STATISTICAL ANALYSIS OF DEMOGRAPHIC DIVIDEND AND ECONOMIC GROWTH IN THE EASTERN EUROPEAN COUNTRIES

Mantsurov Igor,
Doctor of Sciences in Economics, Professor
Corresponding Member of the National Academy of Science of Ukraine,
Director of the Research Institute for System Statistical Studies,
Extraordinary Professor of the Department
of Statistics and Demographic Studies;
Stiegler Nancy,
Doctor of Sciences in Demography, Professor,
Head of the Department of Statistics and Demographic Studies;
Hvelesiani Anna,
PhD in Economics,
Leading Researcher Ptoukha Institute for Demography and Social
Studies of the National Academy of Sciences of Ukraine
Research Fellow of the Department of Statistics and Demographic Studies;
Barvinok Alina,
PhD in Economics,
Kyiv National Economic University named after V. Hetman,
Researcher of the Department of Statistics
and Demographic Studies;
the University of the Western Cape in the Republic of South Africa

The purpose of this article to be presented in the Conference, is to evaluate the demographic factors', including demographic dividend's characteristics', impact on the economic growth dynamics and to propose the main priorities for the social and demographic policy mix in the field of well-being improvement.

The authors are supposed to note in their presentation that in a great majority of the Sustainable Development Goals should be strongly interconnected with demographic issues. Following this conceptual approach, the authors examined the impact of selected socio-demographic factors on the real GDP per capita growth rates in *a sample of the Eastern European countries, including Ukraine, that have entered or declared their intentions to join the European Union in the future*.

Authors investigated general economic and demographic dynamics in the region from 1960 to 2022. The special attention was focused primarily on the highlighted countries' socio-demographic and macroeconomic variables from 1990 to 2022. Among these variables are those that characterize the essence of the demographic dividend, which considered as an important factor for economic development and provided a rationale for policies aiming at a more balanced age structure through birth control and family planning.

Assessing the relative importance of age structure and increases in human capital, the authors would like to argue that the demographic dividend is related to age structure and education and has suggested a dominance of improving education over

age structure.

Here we reconsider the empirical relevance of shifts in the age distribution for development for sample of 13 countries over the period 1990 to 2022. Based on a flexible model of age-structured human capital endowments, the results document important interactions between age structure, human capital endowments and economic growth, suggesting that arguments of clear dominance of education over age structure are unwarranted and lead to potentially misleading policy conclusions.

An increase in the working-age population share has a strong and significant positive effect on growth, even conditional on human capital, in line with the conventional notion of a demographic dividend. An increase in human capital only has positive growth effects if combined with a suitable age structure. An increasing share of the most productive age groups has an additional positive effect on economic performance. Finally, the results show considerable heterogeneity in the effect of age structure and human capital for different levels of development. Successful policies for sustainable development should take this heterogeneity into account to avoid detrimental implications of a unidimensional focus on human capital without accounting for demography.

The demographic dividend has played a prominent role in the debate about suitable policies to support the achievement of sustainable development goals and economic development around the world. In its basic form, the dividend arises as a consequence of a secular decline in fertility in developing countries with high fertility rates [1, p. 7; 2, p. 12].

This decline leads to a shift in the age structure, reducing the youth dependency ratio and increasing the working-age population share, thus providing a boost of living conditions in terms of income per capita. The decline in fertility is typically closely linked to an increase in education attainment. From the perspective of unified growth theory, these fertility and education dynamics are triggered by a change in the demand for skills rooted in the economic and technological environment and complement each other in giving rise to the acceleration in growth during the economic take- off [3, p. 21; 4, p. 17-22; 5, p. 64].

Despite the conceptually close links between fertility, age structure, and education, empirical research on the demographic dividend has focused on isolating single dominant factors, and recent work has reported a clear dominance of human capital over age structure, arguing that the demographic dividend is mainly driven by education [6, p. 17-18; 7, p. 82] These results question the importance of demographic trends, in particular of shifts in the age distribution, for economic performance, although the analysis is severely limited in its ability to account for interactions between human capital and age structure as a consequence of a restrictive structural framework.

Such interactions emerge in different dimensions and refer to the overall education of the working-age population, to the age structure of the working-age population in light of heterogeneity in the age-productivity pro- file, and to the age structure of the education embodied in the population in light of changes in education quality and content.

Authors would suggest that there was a certain interdependence between the working-age population stratum specific weight, the elderly demographic dependency ratio, public healthcare spending, gross capital formation, and the real GDP per capita growth rates. In addition, we propose the main priorities for social and demographic policy in the field of well-being improvement. The potential ways – regarding healthcare, education, and the general profile of fiscal policy – to enhance the model have been disclosed as well.

Authors used the figures of the Eurostat and World Bank open databases. Taking the inertia of economic and demographic changes the authors have analyzed the time interval from 1960 to 2022. The sample represented the 13 countries of the Eastern European countries mentioned in the Table 1. The population aged 15 to 64 was identified as economically active. The working possibilities for the persons aged 65 and older has been noted. The theoretical generalization to systematize the factors influencing the socio-demographic and economic development of the sampled economies as well as the methods of statistical analysis have been used.

According to the analysis results, the total population number in the selected countries has increased from 136 million in 1960 to 149 million in 2022. The share of the working-age group grew by 1.7 percentage points from 64.2% in 1960 to 65.9% in 2022. The share of the youngest population group decreased from 28.6% in 1960 to 15.5% at the end of this period, over which was gradually declining death and fertility levels. As a result, an essential increase in life expectancy at birth has been observed. So, the specific weight of the elderly population age stratum in the total structure raised from 7.2% in 1960 to 18.7% in 2022.

The overall demographic dependency ratio also changed slightly. In 1960, there were 0.56 incapacitated persons of any age stratum for the one working-aged person. In 2022, the indicator equaled to 0.52. It is necessary to note that in 2010, the minimum overall demographic dependency ratio for the period – equaled to 0.43 – has been recorded. At the same time, the specific demographic dependency ratios (focused on the youngest and the eldest population strata) changed essentially. The share of the elderly population stratum increased from 7.2% in 1960 to 18.6% in 2022. Meanwhile, the specific weight of the persons under the age of 14 decreased from 28.6% to 15.5%, respectively (Figure 1).
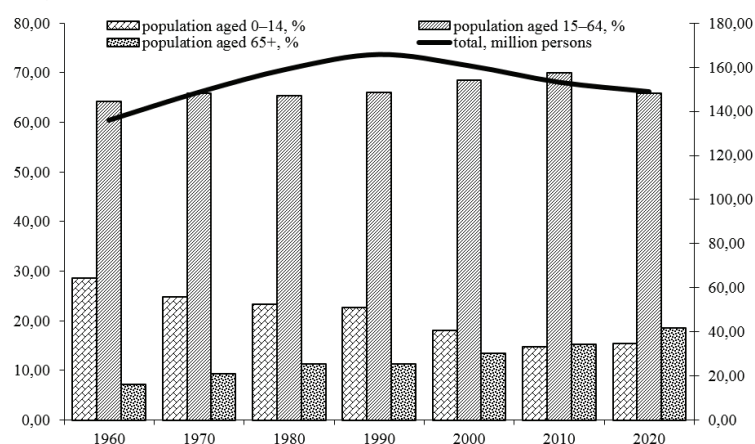

**Figure 1. The age structure of the Eastern European countries'
population over 1960–2022 years**
Source: the authors' calculation based on the Eurostat and World Bank data.

The sample's average life expectancy at birth increased significantly from 67.9 years in 1960 to 75.9 years in 2022. The dynamics of the average life expectancy in the sampled countries over 1990–2022 is presented in the Table 1. It is necessary to emphasize that quite a significant this indicator's level increase was observed in almost in all selected countries, ***except for Moldova and Ukraine.***

Table 1

Average life expectancy at birth in Easter European countries in 1990–2022, years

Country	1990	1995	2000	2005	2010	2015	2020	2022	1990–2022
Bulgaria	71,6	71,1	71,7	72,6	73,5	74,6	73,5	72,9	72,5
Croatia	72,2	72,1	73.9	75,2	76,5	77,3	77,7	78,0	75,8
Czech Republic	71,4	73,1	75,0	75,9	77,4	78,6	79,2	79,8	76,7
Estonia	69,5	67,5	70,4	72,6	75,4	77,6	78,4	79,0	74,1
Hungary	69,3	69,8	71,2	72,7	74,2	75,6	75,8	75,9	72,9
Latvia	69,3	66,4	70,3	71,4	73,5	74,5	75,4	75,6	72,7
Lithuania	71,2	69,0	72,1	71,3	73,3	74,4	74,9	75,0	72,6
Moldova	67,6	66,9	67,0	67,8	69,6	70,5	71,0	69,8	68,9
Poland	70,9	71,9	73,8	75,0	76.2	77,4	76,0	76,3	74,7
Romania	69,7	69,4	71,2	71,9	73.5	74,9	74,4	74,1	72,0
Slovakia	70,9	72,2	73,1	73,9	75.1	76,6	76,9	76,9	74,2
Slovenia	73,2	73,9	75,4	77,6	79.4	80,8	80,5	80,7	78,1
Ukraine	70,1	66,7	67,9	67,9	70.3	71,2	71,2	69,3	69,3
Average	*70,5*	*70,0*	*71,6*	*72,8*	*74.5*	*75,8*	*75,8*	*75,9*	*73,0*

Source: the authors' calculation based on the Eurostat and World Bank data

Life expectancy at birth, total (years) in Ukraine was reported at 71.2 years in 2020 and 69.3 in 2022.

The dynamics of the youngest and the eldest age strata (traditionally excluded from the working-age population according to the methodology of the International Labor Organization) shows that the population compositional structure and demographic dependency ratios changed crucially. While the sampled countries maintained an almost constant average share of the working-age population, a shift towards an increase in the elderly demographic dependency ratio has been occurred.

The number of the elderly population significantly increased even in the countries with relatively low per capita incomes, in particular, in Ukraine and Moldova.

The lowest indicator – equaled to 20.25% – also was observed in Ukraine.

Of the particular interest is the study of the qualitative and quantitative relationships between the dynamics of demographic indicators, particularly, the demographic dividend and economic development.

In this regard authors would propose to use the statistical methodology suggested by Professor Samuelson (1954), who formulated an ambiguous ***Serendipity Theorem***. According to this theorem, ***economic growth is determined exclusively by a combination of fiscal decentralization and rate of natural increase components, i.e.,***

natality and mortality indicators.

This conceptual approach has been improved by Professor Deardorff (1976), who proved that such statement was debatable, since it had been often impossible to estimate the optimal natural population change that could be able to maximize the labor resources utilities *adjusted on the demographic dividend's characteristics, i.e., education level, working experience, health state, etc. And, what is extremely important, by the demographic dependency ratio.*

The structural changes in the population of the sampled countries partly confirm the aforementioned theorem. Population ageing appeared to be the factor that determined the design of the social production's distributive and redistributive phases. Hence, it had been appropriate to study the relationship between demographic ageing, education level, social spending, and macroeconomic dynamics that can be measured by the GDP growth.

All the selected countries were characterized by indisputable decrease in fertility and unsustainable increase in the average life expectancy during the period of study. Meanwhile, the population age structure of the sample varied substantially. The impact of the population ageing and fluctuations in the working age groups appeared to be rather ambiguous. Moreover, an increased elderly population dependency ratio affected both educational as well as production and consumption processes.

Analyzing the relationships between the dynamics of demographic indicators, particularly, the demographic dividend and economic development, authors would like to note that the Baltic countries were the leaders in terms of GDP per capita growth rates varied from 4.53% in Estonia to 5.28% in Lithuania). In 1996 to 2008, three Baltic states were characterized by relatively high average economic growth (ranged from 6.8% in Estonia to 7.7% in Latvia) and rather low elderly demographic dependency ratio (ranged from 22.0% in Lithuania to 23.3% in Latvia).

Over the period of 2000–2021, an increase in the working-age groups specific weight adversely affected economic growth in all Baltic countries.

There were recorded high elderly demographic dependency ratios in these countries, that were varying 25.0% in Lithuania to 26.3% in Latvia. With more or less similar, relatively high educational level of population.

Over the 2009–2021 period, the real GDP per capita growth rates in these Baltic countries went down (it is varying from 2.1% in Latvia to 3.1% in Lithuania). Simultaneously, the average elderly demographic dependency ratios raised to much significantly (ranging from 28.0% in Lithuania to 29.3% in Latvia).

So, the authors' hypothesis regarding the rather high level of dependence of economic growth indicators on the value of the demographic dividend is confirmed. Even though the selected countries varied significantly in terms of economic growth (especially during the 2000s), there were some specific trends common for the entire sample.

Conclusion

Defining the demographic dividend is the accelerated economic growth that may result from a rapid decline in a country's fertility and the subsequent change in the population age structure. With fewer births each year, a country's working-age population grows larger in relation to the young dependent population.

The benefits gotten from a demographic transition is neither automatic nor guaranteed. Any demographic dividend depends on whether the government implements the right policies in areas such as education, health, governance, and the economy. In addition, the amount of demographic dividend that a country receives depends on the level of productivity of young adults which, in turn, depends on the level of schooling, employment practices in a country, timing, and frequency of childbearing, as well as economic policies that make it easier for young parents to work. The dividend amount is also tied to the productivity of older adults which depends on tax incentives, health programs, and pension and retirement policies.

Demographic dividends can be a driving force for supporting development and contributing to peace and security as well as to the post-war rehabilitation programs development and implementation in Ukraine. Talking about youth programs in the conditions of terrible armed conflict in Ukraine, the authors mean such ones as developing strong and sustained connections to the educational, economic, and cultural values of their neighborhoods and cities, first of all during the war and post-war rehabilitation programs.

The obtained results proved that the stochastic interdependence between certain socio-demographic and macroeconomic factors appeared to be valid.

It is proved that over 2000 – 2022, an increase in the working-age groups specific weight affected the real GDP per capita growth rates positively.

The average elderly demographic dependency ratio was negatively interrelated with economic development indices. Regarding that, the social and demographic policy mix should be focused on the elimination of the population ageing negative impact on public welfare. So, the respective policy profile should be updated to ensure active and efficient elderly population strata participation in the production processes.

Following the analysis results the authors thinks that the specific attention of the governments should be paid to the intellectual capital improvement. Healthcare expenditures, both public and private, also should be rationalized, regarding the respective population's actual structure to ensure the elderly strata productive involvement.

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