

## AGING OF THE POPULATION AND IMPACT ON THE LABOR MARKET IN THE SR

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### *Abstract*

*The main goal of the research is to specify the aging of the population in the Slovak Republic and its impact on the labor market. Data obtained from research and current literature serve as a basis for further investigation and offer an overview of new trends related to aging and employment. Based on them, we focused on selected indicators of population aging and their expected development. Since aging affects the whole society, it is necessary to include in the analysis the labor market, the structure and state of the workforce, as well as its future development. The importance of this research stems from the fact that aging is a global and complex process that cannot be stopped. Therefore, it is important to understand its dynamics, anticipate possible future changes and look for ways to mitigate its negative consequences. The results indicate that society is going through and will go through significant demographic transformations that will affect almost all areas of life. With the decrease in the total number of inhabitants, the demographic structure also changes, while the trend of reducing the pre-productive and productive components can negatively affect economic growth. At the same time, the growing population in the post-productive category can put pressure on the social system and healthcare. The consequences of these changes are extensive, from the need to adapt education and retraining programs to the need for changes in employment policy. This process requires an interdisciplinary approach that takes into account the needs of different age groups and sectors. To ensure sustainable development, it will be necessary to invest in technologies and innovations that could support labor productivity and, to some extent, substitute for labor shortages. The findings confirm that the population of the Slovak Republic is aging and the speed of this process has a fundamental impact on the labor market and society as a whole, which requires a systematic approach to the planning and implementation of policies reflecting this challenge. I also consider it important to involve employers, who should be motivated to create flexible working conditions and an environment that supports diversity and inclusion in the workplace.*

### **Key words:**

*aging, population, labor market*

**JEL Classification** J11, J21

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### **INTRODUCTION**

Aging of the population, or population can be characterized as a long-term trend, the manifestations of which are changes in the age structure, changes in demographic indicators and changes in the structure of the labor force (Armstrong-Stassen and Schlosser, 2011). Demographic aging is considered a key element of the demographic transition, and its state and development are influenced by many other demographic phenomena (birth rate, mortality, migration and others). According to Fernandes et al. (2023), population aging is taking place due to the decreasing influx of newborns and the insufficient outflow of older residents. Barsukov and Kalachíková (2020) understand the aging of the population as a global system that is in a transition period, passing from the phase of implementation of demographic dividends. In

the past, aging research focused mainly on identifying it and quantifying its rate and level. Currently, the authors focus mainly on the impacts, consequences and influences that it brings with it. Among the most serious findings, I include the effects on economic growth, the slowdown in GDP/capita growth (Cooley and Henriksen, 2018), the slowdown in the rate of economic growth (Lee and Shin, 2021), changes in labor productivity and the average consumption of people of working age (Mason and Lee, 2022), production growth, investment, savings, interest wages and others (Sun, et. al., 2019). Most authors researching population aging agree that population aging is a global process that takes place on a global scale and affects all countries of the world, on the basis of which this process becomes a trend. However, the examination of its most significant causes,

impacts, influences and possible solutions must be carried out with a specific country in mind. The reason is simple, the aging of the population and its level results from the rate of birth, mortality, fertility, population structure, social policy, level of health care and much more. This fact raises the need for research at the national level (or in a smaller area), due to the variability of the investigated indicators depending on the area (Fernandes et al., 2023). The validity of research and the economic impacts of aging are confirmed by many authors with the conclusions of their research (Cylus and Tayara, 2021; Xinyue, 2023; Wen-Hsin et al., 2019).

This study focuses on specifying the aging of the population in Slovakia and its impact on the labor market, specifically on the state and structure of the labor supply. We start from the quantitative analysis of basic and extended indicators of population aging and from the primary mapping of the population and its structure in Slovakia.

The originality of the research lies in the extended methods used, the results of which offer a broader view and illumination of the context of the investigated issue. The research results provide important findings that are the basis for strategic planning in matters of employment policy, social and pension policy, measures on the labor market, for the creation of support systems by the state, but also for employers as basic information mapping the current situation on the labor market and its upcoming developments.

The structure of the article is as follows. In the theoretical part, the results of scientific studies in the field of population aging are presented from various points of view and possible influences. In the next part of the article, the aim of the research and the methodology used are presented. The third part presents the results of the quantitative analysis in Slovakia. And the last part is a short discussion of the findings and presentation of the basic conclusions.

## 2. Literature overview

Population aging represents one of the most fundamental demographic trends of the 21st century, which has a fundamental impact on labor markets and economic policies in both

developed and developing countries. This phenomenon is caused by a combination of increasing life expectancy and declining birth rates, leading to changes in population structure and disruption of traditional work dynamics.

One of the main consequences of population aging is the reduction of labor supply, which poses a serious challenge to economic growth and sustainability. An aging population leads to changes in the demographic structure, where the increasing proportion of older people means that fewer and fewer persons of working age will be able to participate in the labor market. According to Blien (2020), increasing participation in the labor market is a key objective of employment policies, as it can help compensate for labor shortages caused by demographic changes. Matching labor supply and demand is important to avoid serious economic problems such as declining productivity, rising unemployment and economic instability. To reduce the risk of labor shortages, it is necessary to constantly monitor the state of labor resources and diagnose the needs of the labor market (Wysocka, 2021). In this way, it is possible to identify the areas where there is the greatest demand for labor. Such analyzes can be beneficial for the prevention of unemployment and for the effective planning of educational activities, so that they correlate with the demands of the labor market. Demographic changes affect the job offer not only quantitatively, but also qualitatively. Population aging can lead to a decrease in relative productivity and a change in the structure of industry. As Davis (2022) states, in larger countries knowledge diffusion may be more efficient, increasing productivity, while in smaller countries population aging may limit this process. It is also necessary to consider changes in the consumption and lifestyle of the older population. Yaziz (2020) points out that aging can change the structure of household energy consumption. These changes have the potential to affect economic policies and infrastructure planning. Furthermore, the economic effects of demographic change can be double-edged. Fernandes (2024) points out that a more educated older workforce can contribute to economic growth and reduce inequality if ways are found to integrate these groups into the workforce. Raising awareness of the values and contributions of older workers in society is also

an important part. Creating a positive image of aging and promoting diversity in the workplace can help overcome the stigma associated with age discrimination. The United Nations (2023) identifies increasing life expectancy and decreasing birth rates as major challenges that affect not only the economy but also social systems. Health care and access to education for older workers are key to maintaining their productivity and economic activity. Enabling older workers to acquire new skills and deepen existing knowledge increases their employability. Programs aimed at lifelong learning and retraining can be effective especially in areas where technological innovations and changes in the labor market are taking place. Developed information technologies and the growing sharing economy can also contribute to changes in the labor market, while the issue of ageism, which can prevent older workers from fully engaging in the work process, must also be considered (Kartúzová, 2020).

Currently, we are also facing economic crises and a reduction in household income, which contributes to the complexity of the situation on the labor market. Older workers often find themselves in competition with younger ones, which can increase youth unemployment (Grigoli, 2022). This age gap in employment requires policy interventions to reduce the negative effects of the demographic crisis, such as programs to support employment and improve working conditions for older workers. According to Zubiková (2021), pension systems face serious pressure due to the aging of the population and the deterioration of the demographic structure. The sustainability of these systems requires reforms and innovations that would enable better adaptation to the changing needs of the labor market. Moreover, Mitra (2022) reports that the decline in the working-age population has a direct negative impact on the net inflow of foreign direct investment. The decline poses a serious threat to the economic health of countries, as lower availability of skilled labor can discourage investors. This negative trend further underlines the need for a comprehensive policy to support the labor market. It is imperative that countries actively engage in the creation and implementation of policies that address the

challenges of population aging and the decline in the number of working-age people. To mitigate the adverse effects of ageing, priority should be given to combined approaches that include labor market policies, pension reforms and investment in human capital and technology. Approaches should be designed to complement and reinforce each other. This will ensure comprehensive and sustainable development of the labor market. Labor market policy should be aimed at increasing employment and participation of demographic groups and supporting flexible forms of employment. Equal attention must be paid to pension systems, as they are currently facing increasing pressure due to an aging population. (Papapetrou, 2020). Kratt (2020) emphasizes that a productive aging policy that focuses on attracting older workers to the labor market is an effective response to aging-related challenges. This approach is not only a proactive solution to reduce labor shortages, but also an essential step towards ensuring the sustainability of social systems and the economy as a whole. Countries with a high proportion of elderly populations face problems such as low labor force participation and financial pressure on the sustainability of the pension system. In situations where the number of workers in working age is reduced, contributions to the pension system decrease. Based on this, the pension system is unbalanced (Novák, 2023). Current demographic developments call into question the sustainability of economic growth, as the declining share of the young workforce will have to support the rising share of older unemployed people. This trend can lead to several economic problems, such as a decrease in productivity, a reduction in innovation potential and an increase in social security costs. Some economists, such as Simková (2017), show that population aging has a negative impact on growth and labor productivity, which further underlines the need to address these issues through strategic policies. This demographic shift can ultimately lead to discontent and conflict between generations. In order to avoid these negative consequences, it is necessary to develop policies aimed at the integration of older workers in the labor market.

In conclusion, population aging in advanced economies represents a significant challenge that can have serious implications for labor markets and economic stability. This trend is reflected in

the growing share of older residents, which requires adaptation to changes in the dynamics of the labor market and overall socio-economic conditions. Policies aimed at promoting the participation of older workers, the integration of technology and the development of pension systems are essential to ensure sustainable economic development in the coming decades. Continuous monitoring of demographic trends and their impact on the economy will also be important so that effective and efficient measures can be taken. Given the dynamic nature of demography, it is imperative that politicians and economists constantly address current and projected changes in populations and adapt their policies accordingly. A dynamic approach will make it possible to respond effectively and face the challenges associated with the aging of the population. Ultimately, if countries are unable to adapt to these demographic changes, they may face significant economic and social problems, including reduced economic growth, increased unemployment and pressure on social systems. Therefore, I consider strategic planning to be a key part of effective policies.

### 3. Goal and Methodology

The main goal of the research was to specify the aging of the population in the Slovak Republic and its impact on the labor market.

Based on the expert estimation method, the following hypothesis was formulated:

H1: We assume that the aging process will increase its dynamics.

As part of the empirical research, a quantitative analysis was carried out with a focus on the aging of the population, the aging process in Slovakia, analysis of the current situation, development and projections for the future. The analysis of aging is complemented by the examination of selected indicators reflecting the situation on the labor market and the image of the available workforce in the context of population aging. The current state and current developments are supplemented by projections of the development of the workforce in selected sectors of the economy until 2028. Eurostat and the Statistical Office of the Slovak Republic databases were used to obtain primary data.

The index of potential economic support describes the quantitative relationship between the age category of the productive and the category of the post-productive population. Our research is based on age categories divided by productivity. Based on the relationship, we will find out how many inhabitants of productive age per 100 inhabitants of post-productive age, i.e. j. loading of the productive component with the post-productive one.

$$I_{1p:p} = \frac{O_{15-64}}{O_{65+}} * c, (1), \text{ where}$$

O – population,

c – constant (in our case, 100 people, e.g. per 100 people of post-productive age).

The aging index, also called the Sauvy index, indicates the dynamics of aging. We express it in percentages and it can also be used for reproductive age groups. His relationship reads:

$$\text{Aging index} = \frac{P(62+)}{P(0-14)} * 100, (2)$$

P(62) – number of persons in post-productive age

P(0-14) – number of persons in pre-productive age Linear trend is used in mapping the development of the monitored indicator.

It expresses how much the value of the monitored indicator will change if b<sub>0</sub> changes. Its shape is:

$$Y_t = b_0 + b_1 * t; x = 1, 2 \dots T, (3), \text{ where}$$

b<sub>0</sub> and b<sub>1</sub> – point estimates of the unknown parameters of the linear function.

The inflow coefficient expresses the number of persons aged 10-14 per the number of persons aged 15-64. It is denoted by capital letters KP and is expressed as a percentage. We find the resulting value as:

$$KP_{\%} = \frac{P(10-14)}{P(15-64)} * 100, (4), \text{ where}$$

P(10-14) – number of people aged 10-14

P(15-64) – number of people aged 15-64

The labor force outflow coefficient expresses the number of persons aged 60-64 per the number of persons aged 15-64. It is denoted by the capital letters KO and expressed as a percentage. We find the resulting value as:

$$KO_{\%} = \frac{P(60 - 64)}{P(15 - 64)} * 100, (5), \text{ where}$$

P(60-64) – the number of people aged 60-64

We indicate the exchange coefficient with capital letters KV and calculate the value in percentages. We get it as:

$$KV_{\%} = \frac{KP}{KO}, (6)$$

When creating and following trends, I also focused on their subsequent forecasting for the future. We used extrapolation for short-term projections, but other methods were necessary for long-term projections. The first step was to find out whether the created model is suitable for long-term projection. To find out this information, we used one of the time series alignment methods. This method examines the difference between actual and settled values and,

based on this, detects deviations (Adamec, Strelec, 2020). There are several of these methods, I decided to lean towards the average absolute deviation (M.A.P.E.), which we find out:

$$M.A.P.E. = \frac{100}{T} \sum_{t=1}^T \frac{|Y_t - \hat{Y}_t|}{Y_t}, (7), \text{ where}$$

Y - actual values

Yt - balanced values

To determine the need for labor in selected industries in the future, we decided to use the Boersch-Supan model. The selected model consists of monitoring the consumption of individual age groups of the population, determining the number of workers in selected industries, estimating consumption in the future, and based on these, we will finalize the forecast volume of the workforce in selected industries. Based on this, we can find out how the structure of the labor force in the economy will change, and the data can be used for further research, for example, the changing qualification structure and much more (Kostrová, 2019).

#### 4. Findings and discussion

Table 1 Index of aging in Slovakia in 2011-2023

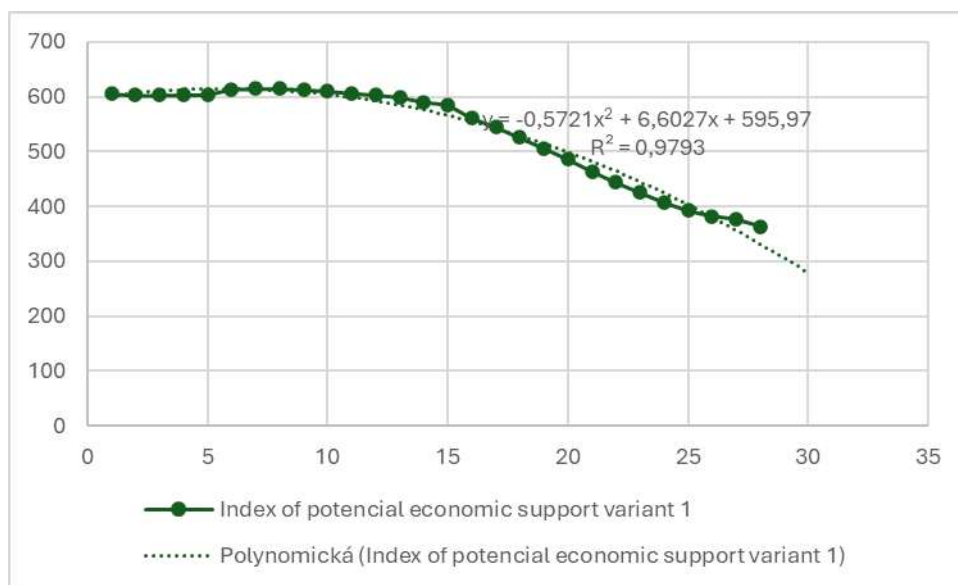
Slovak Republic	Aging Index in %
2011	82.96
2012	85.51
2013	88.34
2014	91.17
2015	94.22
2016	96.96
2017	99.43
2018	101.9
2019	104.8
2020	107.34
2021	108.27
2022	110.95
2023	114.76

Source: ŠÚ SR, 2024, own processing, [om7005rr]

The value of the Aging Index is constantly growing during the monitored time series. The lowest value is recorded in 2011 (82.96%) and the highest in 2023 (114.76%). The mentioned value of 114.76% means that for every 100

people of pre-productive age there are approximately 114 people of post-productive age. The result indicates that the population aging process in Slovakia is increasing its dynamics.

**Chart 1** Index of potential economic support in Slovakia in the years 2011-2023



Source: ŠÚ SR, 2024, Datacube, own processing [pr3802qr]

The following input data were selected for the index of potential economic support: people of productive age and people of post-productive age. Graph 1 shows that the value of the monitored indicator decreases during the monitored time series (this is expressed by the trend line of the polynomial trend). The result means that for every 100 inhabitants in the post-productive age there are fewer and fewer inhabitants in the productive age. While in 2011

it was approximately 562,000, in 2023, it is already only 363,000. The aging process increases the dynamics. Based on the indicators on the appropriate use of the trend (M.A.P.E.), which took on a value of 6.09%, a decision was made to lean towards a linear trend, where the coefficient of determination took on a value of 0.8175, which means that 81.75% of the total variability is expressed by the model.

**Table 2:** Projection of the aging index until 2028 in Slovakia

	2024	2025	2026	2027	2028
65+ rokov	998 182	1 018 351	1 038 428	1 057 863	1 074 288
0-14 rokov	900 731	891 722	882 735	873 921	863 898
Aging Index	110.82	114.20	117.64	121.05	124.35

Source: Eurostat, 2024, own processing. [proj\_23np\_custom\_13103241]

The result derived on the basis of Table 2 and the data in it reads: increasing development of the monitored indicator. In 2023, the index acquired a value of 114.76%. In 2028, it reached a value of 124.35%. Within four years, this is a 10 percent increase. In 2028, the pre-productive part of the population will be burdened by 124

people belonging to the post-productive part of the population. The same conclusion that applies to current developments also applies to the projection, namely that the population of Slovakia will age faster. Based on the aging index and its projection, we evaluate that we accept H1.

**Table 3:** Share of people by productivity in the years 2011-2023 in Slovakia

Year	Pre-productive age	Productive age	Post-productive age
2011	15.41	71.81	12.78
2012	15.35	71.52	13.13
2013	15.32	71.14	13.54
2014	15.31	70.73	13.96
2015	15.33	70.22	14.45
2016	15.46	69.55	14.99
2017	15.61	68.87	15.52
2018	15.74	68.22	16.04
2019	15.83	67.59	16.58
2020	15.9	67.03	17.07
2021	16.06	66.55	17.39
2022	16.09	66.06	17.85
2023	15.99	65.66	18.35

Source: ŠÚ SR, 2023, Datacube, own processing. [om7005rr]

The findings from Table 3 are disturbing. The most numerous category in all examined periods is the productive part of the population. Nevertheless, it remains an unfavorable fact that their share is decreasing during the entire monitored time period. Another unfavorable fact is that the share of the post-productive part of the population is constantly rising in the observed time series. The generational exchange is more than obvious based on the shares. The result remains that the largest changes in shares take place in the productive and post-productive components of the population, and the share of the pre-productive component does not change significantly. For the labor market, this information represents an unfavorable situation, as the results indicate a lack of labor force.

Table 4 offers the number and share of the economically active population in 2016-2023 in Slovakia. For 2016, the most numerous group are 35-44 year olds, which applies throughout the entire monitored period. Their number is increasing, which is also indicated by the value of the average coefficient of increase, namely 1.012228. We recorded an average annual increase both in the case of 45-54 year olds and also in the case of 55 and over. This is understandable, given that older generations were characterized by a higher birth rate, which today is reflected in a larger volume of people in higher age categories. Conversely, the 15-24 and 25-34-year-old categories show an average decrease. For 15-34 it was a decrease of 4.57% and for 25-34 it was 1.69%.

**Table 4:** Economically active population by age categories in the Slovak Republic in 2016-2023

	15-24 years old	25-34 years old	35-44 years old	45-54 years old	55+ years old
2016	206.1	702.2	788.4	643.6	417.8
	<b>7.47%</b>	<b>25.46%</b>	<b>28.58%</b>	<b>23.33%</b>	<b>15.15%</b>
2017	202.6	676.4	792.6	640.9	442.3
	<b>7.35%</b>	<b>24.55%</b>	<b>28.77%</b>	<b>23.26%</b>	<b>16.06%</b>
2018	189.8	663.7	790	653.7	449
	<b>6.91%</b>	<b>24.17%</b>	<b>28.77%</b>	<b>23.80%</b>	<b>16.35%</b>
2019	168.3	649.3	788.8	663.6	471.3
	<b>6.14%</b>	<b>23.69%</b>	<b>28.77%</b>	<b>24.21%</b>	<b>17.19%</b>
2020	156.1	629	782.2	664.8	480.6
	<b>5.75%</b>	<b>23.19%</b>	<b>28.83%</b>	<b>24.51%</b>	<b>17.72%</b>
2021	152.8	640.8	801.3	673.2	490.2
	<b>5.54%</b>	<b>23.23%</b>	<b>29.05%</b>	<b>24.41%</b>	<b>17.77%</b>
2022	141.8	624	794.3	702.9	511.3
	<b>5.11%</b>	<b>22.49%</b>	<b>28.63%</b>	<b>25.34%</b>	<b>18.43%</b>
2023	142.6	601.8	783	719.8	524.7
	<b>5.14%</b>	<b>21.71%</b>	<b>28.25%</b>	<b>25.97%</b>	<b>18.93%</b>

Source: ŠÚ SR, 2024, Datacube, own processing. [pr3804qr]

We examine labor force exchange based on inflow, outflow and exchange coefficients. The year 2023 is designated for their evaluation. The KP for the year 2023 for the SR acquired a value of 8.122, which means that approximately eight people aged 10-14 per 100 people aged 15-64. This influx can be influenced by the rate of fertility, birth rate, economic security, economic efficiency of the country, the level of education and healthcare in the country, education and modernization. From the point of view of the labor market, the current situation is stable, as the number of persons of productive age is sufficiently high, but in the future it may represent a reduction and major problems with the supply of labor on the labor market. The outflow coefficient reached the value of 9.522, which means that approximately 9-10 persons of post-productive age account for 100 persons of productive age. The KO value can be influenced by factors such as health care, environment, life

expectancy in the country and the like. The last indicator is KV, which tells us about the rate of labor force reproduction. Its value is 0.853 less than 1, that is, the inflow is lower than the outflow of labor. We are talking about the so-called reduction of labor force reproduction. Based on the above calculated values, it can be argued that the share of the productive and post-productive component is greater than the share of the pre-productive component. For the labor market, this signals a lack of labor force, as the population in the post-productive component will age, but the number of people will not increase, which would be sufficient to cover the demand for labor force. KP, KO and KV projections until 2028 have an unfavorable development. KP and KO have rising tendencies, and KV is less than 1 throughout the entire forecast period. Based on this, it can be assumed that the reduced reproduction of the labor force will continue to persist.



**Table 5:** Projection of the share of the population by age until 2028 in Slovakia

	Pre-productive component		Productive component		Post-productive component	
	Number	Percentages	Number	Percentages	Number	Percentages
<b>2024</b>	900 731	16.27	3 635 913	65.69	998 182	18.03
<b>2025</b>	891 722	16.15	3 611 295	65.41	1 018 351	18.44
<b>2026</b>	882 735	16.03	3 586 639	65.12	1 038 428	18.85
<b>2027</b>	873 921	15.91	3 562 291	64.84	1 057 863	19.25
<b>2028</b>	863 898	15.77	3 541 659	64.63	1 074 288	19.60

Source: Eurostat, 2023, own processing, proj\_23np\_custom\_13106400

The development of the share of the population divided by productivity does not radically change its development compared to the current situation. As before, the assumption is decreasing for the pre-productive and productive

components and, on the contrary, increasing for the post-productive component. According to all the findings, it can be said that the burden of the post-productive component will continue to grow.

**Table 6:** Need for labor in 2028 in the Slovak Republic based on population consumption

Sector	Employment in 2023	Need in 2028	Difference
<b>Industry</b>	480000	440250	-39750
<b>Healthcare</b>	190000	194850	4 850
Doctors	5200	5497	297
Nurses	10500	11481	981
Nursing Staff	21000	22472	1 472
<b>Education</b>	52000	51025	-975
<b>Transportation</b>	110000	98125	-11875
<b>Information and Communication</b>	55000	67950	12 950
<b>Financial and Insurance Services</b>	53000	52125	-875

Source: Author's calculation

According to the results obtained through the Boersch-Supan model, the selected industries were divided into two groups. Those in which we anticipate an increasing need for labor and those in which the need for workers will decrease. The first category included the healthcare sector and information and

communication technologies. The second group includes industry, education, transport, and financial and insurance services.

The healthcare sector was examined as a whole, but also according to individual professions (doctor, nurse, nursing staff). Based on the

model, it was assumed that the additional need for labor in the health sector will be 4,850 workers, of which 297 are doctors, 981 are nurses, and 1,472 are nursing staff. In this case, the basic trend that causes an additional need for labor is the aging of the population and the migration of health workers abroad.

The same is true of the information and communication sector, where an additional workforce of 12,950 people is expected.

The second group of industries are those in which the need for labor will decrease in the future. The first is the industry sector, in which we can see a decrease in the additional labor force of up to 39,750 persons. Another sector belonging to this category is education, in which a decrease in the need for labor in 2028 by 975 people can be seen. The result is not surprising, given the decreasing dynamics of the increase in the number of children and the compensation of work through technological changes.

We attribute the decrease in demand for labor in the transport sector mainly to the increasing number of drivers and cars and the reduced interest in public mass transport. In the same way, we can also include the fact that public mass transport is increasingly less satisfactory and frequent, and therefore insufficient for people to cover their time and other plans. The last monitored sector is financial and insurance services, in which a reduced demand for workers was also recorded.

Considering the extensive collected data, it can be confidently stated that the population of Slovakia is aging, the dynamics of aging is accelerating, the reproduction of the labor force is reduced, there is not enough labor on the labor market, the forecasts for the future are not favorable, and the sources of labor supply are exhausted. The only way out is to "create" a sufficient job offer. In practice, several steps can be taken. The first of them is the promotion of employment and the creation of conditions for non-working groups of the population (unemployed, long-term unemployed, health-impaired and others). The second solution is to support the employment of people of pre-retirement age or to focus on people of retirement age who have already left the labor market. Focus on motivating them and making them want to return to the labor market. Given

that neither migration, nor automation, nor technological progress will sufficiently cover the needs of the labor market, there is no other option than to turn to people included in the post-productive part of the population, or people in pre-retirement age.

The results of this research confirm the increasing dynamics of population aging, which is becoming one of the most fundamental demographic trends of the 21st century. This process reflects the aging index, but also the share of the population in post-productive age to those in productive age. The findings correspond with Blien (2020), who points out that the increasing share of older people in the labor market can lead to a decrease in its efficiency and confirm warnings about labor shortages, which are in line with Wysocka's (2021) analyses.

Labor shortage is becoming an increasingly serious challenge, as the share of the economically active population in the younger age groups (15-24 and 25-34 years). This decrease is important from the point of view of economic growth and sustainability, as fewer persons of productive age means a reduced supply of labor force, which can directly affect economic stability (Mitra, 2022).

In addition to the quantitative decrease of the labor force, we also encounter the issue of quality. An aging population can lead to reduced productivity and a change in the structure of industry, as Davis (2022) points out. In this context, it is important to note that some sectors, such as healthcare and information technology, are already facing a shortage of additional labor, underscoring the need for targeted policies to support employment and retraining.

Labor force reproduction is proving to be a critical factor. My analysis suggests that reduced labor force reproduction can have long-term effects on a country's economic development. As the authors state, demographic changes not only affect the labor supply, but also the composition of the workforce, which creates new challenges for employment policies (Kartúžová, 2020; Zubiková, 2021).

The results indicate that if countries are not able to adapt to these demographic changes, they may

face significant economic and social problems, including a decline in economic growth and increased unemployment. Therefore, it is necessary to implement comprehensive policies that deal not only with the integration of older workers into the labor market, but also with the reform of pension systems and investments in human capital and technology (Papapetrou, 2020; Grigoli, 2022). Such strategic planning is key to ensuring sustainable economic development in the coming decades.

### Conclusion

The aim of the research was to specify the aging of the population in the Slovak Republic and its impact on the labor market, which affects the economic and social situation in Slovakia. As part of the research, various processes characterizing aging were investigated, which gave us an overall picture of the aging population in Slovakia and its impact on the labor market. The results of the research showed that population aging is taking place in Slovakia, which is constantly increasing its dynamics, and the effects on the labor market can be seen in the changing volume and structure of the workforce.

The research brings results about aging, which claim that the aging process is accelerating and its dynamics are increasing, the number and share of the population in the post-productive component is constantly increasing, the load on the productive and pre-productive component is increasing, the age structure of the workforce is changing and its volume, the share is decreasing of the economically active population aged 15-

24 and 25-34, I note the reduced reproduction of the labor force and its lack on the labor market. I focused on researching selected sectors of the economy based on population consumption, which showed that the need for additional labor is expected in the health and information and communication sectors. The results of the research showed that population aging is taking place in Slovakia, which is constantly increasing its dynamics, and the effects on the labor market can be seen in the changing volume and structure of the workforce.

The results bring a wide range of stimuli for solving the negative and unfavorable effects of aging on society and the labor market. Countries should adapt employment policies, approach the use of flexible forms of work, simplify the integration of older workers into the labor market. The reform of pension systems is also worth mentioning. Likewise, investments and renewal of educational and retraining activities, investing in human capital and technology. Strategic planning can ensure the increase of the country's economic growth, labor productivity, the country's competitiveness, the stability of the labor market and, last but not least, it will ensure sustainable economic development in the future.

The research was limited to only one country, which means we lost the opportunity to compare and examine and compare the global aging trend. The advantage remains that the methodology used is applicable to any country, which could contribute to expanding knowledge and scientific discussion on the given topic.

### REFERENCES

- A', N., Yaziz, M. M., & Azlina, A. A. (2020). Population ageing and energy consumption for sustainable development. *International Journal of Environment and Sustainable Development*, 19(3), 241. <https://doi.org/10.1504/IJESD.2020.108138>
- Adamec, V., & Štřelec, Luboš. (2020). *Ekonometrie I: Cvičebnice* (4. upravené vydání). Mendelova univerzita v Brně.
- Armstrong-Stassen, M. (2008). Human resource practices for mature workers—And why aren't employers using them? *Asia Pacific Journal of Human Resources*, 46(3), 334–352. <https://doi.org/10.1177/1038411108091755>
- Barsukov, V., & Kalachikova, O. (2020). The Evolution of Demographic and Social Construction of the Age of “Old Age”. *Economic and Social Changes: Facts, Trends, Forecast / Экономические и социальные перемены: факты, тенденции, прогноз*, 1 (67). <https://doi.org/10.15838/esc.2020.1.67.2>
- Blien, U., & Hirschenauer, F. (2020). Labour Supply and Regional Labour Market Situation. *Raumforschung und Raumordnung | Spatial Research and Planning*, 78(6), 595–613. <https://doi.org/10.2478/rara-2020-0033>

- Cooley, T., & Henriksen, E. (2018). The demographic deficit. *Journal of Monetary Economics*, 93, 45–62. <https://doi.org/10.1016/j.jmoneco.2017.11.005>
- Cylus, J., & Al Tayara, L. (2021). Health, an ageing labour force, and the economy: Does health moderate the relationship between population age-structure and economic growth? *Social Science & Medicine*, 287, 114353. <https://doi.org/10.1016/j.socscimed.2021.114353>
- Davis, C., Hashimoto, K., & Tabata, K. (2022). Demographic structure, knowledge diffusion, and endogenous productivity growth. *Journal of Macroeconomics*, 71, 103396. <https://doi.org/10.1016/j.jmacro.2021.103396>
- Fernandes, F., Turra, C. M., & Rios Neto, E. L. G. (2023). World population aging as a function of period demographic conditions. *Demographic Research*, 48, 353–372. <https://doi.org/10.4054/DemRes.2023.48.13>
- Grigoli, F., Koczan, Z., & Topalova, P. (2022). Calling older workers back to work. *Applied Economics Letters*, 29(6), 559–566. <https://doi.org/10.1080/13504851.2021.1876205>
- Huang, W.-H., Lin, Y.-J., & Lee, H.-F. (2019). Impact of Population and Workforce Aging on Economic Growth: Case Study of Taiwan. *Sustainability*, 11(22), 6301. <https://doi.org/10.3390/su11226301>
- Kartuzova, M. (2020). Work Practices of Older Population Groups: Reasons for Choice. *Journal of Economic Sociology*, 21(1), 81–99. <https://doi.org/10.17323/1726-3247-2020-1-81-99>
- Kostrová, J. (2019). Zmeny vo vekovej a vzdelanostnej štruktúre obyvateľstva a ich vplyv na trh práce (Dizertačná práca). Trenčianska univerzita A. Dubčeka v Trenčíne, FSEV KMaREZ. Citované 9. októbra 2024. Dostupné na <https://opac.crzp.sk/?fn=detailBiblioFormChildM3MISR&sid=8E0A01F6D74C9FCBC84FE91E231C&seo=CRZP-detail-kniha>
- Kratt, O., & Kirnos, I. (2020). Cross-national analysis of the older workers' employment rate. *SHS Web of Conferences*, 73, 01014. <https://doi.org/10.1051/shsconf/20207301014>
- Lee, H.-H., & Shin, K. (2021). Decomposing Effects of Population Aging on Economic Growth in OECD Countries. *Asian Economic Papers*, 20(3), 138–159. [https://doi.org/10.1162/asep\\_a\\_00839](https://doi.org/10.1162/asep_a_00839)
- Mason, A., Lee, R., & members of the NTA Network. (2022). Six Ways Population Change Will Affect the Global Economy. *Population and Development Review*, 48(1), 51–73. <https://doi.org/10.1111/padr.12469>
- Mitra, R., & Abedin, M. T. (2022). Does a shrinking labor force reduce FDI inflows in OECD countries? *Applied Economics Letters*, 29(17), 1654–1658. <https://doi.org/10.1080/13504851.2022.2025996>
- Novak, V., Vidmar, A., Jerebic, J., & Brezavšček, A. (2023). Employers' Efforts to Encourage Older Workers to Retire Later—A Case Study of Large Companies in Slovenia. *Organizacija*, 56(3), 184–205. <https://doi.org/10.2478/orga-2023-0013>
- Papapetrou, E., & Tsalaporta, P. (2020). The impact of population aging in rich countries: What's the future? *Journal of Policy Modeling*, 42(1), 77–95. <https://doi.org/10.1016/j.jpolmod.2019.12.002>
- Pu, X. (2023). Research on the Aging of Global Workforce and Solutions. *Advances in Economics, Management and Political Sciences*, 56(1), 7–14. <https://doi.org/10.54254/2754-1169/56/20231045>
- Rocha De Jesus Fernandes, A., & Lanza Queiroz, B. (2024). Aging, education and some other implications for the silver dividend in developing countries: Evidence from Brazil. *The Journal of the Economics of Ageing*, 27, 100497. <https://doi.org/10.1016/j.jeoa.2023.100497>
- Samaniego, R. M., & Sun, J. Y. (2019). Uncertainty, depreciation and industry growth. *European Economic Review*, 120, 103314. <https://doi.org/10.1016/j.euroecorev.2019.103314>
- Simkova, M., & Langhamrova, J. (2017). Tertiary sector in relation with population ageing. V T. Loster & T. Pavelka (Ed.), *11th International days of statistics and economics* (s. 1605–1614). melandrium.
- United nations department for economic and social affairs. (2024). World population ageing 2023: Challenges and opportunities of population ageing in the least... developed countries. United nations.
- Wysocka, M. (2021). Effect of Demographic Changes on the Labour Supply in Lithuania and Poland. *Engineering Economics*, 32(1), 35–47. <https://doi.org/10.5755/j01.ee.32.1.25087>
- Zubíková, A., Švejnová-Höesová, K., & Chytil, Z. (2021). Selected Determinants of Employment of Persons in Post Productive Age on Labour Market in Czech Republic and Slovakia. *Politická ekonomie*, 69(2), 170–192. <https://doi.org/10.18267/j.polek.1302>

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