 \dots 95$	$\geq 95 \dots 97$	$\geq 97 \dots 100$	≥ 100
I_2	stimulator	0,1265	<66	$\geq 66 \dots 68$	$\geq 68 \dots 70$	$\geq 70 \dots 75$	$\geq 75 \dots 78$	≥ 78
I_3	disincentive	0,1432	≥ 11	$\geq 9 \dots 11$	$\geq 7 \dots 9$	$\geq 5 \dots 7$	$\geq 4 \dots 5$	<4
I_4	stimulator	0,1874	<-2	$\geq -2 \dots -1$	$\geq -1 \dots 0$	$\geq 0 \dots 1$	$\geq 1 \dots 1,5$	$\geq 1,5$
I_5	disincentive	0,1625	≥ 25	$\geq 22 \dots 25$	$\geq 18 \dots 22$	$\geq 15 \dots 18$	$\geq 11 \dots 15$	<11
I_6	disincentive	0,1265	≥ 55	$\geq 52 \dots 55$	$\geq 49 \dots 52$	$\geq 46 \dots 49$	$\geq 43 \dots 46$	<43
I_7	stimulator	0,1274	<-50	$\geq -50 \dots -25$	$\geq -25 \dots 0$	$\geq 0 \dots 25$	$\geq 25 \dots 50$	≥ 50

Source: Methodologic recommendations for the calculation of economic safety level, 2013.

Marker of economic safety, received as the result of calculations, is the component of index of national economic safety.

Research results. Estimation of demographic safety level in regions of Ukraine. The information basis for research is the statistical data of State Statistics Service of Ukraine (Demographic and social statistics 1995-2017, 2018).

Recently Ukraine is quite regionally bounded country. It is seen in peculiarities of life pattern, traditions, life views of citizens of various regions. In Fig.1 regional administrative map of Ukraine is presented.

Assessment of the demographic security of Ukrainian regions. Ukraine is a very regionally differentiated country, which manifests itself in the peculiarities of the lifestyle, traditions, and attitudes of the inhabitants of its individual regions. Figure 1 shows the regional administrative map of Ukraine.



Figure 1. Administrative map of regions of Ukraine

Source: [15]

While estimation of demographic safety level of each region of Ukraine statistic data, regarding demographic indices in definite regions of Ukraine in the period 1995-2018 were used. The first indicator that forms the level of demographic safety is the marker of factual population size, in percentage to year 1995. There was the trend to population size growth before 1990. Decline of industry, job cuts, less income per individual led to the decrease of natural growth of population of Ukraine and increase of immigration. Decrease of population size of Ukraine is mostly connected with long-lasting social and economic crisis and insufficient incomes for running the family [16]. In Fig.2 the dynamics of this index in context of definite regions of Ukraine is presented.

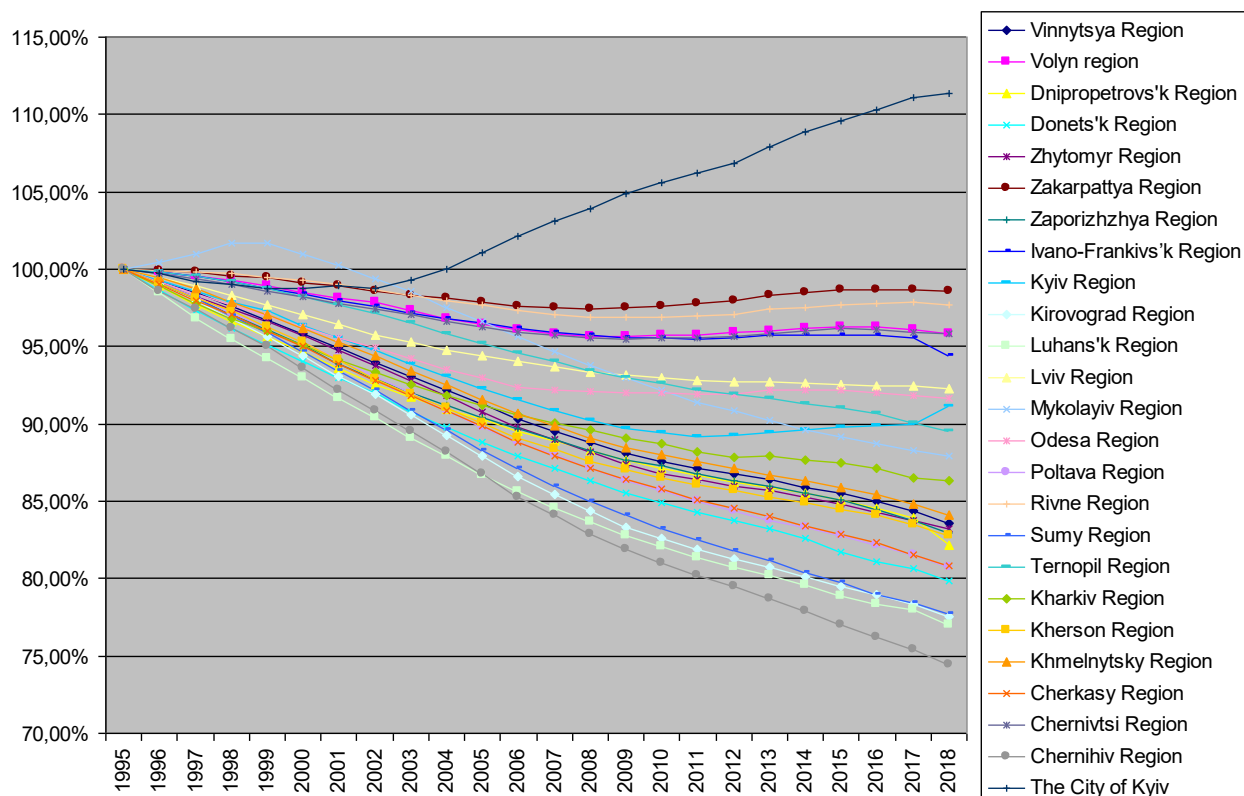


Figure 2. Indicator of factual population size, in percentage to the level of year 1995

Source: compiled by the authors

As it is seen from the figure, almost in all regions of Ukraine, except for Kiev, reduction of factual population is observed. It concerns more eastern, northern and central regions, in which Chernihiv, Luhansk, Kirovograd's and Sumy regions are leading in population reduction. In these regions indicator's value is less than 85% that, according to the research methodology corresponds to absolutely dangerous level of demographic safety. It is explained by traditionally low rate of birth in these regions, high immigration flow of population, which became especially strong since the start of war conflict in Donbass in 2014. A better situation is observed in other regions of Ukraine, especially in western regions: Zakarpattia, Rivne, Volyn, Chernivtsy, where the population size reduced insignificantly since year 1995. Special attention should be paid to growth of population in city Kiyv, which mostly takes place by means of internal migration from other regions of Ukraine. The other indicator of level of demographic safety is the life expectancy, which is presented in Fig.3 in numbers.

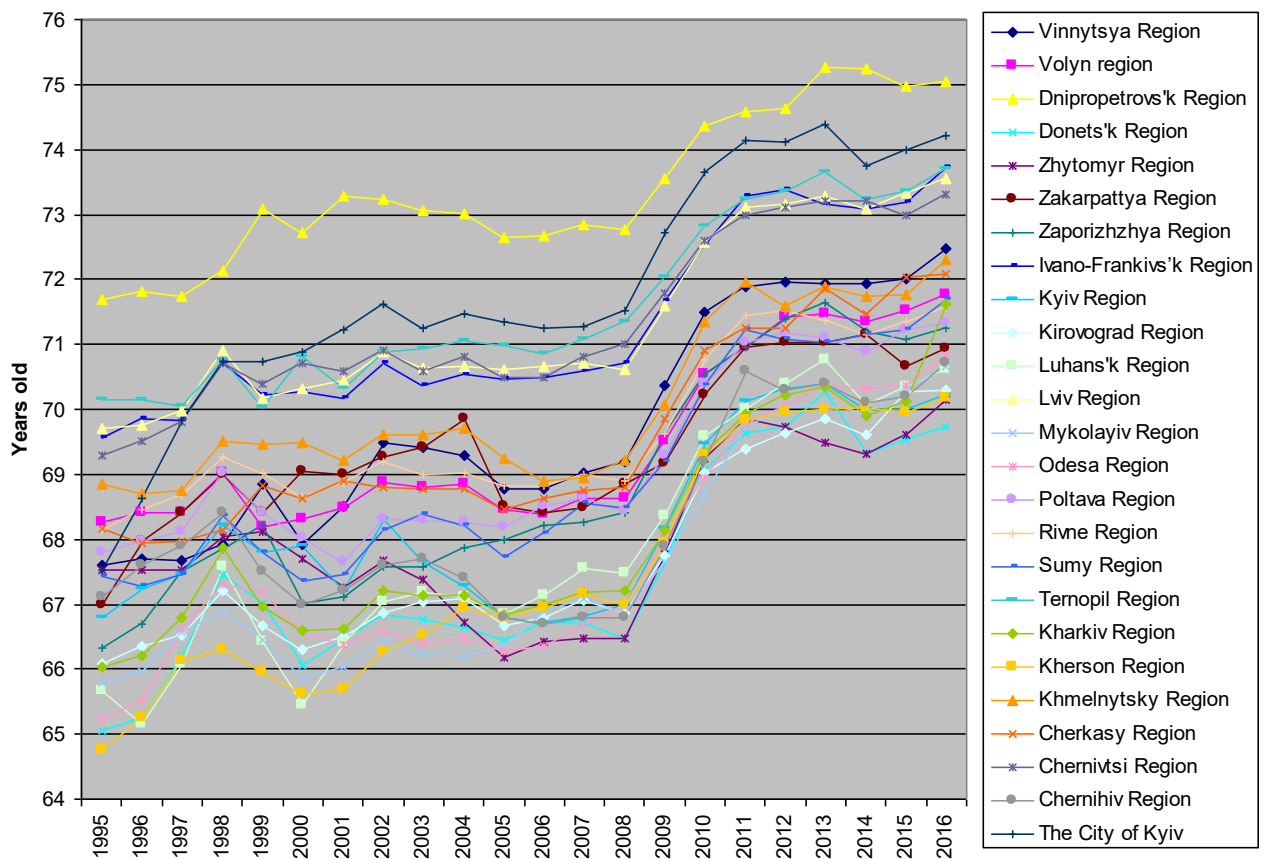


Figure 3. Index of life expectancy

Source: compiled by the authors

As it is seen from this figure the life expectancy has the trend to growth that characterizes it positively from the point of view of demographic safety provision. It is the shortest in Donetsk, Zhytomyr and Kherson regions, and the longest it is in Dnipropetrovsk region and the city Kyiv. Along with that for most of these regions this index is in the interval 70-75 years, that, according to the research methodology responds to unsatisfactory level of demographic safety. Growth of the expected lifespan refers to reduction of death rate from some diseases. Along with that, in the world's rating of countries, accounting the index of expected lifespan, Ukraine occupies 150 place of 223 with index 68,25 [17]. According to UN in 2016 Hong Kong occupied the first place according to the lifespan – people live there 83,5 years. Japan (83,1 years), Italy and Island (82,9), Switzerland (82,7), France (82,6) are the leading countries. So, it is impossible to talk about demographic safety of Ukraine according to this index.

The next index is children's death rate, which is calculated as the number of dead children aged till one year per one thousand born alive. Children's death rates are generally acknowledged markers of nation's health, reflecting the quality of life, level of well-being and distribution of social and material welfares in society, state of environment, level of education and culture, efficiency of disease prevention, level of availability and quality of medical care, etc (site CIA). This marker is disincentive, that means that its growth leads to the reduction of level of demographic safety. Calculation of this marker in regions of Ukraine is presented in Fig.4.

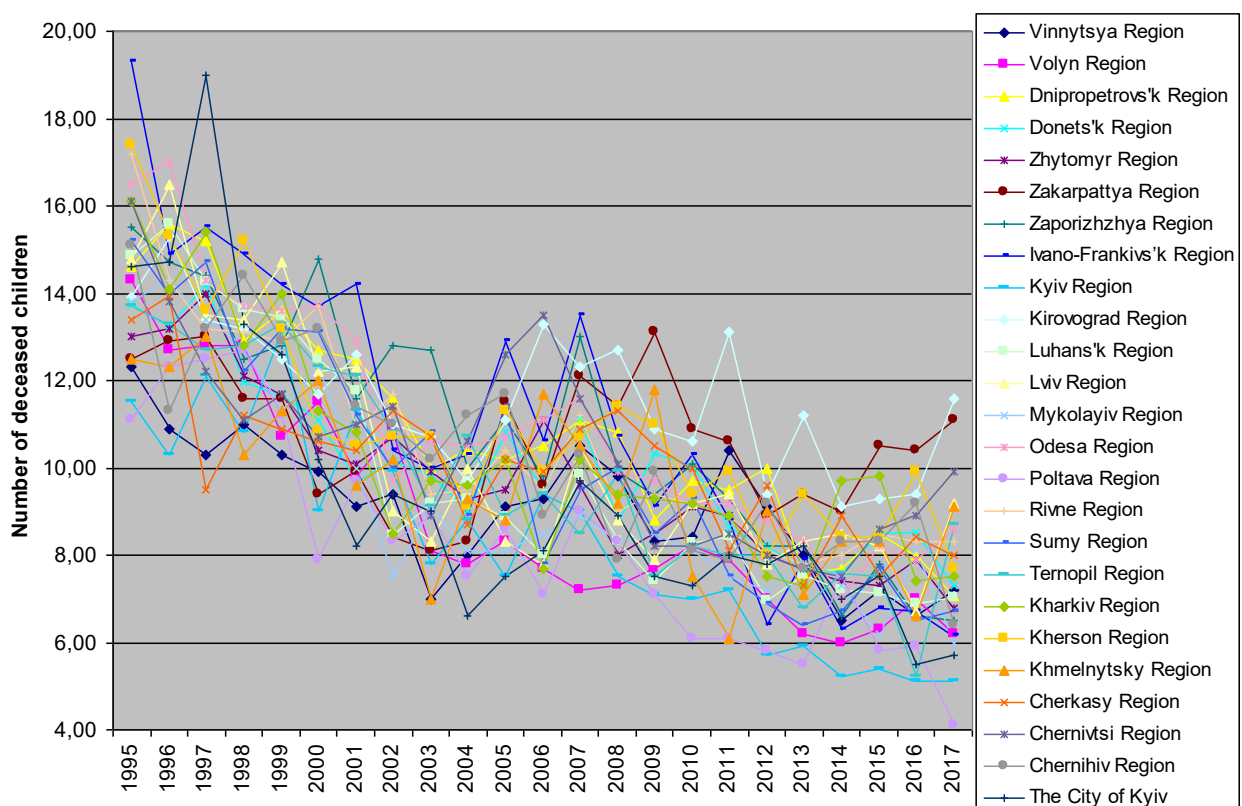


Figure 4. Index of children's death rate

Source: compiled by the authors

It is seen from Fig. 4 that during the last 12 years the index of children's death rate reduced significantly and for the present time, for most regions of Ukraine is equal to 6-10 children per 1000 of born alive. At this the lowest level and that means, the best situation is observed in Poltava and Kyiv regions and in city Kyiv. The worst index of children's death rate is observed in Kirovograd and Zakarpattya Regions.

Correspondently to the research methodology it can be said that despite positive trends according to this marker most of the regions of Ukraine are in the zone of dangerous or unsatisfactory level of demographic safety. Analyzing the world statistics as to this it can be stated that according to the data [18] Ukraine occupies 67 position in the world rating of countries (starting from the lowest value), this index is 7,8. The highest indexes have such countries as Monaco (1,8), Japan (2,0), Island (2,1).

The next is the index of natural growth per 1000 of individuals of factual population. This marker is stimulator and has optimal value on the level 1,5. If the value of this marker is lower than 2 it states the critical level of this index of demographic safety. Starting from 1991 death rate exceeds birth rate and these rates differ only in dynamics. The most interesting is regional specifics, presented in Fig.5.

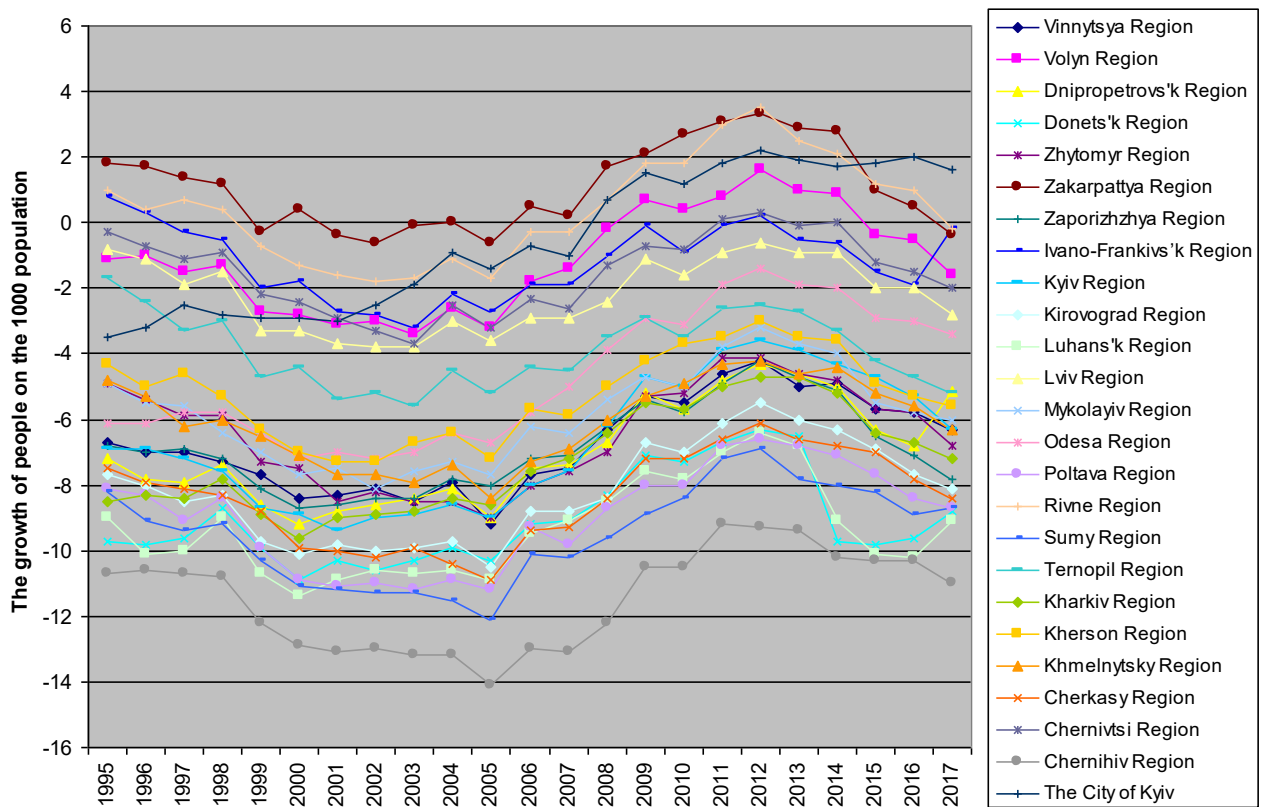


Figure 5. Index of natural growth of population

Source: compiled by the authors

As the diagram shows, this marker has been fluctuating in the regions of Ukraine starting from the 1995. Significant decrease of birth rate that was seen in the second half of 1990s was changed by fast increase at the beginning of 2000, which last till 2014, that is till the beginning of political crisis and war conflict. In the context of regional research, it is seen that value of this index is traditionally high for western regions (Lviv, Ivano-Frankivsk, Zakarpattia and Chernivtsy regions), northern regions (Volyn, Rivne region) and for city Kyiv, where in some years it reached values, which exceeds the optimal ones.

The worst situation with natural growth is in eastern regions (Donetsk and Luhansk regions), and in Sumy, Poltava, Kharkov, Kyiv, Chernihiv, Cherkassy, Kirovograd regions. For the most of these regions the value of this marker is much lower than minimal one or absolutely dangerous level of demographic safety. In this background Chernihiv region stands aside, where the state of popularity reproduction is greatly influenced by the pollution of territory of Ukraine by radioactive elements. The next index of demographic safety is the part of elderly population in the total number of populations, or ageing coefficient. By its nature this index is disincentive, and its absolutely dangerous level comprises 25%. Optimally, the index value according to the methodology is 11%. Practically, increase of this index drags on the row of economic problems and contradictions, connected with redistribution of financial flows and resources in national economics [19]. Dynamics of changes of this index in regions of Ukraine is presented in Fig. 6.

It is seen from the diagram that for the most regions of Ukraine increase of elderly part of population is characteristic, that negatively affects the level of demographic safety. It especially concerns eastern and central regions, where level of demographic safety according to this index has critical or absolutely dangerous value. The situation in western regions is comparatively better, where, in general, level of demographic safety according to this index is characterized as dangerous. It is necessary to state that “ageing” of population takes place in the whole world. According to the UN predictions [20] it is foreseen that the number of populations in age 65 years and older in the period 2015-2050 will increase twice and a half time

from 608mln till 1,6blrd individuals. The part of elderly people will comprise nearly 23% in North America and 28% in Europe.

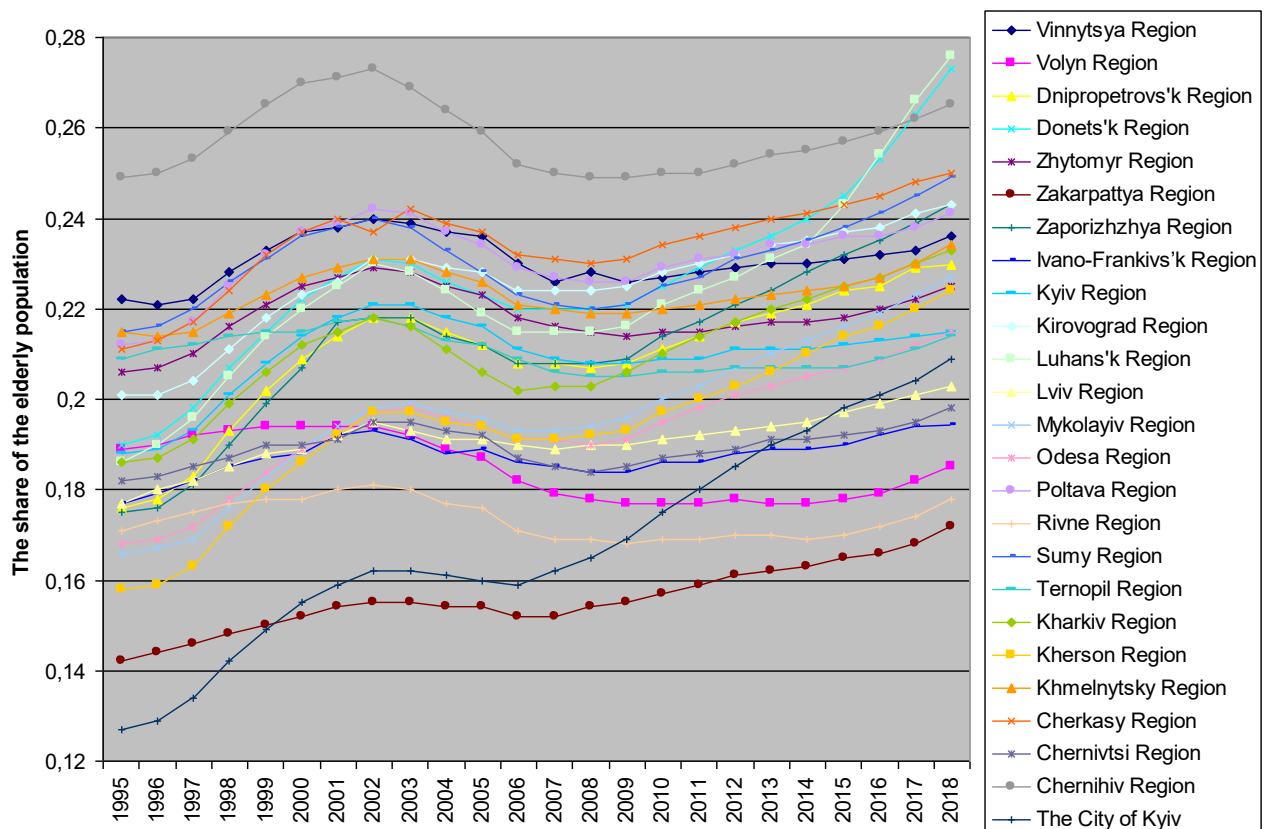


Figure 6. Indicator of elderly part of population in total number of population

Source: compiled by the authors

The next index of demographic safety is demographic load of unworkable population on workable. This index is dis incentive and its normal value according to the research methodology is 45%. Absolutely dangerous value of this index is 55%. Practically, this index is applied while the calculation of expenditures, necessary for pension provision, expenditures for keeping of children, applied while the working out of the measures concerning social provision and rational usage of labor forces. In Fig.7 dynamics of index of demographic load of unworkable population on workable is presented.

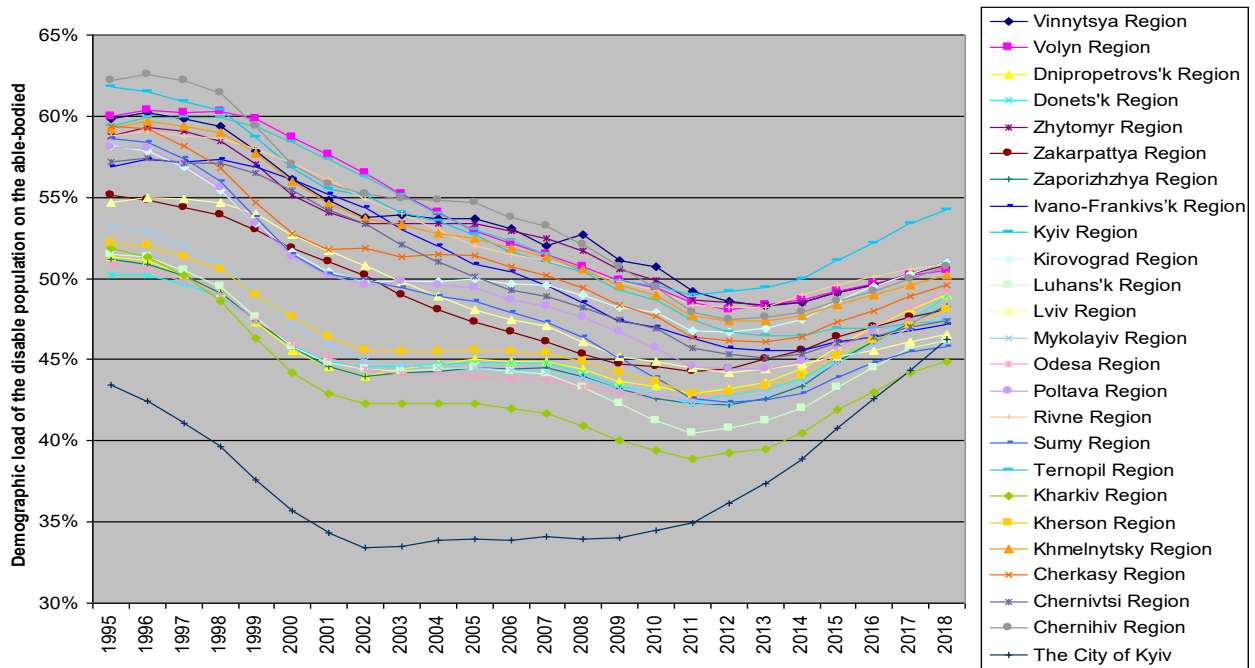


Figure 7. Indicator of demographic load of unworkable population on workable
 Source: compiled by the authors

It is seen from the diagram that for the present day for most regions of Ukraine the value of this indicator lays within the range 45-50%, that responds to the dangerous level and has trend to increase. The last index of demographic safety is the coefficient of migration growth of population (per 10000 individuals). This index shows regional displacement of population, resulting from political, economic, religious, and other reasons, and characterizes the region in context attractivity for life. In Fig.8 dynamics of indicator of migration growth of population in different regions of Ukraine is presented.

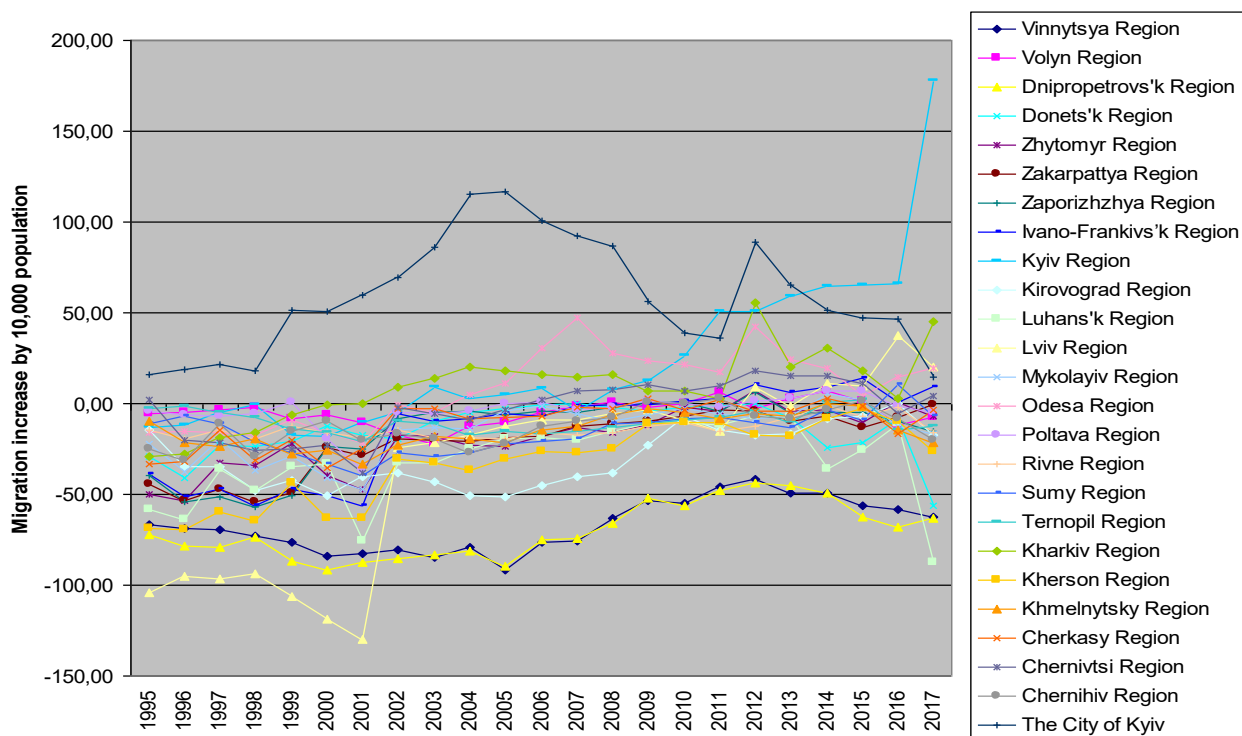


Figure 8. Index of migration growth of population

Source: compiled by the authors

As it is seen from the diagram, it is difficult to form the unital regularity of migration processes for most regions of Ukraine. In the recent years because of the war conflict in East of Ukraine the flow of population from Donetsk and Luhansk regions increased significantly. It is necessary to state that these calculations account only data about migration of population only from territories, controlled by Ukraine. Indexes of migration inflow in Kyiv and Kyiv region are traditionally high. Thus, having defined the value of some definite indexes for regions of Ukraine it is possible to calculate their general level of demographic safety. In table 2 the norm values of indexes for the current period (2018) (first column) and their values, accounting the weight coefficient (second column) are presented.

Table 2 Indexes of level of demographic safety

Region	Indicator														
	I ₁		I ₂		I ₃		I ₄		I ₅		I ₆		I ₇		Σ
Vinnytsya	0	0	0,6	0,076	0,4	0,057	0	0	0,2	0,033	0,4	0,051	0	0	0,216
Volyn	0,6	0,076	0,6	0,076	0,6	0,086	0,2	0,037	0,4	0,065	0,4	0,051	0,4	0,051	0,442
Dnipropetrovs'k	0	0	0,8	0,101	0,4	0,057	0	0	0,2	0,033	0,6	0,076	0	0	0,267

Donets'k	0	0	0,4	0,051	0,4	0,057	0	0	0	0	0,6	0,076	0	0	0,184
Zhytomyr	0	0	0,6	0,076	0,6	0,086	0	0	0,2	0,033	0,4	0,051	0,4	0,051	0,296
Zakarpattya	0,8	0,101	0,6	0,076	0	0	0,4	0,075	0,6	0,098	0,6	0,076	0,4	0,051	0,476
Zaporizhzhya	0	0	0,6	0,076	0,6	0,086	0	0	0,2	0,033	0,6	0,076	0,4	0,051	0,321
Ivano-Frankivs'k	0,4	0,051	0,6	0,076	0,6	0,086	0,4	0,075	0,4	0,065	0,6	0,076	0,6	0,076	0,505
Kyiv	0,4	0,051	0,6	0,076	0,6	0,086	0	0	0,4	0,065	0,2	0,025	1,0	0,127	0,430
Kirovograd	0	0	0,6	0,076	0,0	0	0	0	0,2	0,033	0,4	0,051	0,4	0,051	0,210
Luhans'k	0	0	0,6	0,076	0,4	0,057	0	0	0	0	0,6	0,076	0,0	0	0,209
Lviv	0	0	0,6	0,076	0,2	0,029	0	0	0,4	0,065	0,6	0,076	0,6	0,076	0,322
Mykolayiv	0,2	0,025	0,6	0,076	0,6	0,086	0	0	0,2	0,033	0,6	0,076	0,4	0,051	0,346
Odesa	0,4	0,051	0,6	0,076	0,4	0,057	0	0	0,4	0,065	0,4	0,051	0,6	0,076	0,376
Poltava	0	0	0,6	0,076	0,8	0,115	0	0	0,2	0,033	0,6	0,076	0,4	0,051	0,350
Rivne	0,8	0,101	0,6	0,076	0,4	0,057	0,6	0,112	0,6	0,098	0,4	0,051	0,4	0,051	0,546
Sumy	0	0	0,6	0,076	0,4	0,057	0	0	0,2	0,033	0,8	0,101	0,4	0,051	0,318
Ternopil	0,2	0,025	0,6	0,076	0,4	0,057	0	0	0,4	0,065	0,6	0,076	0,4	0,051	0,350
Kharkiv	0,2	0,025	0,6	0,076	0,4	0,057	0	0	0,2	0,033	0,8	0,101	0,8	0,102	0,394
Kherson	0	0	0,6	0,076	0,4	0,057	0	0	0,2	0,033	0,6	0,076	0,2	0,025	0,267
Khmelnysky	0	0	0,6	0,076	0,2	0,029	0	0	0,2	0,033	0,4	0,051	0,4	0,051	0,239
Cherkasy	0	0	0,6	0,076	0,4	0,057	0	0	0	0	0,4	0,051	0,4	0,051	0,235
Chernivtsi	0,6	0,076	0,6	0,076	0,2	0,029	0,2	0,037	0,4	0,065	0,6	0,076	0,6	0,076	0,435
Chernihiv	0	0	0,6	0,076	0,6	0,086	0	0	0	0	0,4	0,051	0,4	0,051	0,263
The City of Kyiv	1,0	0,127	0,6	0,076	0,6	0,086	1,0	0,187	0,4	0,065	0,6	0,076	0,6	0,076	0,693

Source: compiled by the authors

According to the received data the rating of regions of Ukraine was compiled (Fig.9). As it is seen from Fig.9 the highest level of demographic safety has Kyiv. It is followed by western regions of Ukraine and the lowest level have region of Donetsk regional area. Along with that it can be stated that the majority of regions of Ukraine have dangerous (lower than 0,4) level of demographic safety, that, in its turn, influences the general index of national economic safety.

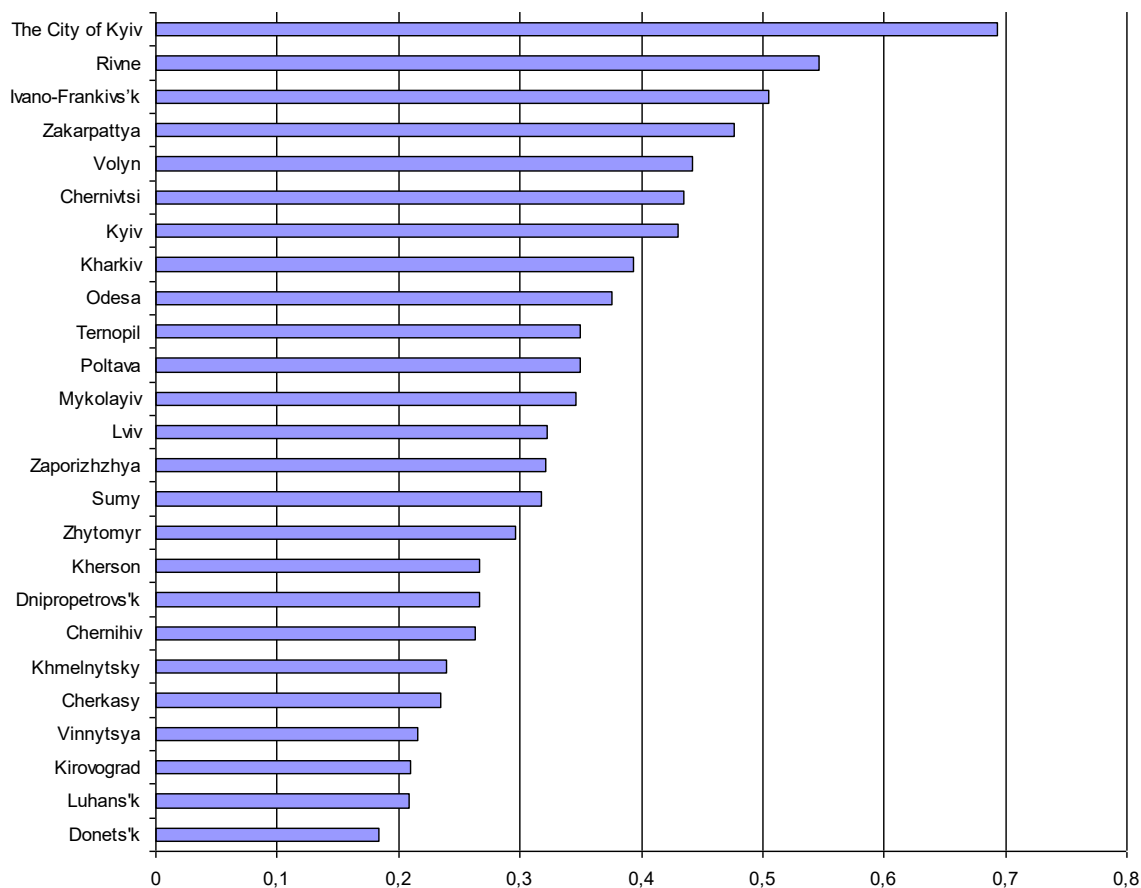


Figure 9. Rating of regions of Ukraine by the level of demographic safety in 2018
 Source: compiled by the authors

CONCLUSIONS

To conclude, issues of demographic safety insurance as the component of national economic safety are the task of state policy of Ukraine of primary importance. For the present day, almost all regions of Ukraine have dangerous level of demographic safety that strengthens hazards and negative trends in economy of Ukraine for the nearest perspective. Especially dangerous are the trends that are characteristic for general reduction of number of populations as the result of its negative natural growth, loss of part of territories because of war conflict and increase of migration processes, connected with wide-scale immigration of population abroad for work and better life. Substantial problem, which is characteristic not only for Ukraine but for most European countries, is the increase of

the part of elderly people and demographic load of unworkable population on workable. It leads to the increase of social expenditures of the state, complete provision of which under conditions of economic and political crisis of Ukraine is very complicated task. A bit better situation is with indexes of expected length of lifespan and children's death rate, which in recent time have the trends to improvement, but still they are too far from the similar indexes of the well-developed countries. So, demographic policy must be balanced and adequate to current economic situation, which main trends are implementation of measures for increase of population birth, that means overcoming of family crisis, improvement of material state of the citizens, fight with diseases and improvement of healthcare system and support of maternity; provision of upbringing, education and development of children, etc.

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