

# THE IMPACT OF DEMOGRAPHIC TRENDS IN THE FEDERATION OF BOSNIA AND HERZEGOVINA ON HIGHER EDUCATION, LABOUR MARKET EFFICIENCY AND INNOVATION

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**Abstract:** *The demographic changes and trends notable in the Balkan countries hit Bosnia and Herzegovina as well. Migration of the population is the result of economic stagnation and living standards far below the EU average. For this reason, the number of the working-age population seeking to move to Western Europe countries is raising. The first aim of the research is to predict the demographic trends expected by the year 2050, using demographic data from the last thirteen years. In addition to this, the aim is to analyze how demographic changes affect higher education and training, labor market efficiency, and innovation. Comparing these variables with population trends, this paper identifies if there is a correlation between them. The research is based on hypothesis that there is a correlation between the country's competitiveness pillars and demographic trends. The hypothesis is tested using statistical methods. Current demographic trends, along with other factors, have an impact on the weakening of the competitiveness of Bosnia and Herzegovina. One of the reasons could be that demographic changes are mainly related to the young and working-age population, as valuable human capital of the country.*

**Key words:** *demographic trends, intellectual capital, competitiveness*

**JEL Classification:** *C1, O34*

## INTRODUCTION

Demographic trends are starting point for deeper analysis of the economic situation in each society. This paper analyzes the population of the Federation of Bosnia and Herzegovina (FBiH). The results obtained are correlated with the

selected pillars of competitiveness. Considering the demographics and trends of the rank of Bosnia and Herzegovina (BiH) in global competitiveness, which has been declining in recent years, the assumption is that there is a strong correlation between variables. The parameters used for analysis are rank and the score of the selected pillars of competitiveness: higher education and training, labor market efficiency and innovation.

These pillars are taken into account because of their interconnectedness. Higher education and training encompass indicators related to the quantity of education, the quality of education and on-the-job training. Labor market efficiency relates to flexibility, such as hiring and firing practices; flexibility of wage determination, labor-employer cooperation etc., and efficient use of talent. A country's capacity to retain and attract talents depends on their availability in the education system and talent's management models. The link between labor market efficiency and demographic trends is assumed to be very high given that labor market efficiency depends on working-age population. The paper also analyzes how the negative trend of demographic changes and innovations are related. Some of the indicators within the innovation's pillar are: capacity for innovation, the availability of scientists and engineers and the university-industry collaboration in research and development. The paper also analyzes the correlation between the selected pillars.

The authors are dealing with examining the relationships between competitiveness pillars and or their indicators, or effects of the particular pillar on competitiveness. A meaningful relationship between innovation and business sophistication was found, ie innovation has a positive effect on the business sophistication (Razavi et al., 2012). Statistically significant relationship among the seven individual pillars of the Slovakia's GCI indicator was found (Sofrankova et.al., 2017). Education and training gap plays an important and increasing role in explaining competitiveness disparities among the advanced economies of EU and developing countries of SEE (Sekuloska, 2014). It confirms the fact that education is a significant factor in raising national competitiveness in the contemporary knowledge-driven economy (Johansen and Sahlberg, 2011).

Poot (2007) found significant impact of demographic changes on regional competitiveness, while Richter (2014) found correlation between demographic change and innovation.

## INTELLECTUAL CAPITAL AND COMPETITIVENESS

Integrated knowledge and intellectual capital are important sources of competitive advantage both at the company and at the national level. The Global competitiveness reports (the World Economic Forum) consist of 114 indicators grouped into 12 pillars of competitiveness. The Global Competitiveness Index (GCI) is a comprehensive framework that integrates the macroeconomic and microeconomic aspects of a country's competitiveness in international frameworks. Competitiveness in this regard is represented by a set of institutions, policies, and factors that determine the level of productivity of a country (Federal Institute for Programming Development, Bosnia and Herzegovina, 2017).

Some of the pillars of competitiveness, grouped according to the three stages of development of the country (factor-driven, efficiency-driven, and innovation-driven) are part of the intellectual capital of the country. Two are in the phase of innovation (business sophistication, innovation) and two in the phase of efficiency (technological readiness, higher education and training). The quality of the education system does not guarantee that human capital will be employed in its profession if the economy of the country does not provide employment opportunities or if the environment is not stimulating for start-up companies. Efficiency and labor market flexibility is crucial to ensure efficient distribution of workers; it must be flexible to quickly move workers from one economic activity to another at very low cost and must provide clear incentives for employed workers and promote the rule of knowledge (Federal Institute for Programming Development, Bosnia and Herzegovina, 2017).

In the global economy, the process of intellectual capital research contributes to the understanding of the new nature of the competitiveness of national economies. The knowledge-based economy relies on an increasingly significant share of non-material factors. Understanding the role of non-material factors as economic drivers and the basis for gaining competitive advantage is of strategic importance. Innovation and knowledge are new measures of competitiveness at the global level.

Several analyzes of the world capital structure point to the fact that the share of intangible capital in total national wealth is between eighty and ninety percent. The National Intellectual Capital (NIC) analysis (Edvinsson and Yeh-Yun Lin, 2011), which included 40 countries for the period from 1995 to 2008, showed a strong correlation of 0.88 between national intellectual capital and GDP per capita. The analysis of the capital structure in 115 countries (The World Bank, 2011) points to the fact that the share of intangible capital in total national

wealth ranges between 80 and 90 percent. Human capital in the developed countries has a dominant role among other intangible resources. When it comes to developing countries, the quality of institutions, legacies and the history of the country play a significant role in creating a high potential for human capital.

According to OECD (2001), human capital includes all the accumulated knowledge; skills; competencies and attributes that are embedded in individuals and facilitate the creation of personal, social and economic well-being. National human capital encompasses the overall knowledge, skills, and abilities of individuals; education levels; ethics; attitudes and values at the state level. It is a key factor for growth, development, and competitiveness both at the company and national level, primarily as the initiator of innovation. It is a dynamic category that influences long-term success more than any other factor, depending on how some companies and countries invest in it. This is also indicated by the Global Human Capital Index, which is published annually by the World Economic Forum. It assesses the degree to which the country optimizes its human capital for the benefit of its economy and individuals. The educational system is one channel through which individuals can be encouraged to participate in the entrepreneurial activities, especially in light of the fact that there is an increase in number of entrepreneurial universities (Mikić, Sopta, & Horvatinović, 2018).

The country's rank indicates its current position in global competitiveness ranking. It is an indicator of its both present and future global competitiveness potential, which takes into account factors influencing intellectual capital such as education, technological readiness, business sophistication, and innovation. Re-designed GCI 4.0 (World Economic Forum, 2018) points innovation as the main driver of productivity and value. This is particularly important in the era of the fourth industrial revolution (4IR). In addition to the traditional factors within GCI, GCI 4.0 takes into account both the intangible components of innovation. With the implementation of the new GCI 4.0, each of the pillars gets the same weight. These changes encourage low-income countries that have better performance in the innovative ecosystem while sanctioning those who ignore basic competitive factors. Demographic changes can significantly affect the values related to competitiveness and enhance their interdependence.

## **METHODOLOGY**

Statistical methods used for analyzing data are as follows: descriptive statistics, dynamic analysis, and correlation analysis. Descriptive statistics are presented

without deeper analysis. The trend method is based on the series from the previous years, forecasting possible trends in the future. Available data for the series ranged from six to thirteen years. One of the prerequisites for the use of regression analysis is the existence of linear dependence between variables. It is necessary because the analysis begins by calculating the coefficients of simple correlation (bivariate correlations) for all pairs of variables, and all of these calculations require a linear relationship between the pairs of the variables. The research is based on the hypothesis H1 that there is a correlation between competitiveness' pillars of the country and demographic trends and hypothesis H2: there is a correlation between pillars: higher education and training, labor market efficiency and innovation.

## RESULTS AND DISCUSSION

### Population analysis in the Federation of Bosnia and Herzegovina

The data analysis covers the period from the year 2005 to the year 2018. Data are presented in the tabular and graphical form, followed by an analysis using the trend method. Given that the sample includes data of 13 years' data, there is a high degree of representativity of the model. A sample of available data for the given period can be considered as representative for trend-based analysis.

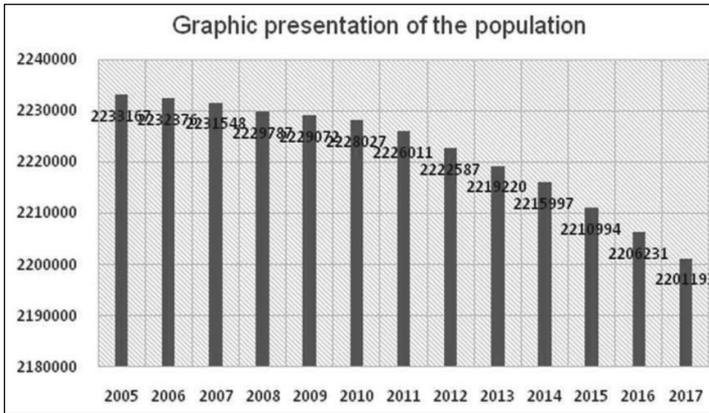
**Table 1.** Number of population in FBiH (2005-2017)

Year	Number of population	Base index
2005	2233167	0
2006	2232376	99.95
2007	2231548	99.92
2008	2229787	99.84
2009	2229072	99.81
2010	2228027	99.77
2011	2226011	99.67
2012	2222587	99.52
2013	2219220	99.24
2014	2215997	99.23
2015	2210994	99.00
2016	2206231	98.79
2017	2201193	98.54

**Source:** Federal Office of Statistics

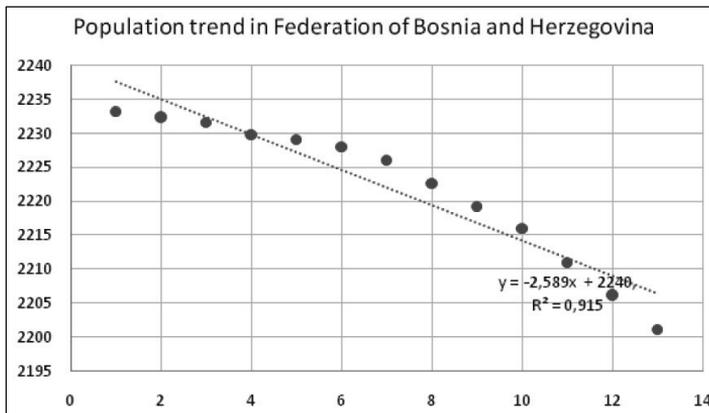
Table 1 shows a declining number of the population compared to the year 2005 (32,000 or 1,5%). Until the year 2013, the decline is slightly lower than in the period afterward. Number of the population by the year 2013 declined by 0.43%, and from the year 2013 to the year 2018 by 1.12%.

**Graph 1.** Number of population in FBIH (2005-2017)



Source: Federal Office of Statistics

**Graph 2.** Analysis of number of population in FBIH (2005-2017)



Source: authors

Based on the analysis of the previous 13 years and population's trend, the linear function of the trend is:

$$Y = - 2.5896X + 2240.1$$

It is important to emphasize a high degree of determination of 91.53%, which

shows a high degree of representativity of the model. Therefore, the forecast presented in the following table can be considered reliable.

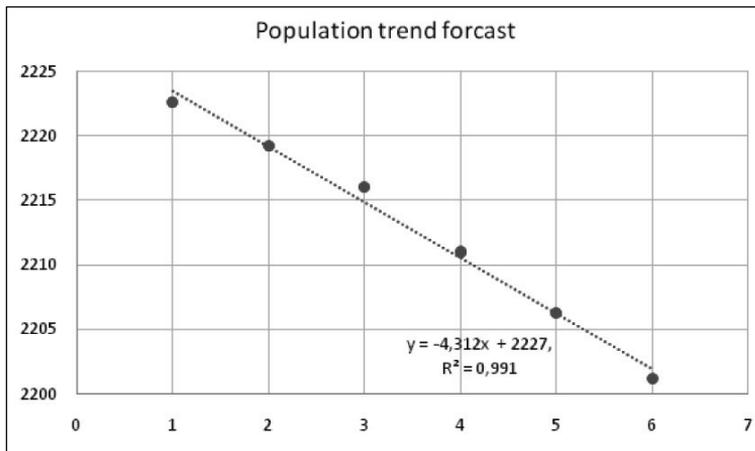
**Table 2.** Population forecast

Year	Population forecast
2018	2203845
2019	2201256
2020	2198666
2050	2018388

**Source:** authors

One can expect a continual decline of population number. If the population's number decline remains the same as it was in the period from the year 2005 to the year 2018, then by the year 2050 the number of population will be lower by about 100.000. There is a higher intensity of decline in the population's number within the last five years. The prognosis based on that period shows different results than the above presented.

**Graph 3.** Population forecast based on the last five years figures



**Source:** authors

Based on the analysis of the previous five years and the population's trend, the linear function of the trend is:

$$Y = - 4.3126X + 2227.8$$

It is important to emphasize a high degree of determination of 99.14%, which shows a high degree of representativity of the model. Therefore, the forecast presented in the following table can be considered reliable.

**Table 3.** Population forecast based on the last five years analysis

Year	Population forecast
2018	2 187 611
2019	2 183 299
2020	2 178 986
2050	2 000 608

**Source:** authors

Data analysis shows that in next year (2019) the number of population will decline by 15.000, and by the year 2020 it can decline by 25.000 of the population compared to the year 2017. If the decline of a number of the population continues at this pace, not taking into account the number of newborns and deceased, population number up to 2050 can be expected to be 2 million, which is the decline of 250.000 of the population compared to the year 2005.

### **Correlation between higher education, labor market efficiency, innovation, and demographic trends of the population**

Determining the correlation between higher education, labor market efficiency, innovation, and demographic trends of the population is used to test hypothesis H1. Table 4 presents the rank and score of the pillars for the period from the year 2009 to the year 2017. The rank denotes the position of the pillar among other participating countries, whose number in the research period is about 130. The score represents the value between one and seven.

**Tabela 4.** Rank and score of the pillars (2009-2017)

	2009	2010	2011	2012	2013	2014	2015	2016	2017
<b>Higher education and training Rank</b>	100	98	92	81	81	90	94	92	91
<b>Higher education and training Score</b>	3.74	4.5	4.25	4.33	4.4	4.3	4.23	4	4
<b>Labor market efficiency Rank</b>	100	100	102	97	89	95	106	125	123
<b>Labor market efficiency Score</b>	3.5	3.57	3.63	3.75	3.8	3.7	3.6	3.5	3.5
<b>Innovation Rank</b>	127	120	108	99	89	110	122	125	123
<b>Innovation Score</b>	2.8	2.93	3.13	3.28	3.4	3.3	3.4	2.7	2.7

**Source:** Federal Office of Statistics

Although the positions of all three pillars are very low, the best rank and score has higher education. Innovations' rank and the score is the lowest. Last two years'

score was the lowest in the period presented. The scores of all three pillars are declining in the last three years. For a deeper analysis of the causes, it is necessary to explore the structure of pillars and their indicators. Not all indicators within pillars are related to human capital. This analysis serves to provide a general picture of the correlation between population and pillars influencing progress in achieving better competitiveness position, with emphasis on innovation processes. In Table 5. the correlation is calculated, i.e. to what extent the number of population influence the pillars of higher education.

**Table 5.** Correlation between number of population and higher education

		Correlations		
		Number of population FBiH	Higher education Rank	Higher education Score
<b>Number of population FBiH</b>	Pearson Correlation	1	-.472	.436
	Sig. (2-tailed)		.048	.040
	N	9	9	9
<b>Higher education Rank</b>	Pearson Correlation	-.472	1	-.443
	Sig. (2-tailed)	.048		.033
	N	9	9	9
<b>Higher education Score</b>	Pearson Correlation	.436	-.443	1
	Sig. (2-tailed)	.040	.033	
	N	9	9	9

**Source:** authors in SPSS 20.

It can be concluded that there is a moderate-strong correlation ranging from 47.2% for rank and 43.6% for the score, and is statistically significant because of  $p < 0.05$ . A negative coefficient of the rank is an indicator of a negative trend manifested by an increase on a scale, which means that the more ranked it is, the worse position it is.

**Table 6.** Correlation between number of population and labor market efficiency

		Correlations		
		Number of population FBiH	Labor market efficiency Rank	Labor market efficiency Score
<b>Number of population FBiH</b>	Pearson Correlation	1	-.847*	.776
	Sig. (2-tailed)		.021	.032
	N	9	9	9
<b>Labor market efficiency Rank</b>	Pearson Correlation	-.847*	1	-.771*
	Sig. (2-tailed)	.021		.015
	N	9	9	9
<b>Labor market efficiency Score</b>	Pearson Correlation	.776	-.771*	1
	Sig. (2-tailed)	.032	.015	
	N	9	9	9

**\*. Correlation is significant at the 0.05 level (2-tailed).**

**Source:** authors in SPSS 20.

There is a very strong correlation between population and labor market efficiency, which is 84.7% for rank and 77.6% for the score. Based on the results obtained, it can be concluded that the decline in the number of inhabitants is accompanied by a decrease in labor market efficiency. The obtained coefficient is also statistically significant because of  $p < 0.05$ .

**Table 7.** Correlation between number of population and innovation

		Correlations		
		Number of population FBiH	Innovation Rank	Innovation Score
<b>Number of population FBiH</b>	Pearson Correlation	1	-.663	.527
	Sig. (2-tailed)		.044	.047
	N	9	9	9
<b>Innovation Rank</b>	Pearson Correlation	-.663	1	-.711*
	Sig. (2-tailed)	.044		.032
	N	9	9	9
<b>Innovation Score</b>	Pearson Correlation	.527	-.711*	1
	Sig. (2-tailed)	.047	.032	
	N	9	9	9

**\*. Correlation is significant at the 0.05 level (2-tailed).**

**Source:** authors in SPSS 20.

The coefficient of correlation between the number of population and innovation is 66.3% for rank and 52.7% for the score and is statistically significant because of  $p < 0.05$ . This result indicates that the decline in the number of inhabitants, as defined in the previous section, is directly linked to the decline in innovation in recent years, both in the rank and score.

Taking in consideration results from Table 5.; Table 6., and Table 7., hypothesis *H1: there is a correlation between competitiveness' pillars of the country and demographic trends and hypothesis* is confirmed.

### Correlation between pillars

Determining correlation between chosen pillars is used to test hypothesis H2: there is a correlation between pillars: higher education and training, labor market efficiency and innovation.

**Table 8.** Correlation between the pillars

Correlations				
		Innovation Score	Labor market efficiency Score	Higher education Score
Innovation Score	Pearson Correlation	1	.861**	.646
	Sig. (2-tailed)		.003	.060
	N	9	9	9
Labor market efficiency Score	Pearson Correlation	.861**	1	.694*
	Sig. (2-tailed)	.003		.038
	N	9	9	9
Higher education Score	Pearson Correlation	.646	.694*	1
	Sig. (2-tailed)	.060	.038	
	N	9	9	9

\*\* . Correlation is significant at the 0.01 level (2-tailed).  
 \* . Correlation is significant at the 0.05 level (2-tailed).

Source: authors in SPSS 20.

As can be inferred from Table 8, there is a strong correlation between competitiveness pillars. The strongest correlation is between innovation and the labor market, and medium strong between higher education and other two pillars. The correlation between higher education and other two competitive pillars is also influenced by different types of indicators, such as the quantity of education (enrollment in secondary schools and faculties), meaning that human capital still in the process of education can not yet contribute to the development of innovation and labor efficiency. Correlation might be stronger with regard to indicators

under the quality of education. According to the Federal Office of Statistics, enrollment in faculties is decreasing from the year 2012 to the year 2017 for 6,6%. All coefficients of correlation are statistically significant because of  $p < 0.05$ , in all interrelationships between variables. Hypothesis H2 is confirmed.

## CONCLUSION

Gaining a competitive advantage is a process. When it comes to human capital as part of the state's overall intellectual capital, these three pillars are complementary in the domain of indicators related to the quality of higher education, the efficient use of talents, the availability of scientists and engineers and the university-industry collaboration in research and development. An input to the quantity of higher education is the number of young people studying. Among other indicators, the quality of education depends on the number and quality of academic staff and the quality management system of higher education at the state level. The output value of the education system is input to some of the labor market efficiency indicators. It is crucial to retain talents in the country to contribute to enhancing innovation and further progress of the country. There should be incentive conditions regulated at the first factor level of country development. Significant demographic changes can affect certain indicators as well as the total score of a particular pillar. It can be concluded that demographic changes have a significant impact on the score of the investigated pillars and the strongest correlation is found between demographic trends and labor market efficiency. This means that it is necessary to strengthen hiring and firing practices and country capacity to attract and retain talents. This paper suggests the need for further research in order to determine the impact of decreasing numbers of enrollment in faculties on future innovation and labor market efficiency and to examine the structure of the working-age population in the country as well as those moving to other countries.

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