
Correlation between the Dynamics of Changes in the Population of Selected European Societies and the Level of European Regional Security in the Day of Covid-19

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Abstract:

Purpose: The rationale for undertaking the research was the lack of multifaceted, comparative analyzes of the population in European countries in terms of dynamics and multifaceted analyzes of births and deaths in individual European societies during the COVID-19 period literature.

Design/Methodology/Approach: The study attempts to analyze the population in thirty-two European countries. For this purpose, multifaceted comparative analyzes were selected. The raw data were grouped and ungrouped. Bar and line charts, as well as indexes of dynamics on a fixed basis, were used. The study is completed with a summary and conclusions.

Findings: The multifaceted comparative analysis of the European population used in this study shows the dynamics in terms of security. In 2011-2019, there was observed a growing trend in population growth in all thirty-two European countries. In eleven of the considered thirty-two European countries, there was a negative difference between birth and death. In the remaining 21 countries, the result was positive. The conducted analyzes show that the number of people is a factor influencing states' state of security.

Practical Implications: The performed research was supplemented with an analysis of the impact of the above-mentioned factors on the state of regional security.

Originality: The research subject is thirty-two European countries, and the core matter of it is the number of people in Europe and the number of deaths and births in dynamic terms.

Keywords: Population in Europe, number of births and deaths of people, multivariate analyzes, safety.

JEL codes: C51, E31, E37, E64.

Paper Type: Research in Security Studies.

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1. Introduction and Literature Review

The literature analysis shows that the number of people in the world in 2020 is 7.8 billion and will increase by 2050 to the level of about 10 billion (J. Baillie, Y. Zhang, 2018). At the turn of the 19th and 20th centuries, this number fluctuates around 1.7 billion. Over the next half-century, it grew to 2.5 billion. In 1987, it increased to 5 billion (Businessinsider, 2020). The general increase in the population results from a decrease in the total fertility rate (TFR), associated with increased women, educational achievement, and global access to contraception (Abubakar, 2020). The visible growing trend in the world's population causes a rapidly increasing impact on land areas (Nowosad and Stapinski, 2018). The escalation of the human population drives the growth of all environmental problems (Brown and Nielsen, 2000; Plant, Smith, Smith, and Williams, 2000; Lelieveld, Ramanathan, and Crutzen, 1999; Bartiaux, 1993; Alper, 1991; Brinckman, 1985). Population growth contributes to reducing natural resources, water pollution, atmosphere, and soil by dumping various waste types.

The increase in the number of people in many countries of the world is caused by migration. An example is the United States, where the population mounted from 0 to 270 million in 510 years (Hopfenberg and Pimentel, 2001). The rate of growth, however, was not the same in all nations, races, and classes of humankind (Cannigs, 1972). There are also countries where difficulties in taking measurements during organized censuses are observed. Nigeria is one of them.

This country's population is about one-fifth of the total population of Africa, and it oscillates around 188.5 million people (Ola, 2018). When considering the world's population, one should carefully look at Europe as a whole and individual countries using research tools such as a multifaceted data analysis using security dynamics indicators. The literature's critical analysis shows that the multivariate analysis concerns a group of statistical methods by which at least two variables describing the dependent variable are compared (Łuniewska, 2006).

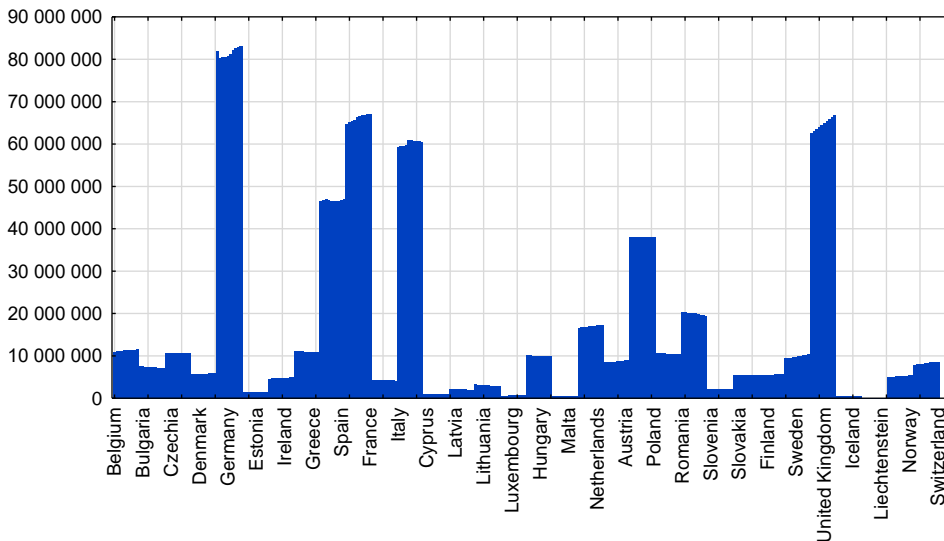
Security in literature is the certainty of existence and survival, the state of possession, functioning, and development of the subject (Zięba, 2018). An important aspect of security and population number is migration in dynamic terms, which affects states' security (Bali, S., edited by Williams, 2012). The number of people in individual countries and continents is significant from their income point. It should be emphasized that potentially every person buys products and, in most cases, pays taxes, thus increasing the national income. Large changes in the population may lead to a reduction in the national income and the inability to achieve the strategic goals of countries or organizations. The population of individual European countries is diverse and has changed dynamically.

The next section will be devoted to the multifaceted analysis of the population in Europe.

2. Multifaceted Analysis of the Population in Europe

The study began by delineating a categorized bar graph (Figure 1) of primary human population data in thirty-two European countries between 2010 and 2019.

Figure 1. Categorized bar graph of primary population data in thirty-two European countries in 2010-2019

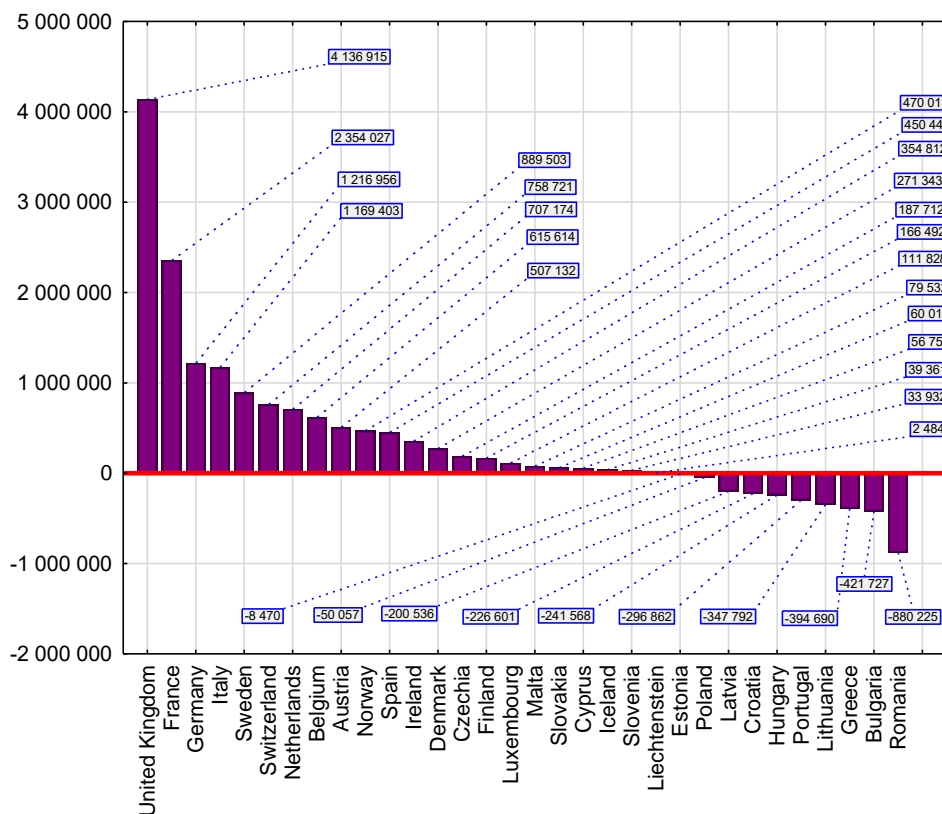


Source: Own study based on data obtained from the website: <https://ec.europa.eu/eurostat/home?> [as of September 7, 2020]

The observations of the data presented in Figure 1 show that the largest population of people in the thirty-two analyzed European countries can be found in Germany. It amounts to about 82,000,000 inhabitants and shows a dynamically growing trend. France is second, followed by Great Britain. A growing trend in the number of inhabitants is visible in these countries. The population of France and Great Britain exceeds 62,000,000. Italy comes in fourth place. The population of this country is around 60,000,000. Spain is fifth in the ranking - around 46,000,000 people. The sixth place in the ranking of the inhabitants' population is taken by Poland, with about 38,000,000 people. The remaining twenty-six countries have less than 20,000,000 inhabitants. The observation of the data presented in Figure 1 allows us to conclude that there are countries where there is a visible upward and downward trend, and most of which lacks the above-mentioned regularity.

For research purposes, a rank-order bar chart of the raw data of the difference in the human population in thirty-two European countries between 2019 and 2020 was delineated.

Figure 2. Bar graph of the population difference in thirty-two European countries between 2010 and 2019



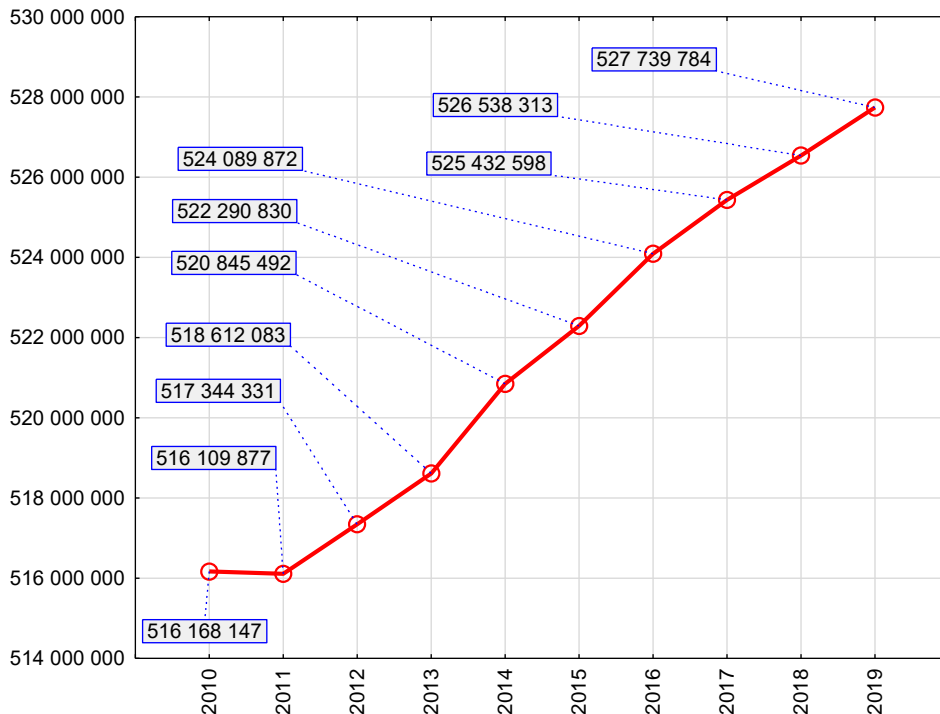
Source: Own study based on data obtained from the website: <https://ec.europa.eu/eurostat/home?> [as of September 7, 2020]

The data presented in Figure 2 shows that nine out of thirty-two observed countries show a negative difference in the human population between 2019 and 2010. The last place in the population increase ranking was recorded in Romania with a negative result of -800,225. The highest increase was in Great Britain. Great Britain (4,136,915), then France (2,354,027). Germany is third (1,216,956), and Italy is fourth (1,169,403). In the subsequently analyzed countries, the increase was lower than 1,000,000.

In ten out of thirty-two countries, a downward trend in the human population between 2010 and 2019 was observed, while in the remaining twenty-two, an upward trend was observed. In 2010-2019, there was a population increase in thirty-two European countries by a total of 11,571,637 inhabitants.

The next stage of the research was preparing a linear graph of the sum of the human population in total in thirty-two European countries in 2010-2019.

Figure 3. A linear graph of the sum of the human population in total in thirty-two European countries in 2010-2019



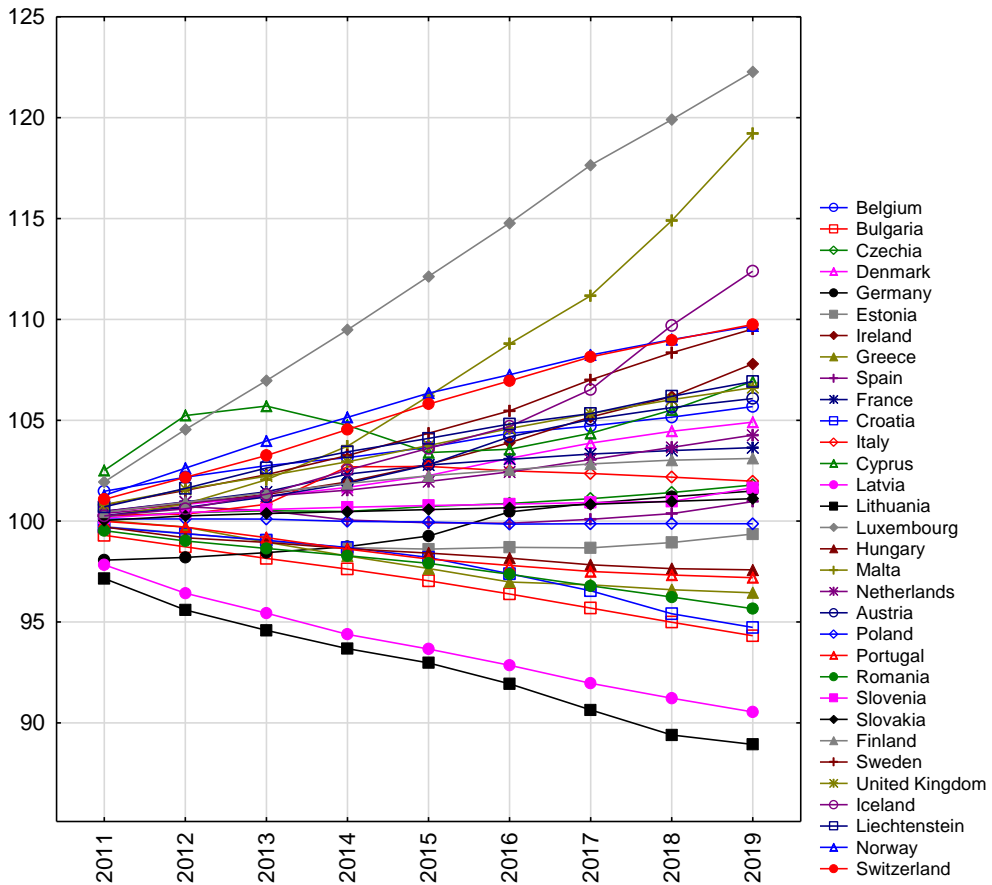
Source: Own study based on data obtained from the website: <https://ec.europa.eu/eurostat/home?> [as of September 7, 2020].

The information in Figure 3 allows the observation of regularities in the form of a linear trend of increasing population in all thirty-two countries in the analyzed period between 2011-2019. From 2010 to 2019, there was an increase in population in Europe by 11,571,637. In the years 2010-2011, a slight downward trend in the number of people was observed in the analyzed all thirty-two European countries. A line graph of the dynamic's indexes with a fixed base (population in each of the thirty-two countries - 2010) of the population in each of the thirty-two European countries in 2011-2019 was made.

The points outlined in Figure 4 show that the highest dynamics of population growth in thirty-two European countries in 2010-2019 was visible in Luxembourg. The dynamics indexes increased to 122.27 percentage points in 2019 compared to the year 2010. Malta was second in the ranking. Fixed-based dynamics indexes increased to 119.21 percentage points in 2019. Iceland came third, with the index of dynamics on a fixed basis amounted to 112.39 percentage points in 2019. Twelve out of thirty-two European countries were included in ranking the growth of the dynamics index with a fixed base above 105 percentage points in 2019. Great Britain, with a result of 106.62 pp, and Poland with a result of 105.68 pp was

placed among them. On the other hand, the lowest in the ranking, considering the dynamics indexes on a fixed basis, was Lithuania, resulting from 88.94 percentage points. Latvia was second from the end of the ranking with a result of 90.54 percentage points. Then Bulgaria (94.32 percentage points) and Croatia (94.73 percentage points).

Figure 4. Linear chart of dynamics indexes on a fixed basis (population in each of thirty-two countries - 2010) of the population of people in each of thirty-two European countries in 2011-2019



Source: Own study based on data obtained from the website: <https://ec.europa.eu/eurostat/home?> [as of September 7, 2020]

Sixteen out of the thirty-two analyzed European countries displayed dynamics indexes with a fixed base ranging from 95 to 105 percentage points (in 2019), including all the countries with the largest population above 20,000,000, excluding Great Britain, where the population growth was much higher (106, 62 percentage points).

The next stage of the research is preparing descriptive statistics in Table 1 of the primary data on the population in thirty-two European countries in 2019.

Table 1. Descriptive statistics analysis of primary population data in thirty-two European countries in 2019

	N	Arithmetic mean	Median	Sum	Min.	Max.	Standard deviation
Population	32	16 491 868	7 772 283	527 739 784	38 378,00	83 019 213	22 812 823

Source: Own study based on data obtained from the website:

<https://ec.europa.eu/eurostat/home?> [as of September 7, 2020].

The descriptive statistics analysis performed in Table 1 on the population in thirty-two analyzed European countries shows that the most frequent number of inhabitants in thirty-two countries in 2019 was 7,772,283 (median). Due to the large difference in the populations between the analyzed countries, the arithmetic mean was higher and amounted to 16 491 868. The total sum of the population in thirty-two European countries is 527 739 784. The smallest country in terms of population in 2019 was Liechtenstein with a result of 38 378, whereas the most populated one in Europe in 2019 was in Germany - 83,019,213. The standard deviation from the arithmetic mean of the analyzed data was 22,812,823.

Then it was decided to perform a multifaceted data analysis on the number of births and deaths of people in Europe.

3. Multifaceted Analysis of the Number of Births and Deaths of People in Europe

The study began with the analysis of descriptive statistics of birth and death rates in thirty-two European countries in the period from 2009 to 2018 in Table 2.

Table 2. Descriptive statistics data analysis on the difference between births and deaths rates in each of the thirty-two European countries in 2009-2018 in total

Nation	A1	A2	A1-A2
	Birth from 2009 to 2018	Death from 2009 to 2018	
Belgium	1 246 853	1 075 460	171 393
Bulgaria	687 685	1 085 083	-397 398
Czechia	1 121 229	1 087 413	33 816
Denmark	598 578	531 763	66 815
Germany	7 178 438	8 920 651	-1 742 213
Estonia	143 516	155 222	-11 706
Ireland	684 907	294 859	390 048
Greece	985 519	1 155 469	-169 950
Spain	4 342 644	4 008 745	333 899

France	8 050 236	5 748 034	2 302 202
Croatia	398 952	520 394	-121 442
Italy	5 085 592	6 129 595	-1 044 003
Cyprus	94 974	55 113	39 861
Latvia	206 978	289 294	-82 316
Lithuania	302 765	410 488	-107 723
Luxembourg	59 975	39 304	20 671
Hungary	923 509	1 293 873	-370 364
Malta	42 009	33 465	8 544
The Netherlands	1 753 244	1 427 023	326 221
Austria	818 423	799 260	19 163
Poland	3 892 023	3 887 468	4 555
Portugal	898 522	1 074 162	-175 640
Romania	2 031 935	2 572 513	-540 578
Slovenia	211 172	194 052	17 120
Slovakia	576 598	528 517	48 081
Finland	562 414	521 384	41 030
Sweden	1 144 432	907 867	236 565
Great Britain	7 809 291	5 803 312	2 005 979
Island	44 121	21 145	22 976
Liechtenstein	3 617	2 499	1 118
Norway	591 036	410 849	180 187
Switzerland	839 240	646 917	192 323
Total	53 330 427	51 631 193	1 699 234

Source: Own study based on data obtained from the website:
<https://ec.europa.eu/eurostat/home?> [as of September 7, 2020]

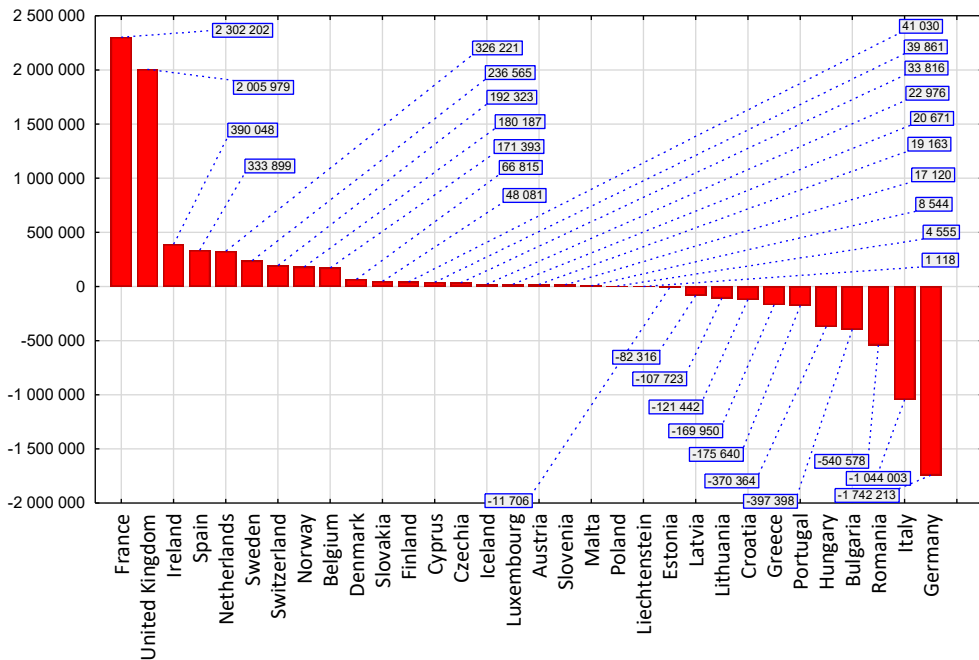
Data from Table 2 show that in 2009-2018 the number of births (53,330,427) was greater than the number of deaths (51,631,193) in thirty-two European countries - by 1,699,234 people. Figure 5 ranks data on the difference between birth and death rates in 2009-2018 in thirty-two European countries.

The observation of the data presented in Figure 5 shows that in eleven out of thirty-two analyzed European countries, there was a negative difference between birth and death rates. In the remaining 21 countries, the result was positive. The largest difference between births and deaths combined in 2009-2018 was recorded in France (2,302,202), followed by Great Britain (2,005,979). In the remaining 19 countries, the difference between birth and death rates was positive.

The difference between birth and death rates in each of these countries was less than 500,000 people. The lowest negative difference was recorded in Germany (-1,742,213). Considering the data presented in Figure 2, it can be assumed that the

difference between birth and death rate in Germany will be positive, while according to the data in Table 3 and Figure 5, it is negative. This phenomenon may be caused by the migration of people to European countries from various countries, including those commonly referred to as Third World countries.

Figure 5. Bar chart of the difference between birth and death rates of people in total in 2009-2018 in thirty-two European countries

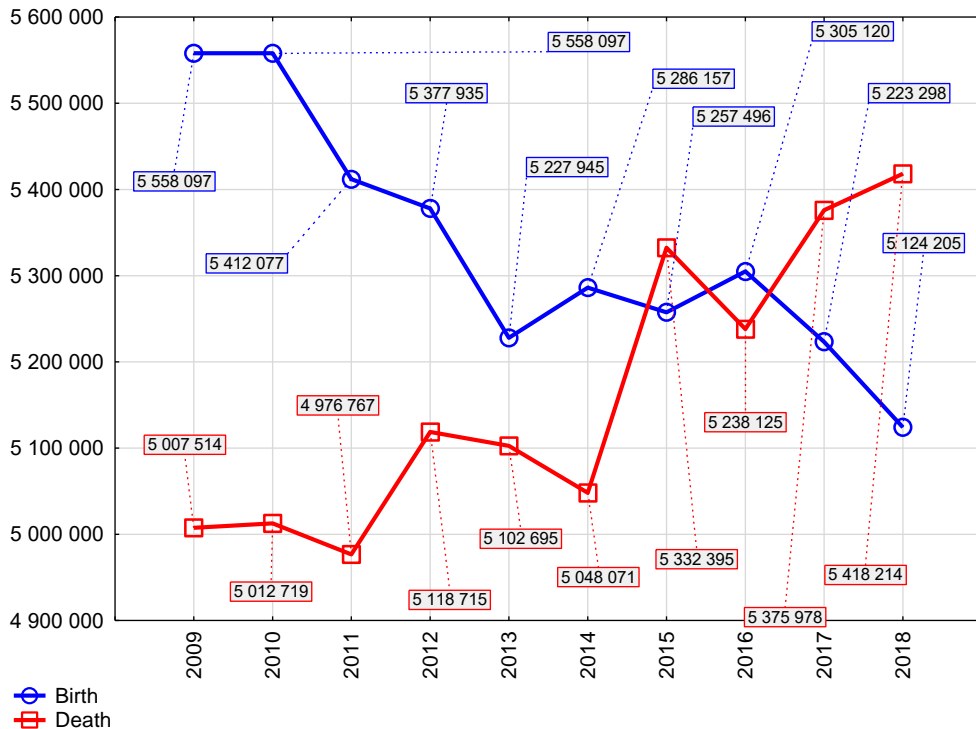


Source: Own study based on data obtained from the website: <https://ec.europa.eu/eurostat/home?> [as of September 7, 2020].

The next stage of the research is the correlation of the birth and death rates of people in 2009-2018 in all thirty-two European countries on a line graph.

Two functions outlined in Figure 6 clearly indicate two different types of trends. The first function (birth rates) indicates a decreasing trend, while the second one is called the increasing death trend. In 2009-2014 and 2015, there was a positive difference between the number of births and deaths in thirty-two European countries when looking at the 2009-2018 period together. A negative difference was visible in the remaining three years (2016, 2017, and 2018). The biggest positive difference was observed in 2009 and amounted to 550 583, then in 2010 - 545 378 people. In the following years, the declines were observed. In 2012 - 259,220 people, and in 2013 - 125,250 people. The first negative difference in the analyzed period was in 2015 and amounted to - 74 899. The lowest negative difference was in 2018 - 294 099.

Figure 6. Linear diagram of human birth and death rates in 2009-2018 in all thirty-two European countries

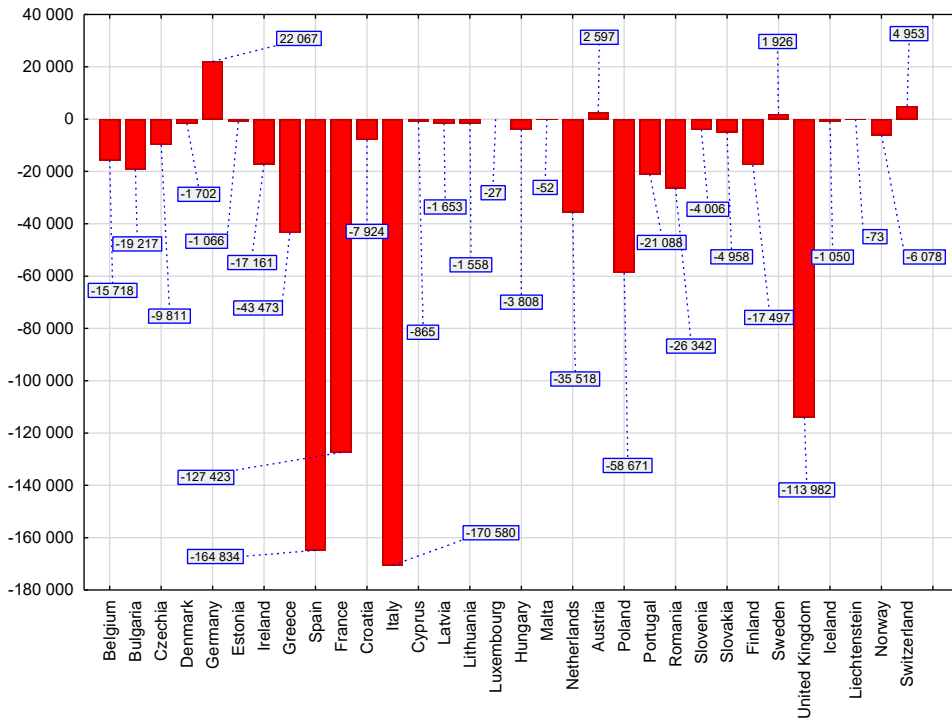


Source: Own study based on data obtained from the website: <https://ec.europa.eu/eurostat/home?> [as of September 7, 2020].

The next stage of the analysis was to conduct a study to observe whether a change in the trend in 2018 in any of these countries took place after the decline in the difference between the birth and death rates of people in thirty-two European countries since 2015; for this purpose, the results of the difference of birth and death rates in thirty-two European countries between 2009 and 2018 were compared. They are summarized in Figure 7.

The observations of the data presented in Figure 7 clearly show that the highest observed positive difference between birth and death rates, between 2018 and 2009, was recorded in Germany and amounted to 22,067. Additionally, a positive difference was observed in three countries: Switzerland (4,593), Austria (2,597), and Sweden (1926). In the remaining twenty-eight European countries, there was a negative difference between birth and death rates between 2019 and 2009. The lowest negative level was recorded in Italy (-170,580), Spain (-164,834), France (-127,423), Great Britain (-113 982) and Poland (-58 671). The other twenty-two countries had a difference of less than -50,000.

Figure 7. Bar chart of the difference in human birth and death rates between 2018 and 2009 in thirty-two European countries



Source: Own study based on data obtained from the website: <https://ec.europa.eu/eurostat/home?> [as of September 7, 2020].

4. Summary and Conclusions

The conducted research shows that the largest human population in thirty-two analyzed European countries is in Germany. It amounts to about 82,000,000 inhabitants and shows a dynamically growing trend. France is in the second position, followed by Great Britain. A growing trend in the number of inhabitants is visible in these countries. The population of France, as well as in Great Britain, exceeds 62,000,000. In fourth place in terms of the number of inhabitants in Europe is ranked Italy - around 60,000,000. Spain is in fifth place in the ranking with a population of around 46,000,000. Poland ranks sixth in the population, with approximately 38,000,000 people. In 2011-2019, there was observed a growing trend in population growth in all thirty-two European countries. From 2010 to 2019, the increase amounted to 11,571,637 people.

Nine of the thirty-two observed countries show a negative population difference between 2019 and 2010. The last place in the population increase ranking was recorded in Romania with a negative result of -800,225. The highest increase was in Great Britain (4,136,915), followed by France (2 354 027). Germany took the

third position (1,216,956), and Italy, the fourth one (1,169,403). In subsequent countries, the increase was lower than 1,000,000. The highest dynamics of population growth in thirty-two European countries in 2010-2019 were observed in Luxembourg. The dynamics index increased to 122.27 percentage point in 2019 compared to 2010. Malta was second in the ranking. The fixed-basis dynamics index increased in 2019 to 119.21 percentage points. Iceland came third, with the dynamics index on a fixed basis of 112.39 percentage points in 2019.

The most common population in thirty-two countries in 2019 is 7,772,283 (median). Due to the large difference in the populations among the analyzed countries, the arithmetic mean was higher than the median and amounted to 16,491,868. The total population of thirty-two European countries is 527,739,784. In 2019, The smallest country in terms of population was Liechtenstein, with 38 378, whereas the most populated one in Europe was Germany with - 83,019,213 inhabitants. The standard deviation from the arithmetic mean of the analyzed data was 22 812 823.

In eleven of the considered thirty-two European countries, there was a negative difference between birth and death. In the remaining 21 countries, the result was positive. The largest difference between birth and death rates combined in 2009-2018 was recorded in France (2,302,202), followed by Great Britain (2,005,979). In 2009-2014 and 2015, there was a positive difference between the number of birth and death rates in thirty-two European countries when looking at the 2009-2018 time period together. In the remaining years (2015, 2017, and 2018), a negative difference was recorded. The largest positive difference was observed in 2009 and amounted to 550,583 people, then in 2010 - 545,378 people. In the following years, the declines were observed.

A positive difference between birth and death rates between 2018 and 2009 was the highest in Germany and amounted to 22,067. Additionally, a positive difference was observed in three countries: Switzerland (4,593), Austria (2,597), and Sweden (1926). In the remaining twenty-eight European countries, there was a negative difference between birth and death rates between 2018 and 2009.

The conducted analyzes show that the number of people is a factor influencing states' state of security. Systematic population growth in total for thirty-two countries in the years 2011 and 2019 in Europe translates into the stability of the supranational structure that is the European Union. It should be emphasized that the number of people cannot grow continuously and systematically. The tendency of population growth may reduce the number of natural resources, an increase in the dangerous phenomenon of hunger, and a faster spread of various diseases (the tragic and most recent example of which is the COVID-19 epidemic that has continued uninterruptedly since 2019). It is essential to analyze and evaluate the data to maintain an appropriate level of the growing trend in Europe and its individual countries. The epidemic is likely to change the observed trends. The new

data obtained in the future will allow for further research and interpretations to indicate how the level of security of both individual societies and supranational organizations may change due to changes in the population number.

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