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Regularities in the gender gap in life expectancy at birth in European post-communist countries

Abstract

The aim of the article is to find patterns in the gender gap in life expectancy at birth in European post-communist countries. The analysis covers the years 1990–2018. Larger differences occur in the countries of the former USSR, smaller ones on the Balkan Peninsula. Belonging to the USSR (larger gap) and the Ottoman Empire (smaller gap) in the past has a great influence of the gender gap. In half of the analysed countries, the gender gap decreased. In a quarter, after an initial increase, there was also a decrease in the gender gap (some countries of the former USSR). Moreover, in a quarter of the countries, these changes were ambiguous (some countries on the Balkan Peninsula). One can see here the impact of an improving economic situation of the population. An attempt to link the gender gap and life expectancy with the 'homo-sovieticus' requires further research.

Keywords: gender gap, life expectancy at birth, European post-communist countries

Introduction

Biological determinants alone make the average life expectancy of males shorter than that of females by one to two years (Luty, 2003; Ram, 1993). Larger differences are already conditioned by non-biological factors (e.g. behaviour, lifestyle, social roles), with particular significance of anti-health behaviours (e.g. alcoholism, nicotinism, drug addiction) and occupational risks being more widespread among men (Loef & Walach, 2012; Oksuzyan, Juel, Vaupel, & Christensen, 2008).

The difference between female–male life expectancy is greater in Eastern Europe than in Western Europe (Ginter & Simko, 2013; Solé-Auró, Jasilionis, Li, & Oksuzyan, 2018). Therefore, the study aims to find patterns in the gender gap in life expectancy at birth.

When undertaking the study, three hypotheses were formulated. They focus on both the size of differences between men and women in various countries and on the variability in changes of these differences over time:

1. The main factor affecting female–male differences in life expectancy at birth are the cultural determinants related to anti-health behaviours (mainly alcoholism and nicotinism) being more widespread among men (see McCartney, Mahmood, Leyland, Batty, & Hunt, 2011). This is probably related to a greater intensity of negative traits attributed to the 'homo sovieticus'. Theorists of Marxism-Leninism promoted the rise of a new and better man. He was most often referred to as 'a new Soviet person' or 'homo sovieticus' (Parniewski, 1995). He was to be a healthy, muscular man, etc., but above all, he was to be involved in spreading the revolution.[1] In the case of women, it was postulated to combine the traditional values of a wife and a mother with new ones, typical of the new Soviet man. Despite the gender equality declared by the communist authorities, men played a supreme role in this concept. Women were presented more as beneficiaries of the revolution rather than its creators. As a result, in propaganda, male domination was equated with the leading role of the proletariat, and the 'new Soviet person' was generally characterized as male (Engel, 2004). Because the origins of the 'homo sovieticus' are associated with the interwar period and the then USSR (Ustryalov, 1934) and it was culturally the strongest over there, the differences in the countries of the former USSR should be greater than in the remaining area. Furthermore, taking into account the greater importance of men than women in this concept, one

[1] However, at present this term has negative connotations (cf. Heller, 1988; Tischner, 1992; Zinoviev, 1986).

could presume that men would pull themselves together much worse in the new, post-communist reality (cf. the concept of the 'homo post-sovieticus' – Ganev, 2017). Thus, it can be assumed that a gender gap in the former USSR countries will grow at least in the first years after the fall of communism.

2. The factor associated with the lower status of women in Balkan countries, which in the past were under the dominion of the Ottoman Empire is of secondary importance (see Cockerham, Hinote, & Abbott, 2006). Therefore, it can be assumed that the gender gap in these countries will be smaller than in the remaining countries of the region. This is connected with the status of women in that empire (Dursteler, 2016), or more generally – in Islam (Mernissi, 1991).
3. In countries where successful reforms were implemented, which, among others, resulted in increasing the society's wealth or improving the quality of medical care (including reducing corruption in it; see Shakarishvili, 2005; Kotlebová, 2017) the gender gap in life expectancy should be reduced (Schünemann, Strulik, & Trimborn, 2017). This can be explained by the fact that improving the functioning of state institutions (and healthcare is one) will ensure easier access to their services (McKee & Nolte, 2004). Moreover, improving education and wealth of the population will result in increased pro-health behaviours (Leinsalu, Stirbu, Vågerö, Kladiene, Kovács, Wojtyniak, Wróblewska, Mackenbach, & Kunst, 2009).

The period of the study covers the years 1990–2018. The spatial scope covers almost all European post-communist countries except the former German Democratic Republic (since it is currently part of Germany) and three quasi-states: Transnistria, the Donetsk People's Republic and the Luhansk People's Republic.

Data and methods

Statistical data used in the article were collected based on the desk research method (Czarniawska, 2014). The *Gender Statistics* database, maintained by the World Bank, was the primary source of data. Except for the period 1990–2000 for Serbia, all data on life expectancy come from this database. In several cases, its authors marked the data with additional annotations: interpolated data (Croatia: 1993, 1994; Romania: 2004, 2005; Estonia: 2006; Slovenia: 2006), break in series, although they provide values (Poland: 2009; Serbia: 2011; Hungary: 2012; Estonia: 2015), extrapolated assuming the same linear trend as in the previous year (Estonia: 2018; Latvia: 2018; Lithuania: 2018; Slovakia: 2018; Romania: 2018), extrapolated assuming the same as in the previous year (Bulgaria: 2018; Czechia: 2018; Hungary: 2018; Poland: 2018; Serbia: 2018; Slovakia: 2018), estimated by the government (Romania: 2013, 2014).

Only in the case of Serbia, the data in the first half of the analysed period were missing from *Gender Statistics*. They also appeared in the *European Health for All* database (HFA-DB) run by the World Health Organization Regional Office for Europe. Therefore, in this case the decision was made to use national data. For the years 1990–2000, they were retrieved from the publication of the Statistical Office of the Republic of Serbia (*Skraćene*…, 2009). However, the difficulty was that the data contained in this publication for the period up to 2002 did not relate to one specific year but to two years. Therefore, the data for Serbia marked as 1990 are from the period 1989–1990, as 1991 are from the period 1990–1991, etc. up to and including 2000.

A serious problem in international comparisons is the data quality. In this case, the above data were compared with those from the mentioned HFA-DB. However, this database is much less complete than *Gender Statistics*. The comparison of data in both of these databases showed that in the vast majority of cases the differences in data are in the range of 0.0–0.2. In only a few cases, they were slightly higher, occurring mainly at the beginning of the analysed period.

Additionally, when analysing the GDP per capita, PPP (current international $),[2] the *World Development Indicators* database run by the World Bank was used. In analysing the percentage of Muslims in selected countries, Kettani's publication (2020) supplemented with *Republic of North Macedonia. Population: Demographic Situation, Languages and Religions* (2020) was used. In the analysis of the gender gap SDR[3] selected smoking-related and selected alcohol-related causes, HFA-DB was used again.

The commonly used indicators and statistical methods were applied in the study: arithmetic mean (average), standard deviation (SD), coefficient of variation (CV), Pearson correlation coefficient (PCC) (Reid, 2013). To analyse the similarity of value changes in the gender gap, McQuitty's linkage analysis, the version without rotation (Lankford, 1974), was used. A breakdown into types was made at PCC=0.60, and for subtypes at PCC=0.80. A regressive model was used to analyse changes in the gender gap over time (Reid, 2013). The model with the highest R^2 value was chosen from among the functions: linear, logarithm, exponentiation, exponential, polynominal (degree 2). If for all models the value of $R^2<0.70$, then none of the models was taken into account. The breakdown into groups with a similar gender gap was made on

[2] This indicator provides per capita values for gross domestic product (GDP) expressed in current international dollars converted by the purchasing power parity (PPP) conversion factor. GDP is the sum of gross value added by all resident producers in the country plus any product taxes and minus any subsidies not included in the value of the products. The conversion factor is a spatial price deflator and currency converter that controls for the price level differences between countries (World Bank, n.d.).

[3] age-standardised death rate.

the basis of Hellwig's critical distance (Hellwig, 1968) for k=0.8. To investigate spatial autocorrelation, Moran's *I* in the version of adding up values in the rows of the matrix to 1 was used (Moran, 1950).

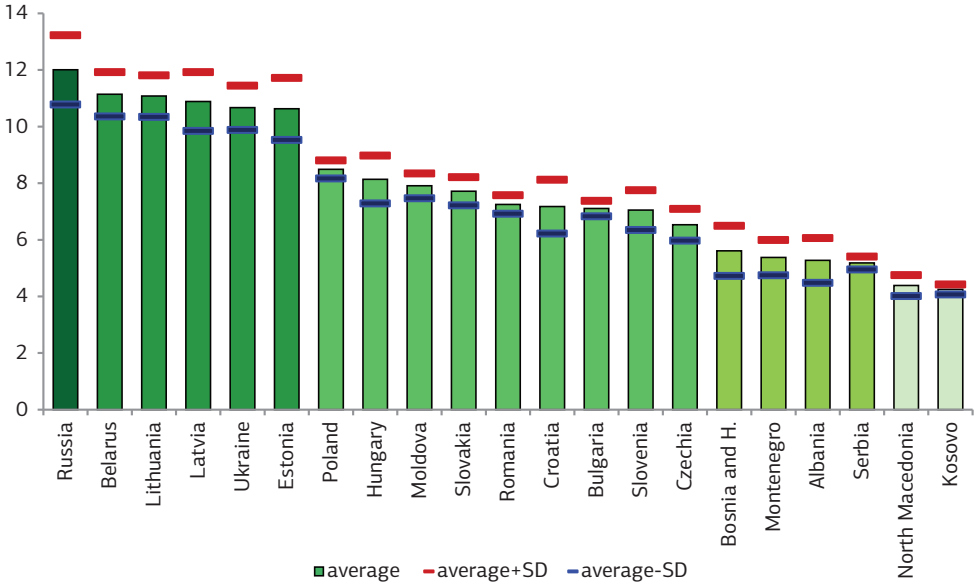
Results and analysis

Before the actual analysis is carried out – the decision was made to show the value of life expectancy at birth. This is the average value from 1990–2018 expressed in years. It will be a background for considering the gender gap. In all the countries, the analysed values are higher for women. The diversity of the situation between countries is greater for men (CV=4.7%) than for women (2.8%). The longest female life expectancy at birth was recorded in the richest countries of the region (Slovenia, Czechia), and then in various countries located in the central and northern parts of the region (Poland, Croatia, Slovakia, Estonia). The worst one was in Kosovo and the post-Soviet countries: Moldova, Russia, Ukraine. In the case of male life expectancy at birth, the best situation was recorded again in Slovenia and Czechia. However, next were the countries located in the south of the region: Albania, Montenegro, Bosnia and Herzegovina, North Macedonia. The worst situation was again in post-Soviet countries: Russia, Ukraine, Moldova, Belarus.

Looking at the average gender gap in life expectancy (in years), we see large diversity between countries (Figure 1). For this reason, they were broken down into 5 groups (Hellwig's critical distance was used). By far the largest differences were recorded in Russia (12.0 years). The next group, also with large differences (10.6–11.1), comprised: Belarus, Lithuania, Latvia, Ukraine, Estonia. The most numerous is the group with relatively average differences (6.5–8.5): Poland, Hungary, Moldova, Slovakia, Romania, Croatia, Bulgaria, Slovenia, Czechia. Then we have two groups with small differences (5.2–5.6): Bosnia and Herzegovina, Montenegro, Albania, Serbia, and very small ones (4.3–4.4): North Macedonia, Kosovo.

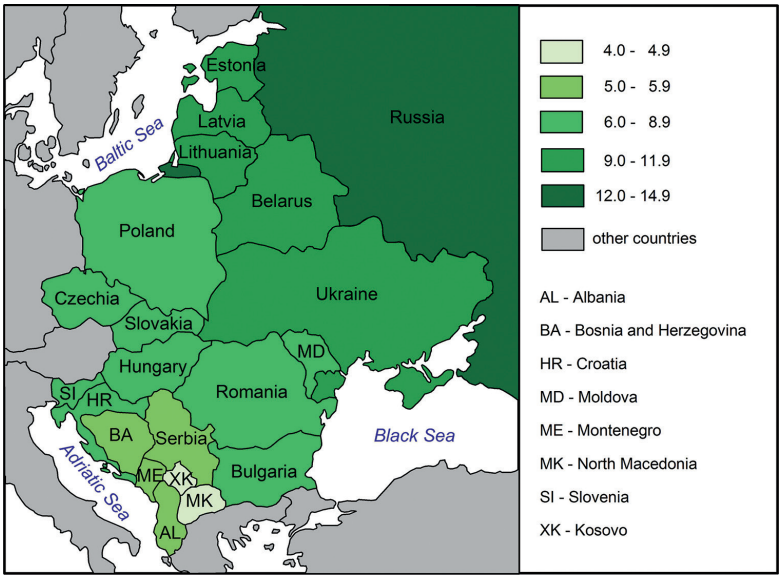
Moran's *I* statistic amounts to 0.83, which indicates the spatial order of the analysed phenomenon. This is confirmed by the analysis of Figure 2. It shows that from the north-east (Russia) to the south-west (part of the countries of former Yugoslavia and Albania) there are four meridional strips. From a geopolitical point of view, the largest differences occur in the countries of the former Soviet Union, and the smallest ones in the countries with a significant percentage of Muslims (without Russia).

Figure 1. Gender gap in life expectancy at birth, average 1990–2018 (years)



Source: Own study based on: *Gender Statistics*; HFA-DB; *Skriveene…* (2009).

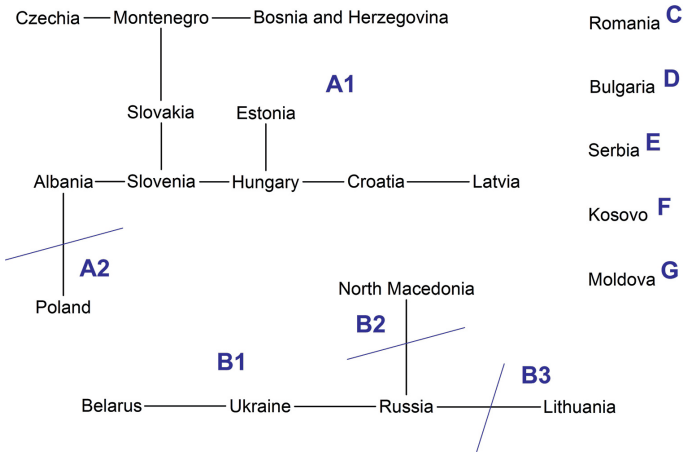
Figure 2. Spatial approach – gender gap in life expectancy at birth, average 1990–2018 (years)



Source: Own study based on: *Gender Statistics*; HFA-DB; *Skriveene…* (2009).

The information itself on the average level of the gender gap is too general. Additional information is provided by an analysis of the similarity of changes over time. The aforementioned McQuitty's linkage analysis was used, and its results are shown in Figure 3. We see that the analysed countries are divided into two groups. About half of them belong to type A, 1/4 to type B and 1/4 are single-element types.

Figure 3. Dendrite similarities of changes in the gender gap in life expectancy at birth in the years 1990–2018

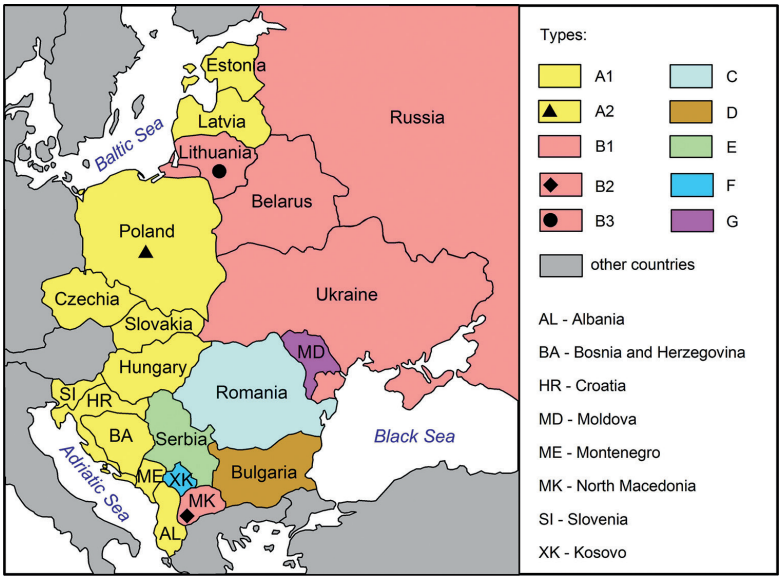


Source: Own study based on: *Gender Statistics*; HFA-DB; *Skriveene…* (2009).

Looking at Figure 4, we can see that the countries included in type A form a meridional strip in the west of the analysed area: from Estonia in the north, to Albania in the south. Type B includes post-Soviet countries plus North Macedonia. On the other hand, the countries classified into individual types are located in the central and eastern Balkans (plus Moldova).

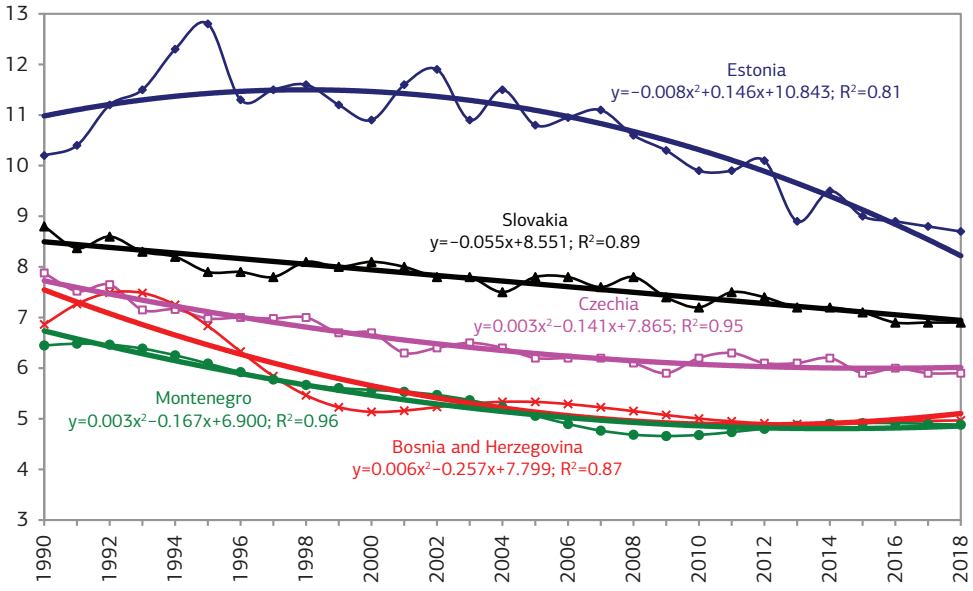
Considering the legibility of the graphs – changes in the gender gap values in the years 1990–2018 were represented in four figures. Figures 5 and 6 present these changes for the countries classified in type A. In all of these countries, we can see a downward trend in the gender gap. For Poland and Latvia, due to large fluctuations in values (resulting in $R^2<0.70$), it was impossible to calculate the regressive model. Although for the remaining ones the polynominal function (degree 2) was calculated, but looking at very low values at x^2 it can be stated that the downward trend in the gender gap was close to linear (Croatia with a value of –0.096 is a partial exception).

Figure 4. Spatial approach – similarity of changes in the gender gap in life expectancy at birth in the years 1990–2018



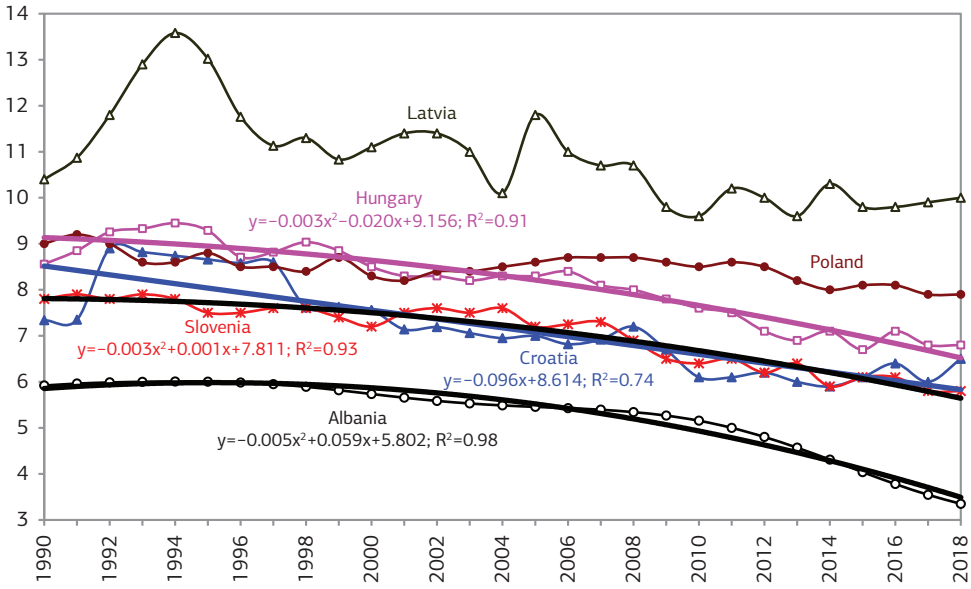
Source: Own study based on: *Gender Statistics*; HFA-DB; *Skriveene…* (2009).

Figure 5. Changes in the gender gap in life expectancy at birth in the years 1990–2018, type A part 1



Source: Own study based on: *Gender Statistics*; HFA-DB; *Skriveene…* (2009).

Figure 6. Changes in the gender gap in life expectancy at birth in the years 1990–2018, type A part 2



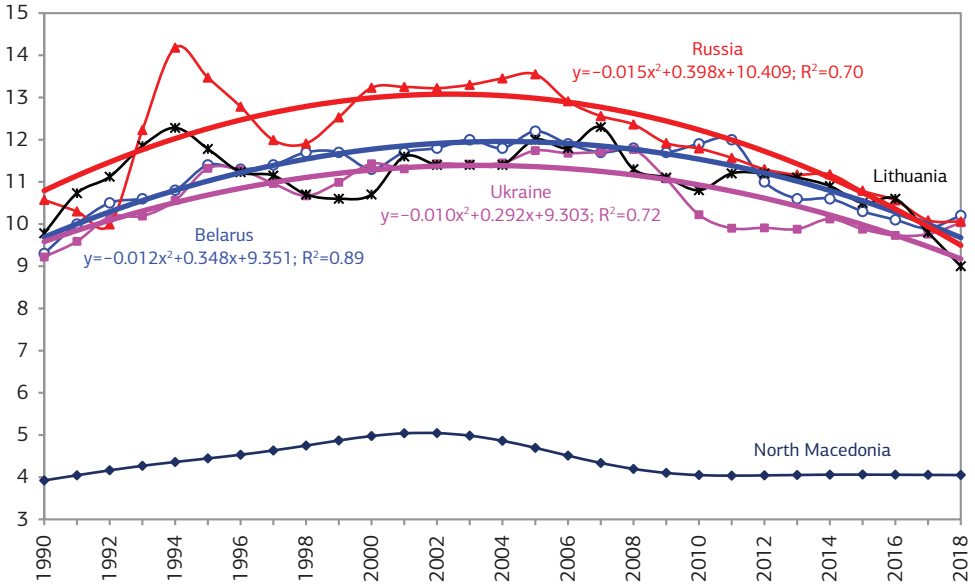
Source: Own study based on: *Gender Statistics*; HFA-DB; *Skriveene…* (2009).

In countries classified to type B, an increase in the gender gap was initially noted, which then went down (Figure 7), which is quite well described in polynominal functions (degree 2).[4] In the countries included in subtype B1 and B3, the maximum differences were recorded in the period 2005 to 2008, while in North Macedonia (type B2) this happened earlier (in 2000–2003). In addition, in the case of Ukraine, Russia and Lithuania an additional earlier maximum was also recorded in the period 1994–1996.

In the remaining countries, the gender gap changes in subsequent years were so different that each of them was classified into a separate type (Figure 8). In the case of Moldova (type G), there was a clear upward trend in male–female differences in life expectancy at birth. However, in the case of other countries, no tendency to changes in the gender gap was noted. Since simultaneously there were also large fluctuations in the gender gap, it was not possible to determine the regression model.

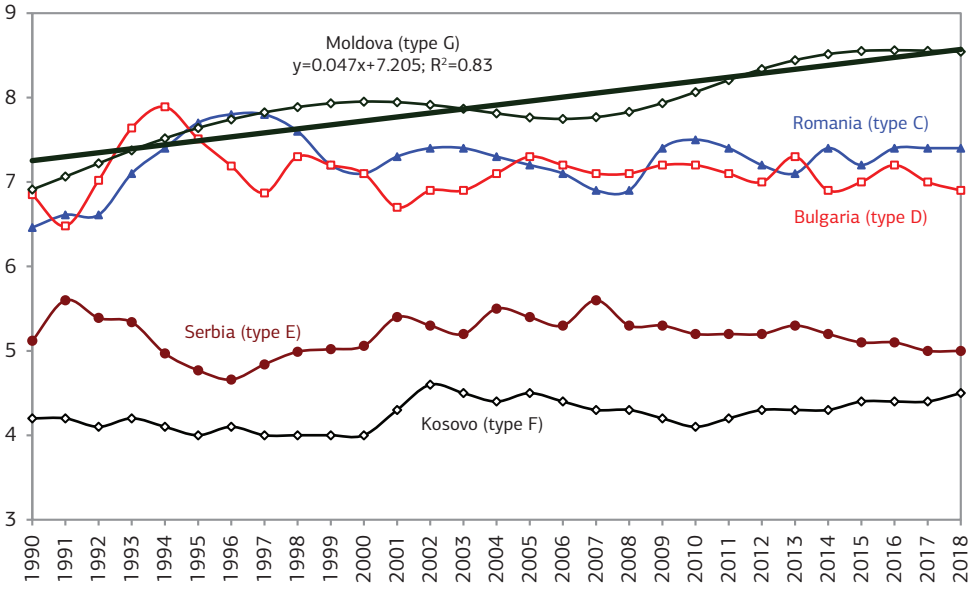
[4] North Macedonia constitutes an exception where although there were no major fluctuations, but the shape of the changes was so complicated that it was satisfactorily described only by the equation: $y = 0.0004x^3 - 0.0221x^2 + 0.3261x + 3.3933$ ($R^2 = 0.85$).

Figure 7. Changes in the gender gap in life expectancy at birth in the years 1990–2018, type B



Source: Own study based on: *Gender Statistics*; HFA-DB; *Skriveene*… (2009).

Figure 8. Changes in the gender gap in life expectancy at birth in the years 1990–2018, types C – G



Source: Own study based on: *Gender Statistics*; HFA-DB; *Skriveene*… (2009).

According to the first hypothesis, the largest gender gap should occur in the countries of the former USSR, which were part of that country already before World War II (Russia, Ukraine, Belarus). Slightly smaller ones should occur in the countries that became part of the USSR after World War II (the Baltic Assembly plus Moldova) and Albania.[5] The third group includes the remaining countries. Furthermore, in the countries included in the first group, these differences should initially grow.

Looking at Figure 1, we see that starting with the biggest differences – the first two places are taken by Russia (12.0 years) and Belarus (11.1), and Ukraine (10.7) is in the fifth place. Of the countries included in the second group, Lithuania (11.1) ranks third, followed by Latvia (10.9), and Estonia (10.6) in the sixth place. Moldova (7.9) occupies the ninth place, and Albania (5.3) is only in the eighteenth place. In the remaining countries of the far abroad differences were average (the largest being in Poland (8.5) and Hungary (8.1)). It can, therefore, be concluded that the hypothesis has largely been confirmed, since the largest differences occurred in the countries of the former USSR (except for Moldova, where they were average). Anyway, the gender gap in life expectancy at birth in the countries of the former USSR was still large at the time when they constituted one state (Cockerham, 1997). By contrast, the gender gap in Albania does not fit this hypothesis. Obviously, to what extent this is related to the severity of the 'homo sovieticus' in these societies requires additional in-depth research. Also, if we look at the severity of selected anti-health behaviours among men in comparison to women, we can see (Table 1) that it correlates with the size of the gender gap in life expectancy at birth in years. On the other hand, when looking at the trends in changes in the gender gap in the analysed countries (Figures 5–8), we can see that they initially increased in Belarus, Russia, Ukraine, and are still growing in Moldova. This can be explained by the initially high intensity of the population's attitudes defined as 'homo post-sovieticus'. However, separate studies are required to confirm this.

According to the second hypothesis, the smallest gender gap should occur in countries that used to be part of the Ottoman Empire. At its maximum area (in the 17th century), the Ottoman Empire in Europe covered the areas of today's Bulgaria, Romania, former Yugoslavia (without Slovenia), Albania, Moldova, southern Ukraine. Bulgaria, Albania, Kosovo, and North Macedonia remained the longest under Turkish rule (Faroqui, 2009; Kia, 2008). However, the largest percentage of Muslims is currently present in 6 countries shown in Table 2. In other countries, the percentage of Muslims was below 10%.

[5] Albania was included in this group, given the high level of repression against citizens during the communist regime under Enver Hoxha (1946–1985) (see O'Donnell, 1999; Pipa, 1990).

Table 1. Male-female gap in SDR selected smoking-related (A) or selected alcohol-related (B) causes per 100,000 of a given sex, average from 2000–2004

	A	B
Albania	160.2	60.1
Belarus (1997–2001)	545.3	241.8
Bosnia and Herzegovina	no data	no data
Bulgaria	228.5	86.1
Croatia	259.6	112.4
Czechia	237.1	86.5
Estonia	377.0	213.4
Hungary	333.6	163.9
Kosovo	no data	no data
Latvia	409.0	214.7
Lithuania	364.6	236.2
Moldova	372.0	161.6
Montenegro	119.2	50.3
North Macedonia	177.9	60.6
Poland	252.8	111.0
Romania	252.1	124.8
Russia	no data	no data
Serbia	183.0	82.9
Slovakia	290.5	120.2
Slovenia	215.5	121.5
Ukraine	481.3	242.3

Own study based on HFA-DB.

Table 2. Percentage of Muslims in selected countries

Country	Year	Percentage
Kosovo	2011	96.1%
Albania	2011	70.2%
Bosnia and Herzegovina	2013	51.3%
North Macedonia	2010	36.6%
Montenegro	2011	20.2%
Bulgaria	2011	10.8%

Source: Kettani (2020); *Republic of North…* (2020).

Again looking at Figure 1, we see that among those listed in Table 2, the smallest gender gap was recorded in Kosovo (4.3 years) and North Macedonia (4.4). Later we have Serbia (5.2), which, however, also partly fits this hypothesis because it used

to be part of the Ottoman Empire, and the percentage of Muslims in 2011 was 3.3% (Kettani, 2020). Then we have three countries with a high percentage of Muslims: Albania (5.3) and Montenegro (5.4), Bosnia and Herzegovina (5.6). They are followed by Czechia and Slovenia, followed by the last country from the table – Bulgaria (7.1). Therefore, it can be concluded that the second hypothesis has largely been confirmed.

Table 3. Correlation between GDP per capita, PPP (current international $) and the gender gap in life expectancy at birth in different years

Country	Years	PCC
Hungary	1995–2018	–0.96
Albania	1990–2018	–0.95
Slovenia	1990–2018	–0.92
Slovakia	1992–2018	–0.92
Estonia	1993–2018	–0.92
Czechia	1990–2018	–0.86
Croatia	1995–2018	–0.85
Bosnia and Herzegovina	1994–2018	–0.76
Latvia	1995–2018	–0.76
Poland	1990–2018	–0.72
Montenegro	2000–2018	–0.71
North Macedonia	1990–2018	–0.59
Lithuania	1995–2018	–0.55
Russia	1990–2018	–0.54
Ukraine	1990–2018	–0.49
Belarus	1990–2018	–0.19
Bulgaria	1990–2018	–0.10
Kosovo	2000–2018	0.10
Romania	1990–2018	0.12
Serbia	1995–2018	0.24
Moldova	1995–2018	0.88

Source: Own study based on: *World Development Indicators*; *Gender Statistics*; HFA-DB; *Skraćene…* (2009).

According to the third hypothesis, successful systemic reforms should translate into a shrinking gender gap. Because the evaluation of reforms always has a political background, it was decided to use GDP per capita, PPP (current international $) for analysis.[6] To check the relationship between changes in wealth and changes

[6] Although living conditions are better reflected by the Human Development Index (HDI) and because life expectancy is its component, it was acknowledged that it should not be used to explain changes in the gender gap in life expectancy at birth.

in the gender gap, PCC between them was calculated[7] (Table 3). Although in all the analysed countries, there was an increase in wealth, the differences between them in this respect are significant. For example, in 2018, extreme values were noted by Czechia (40,400) and Kosovo (11,200). The data presented in the table show that increasing the level of wealth in half of the countries clearly correlates (PCC<0.70) with decreasing the gender gap. In another 4 it is poorly correlated (PCC takes values between 0.49 and 0.59). In the case of Moldova, there is a reverse process. In other countries, the changes are weakly correlated. Therefore, it can be concluded that the third hypothesis was confirmed in over 70% of the cases.

Conclusion

As a result of the conducted analysis, it was found that the gender gap in life expectancy at birth in European post-communist countries in the period of 1990–2018 is still large. It is larger than in highly developed European countries, where this gap is even getting smaller (Ginter & Simko, 2013; Sundberg, Agahi, Fritzell, & Fors, 2018).

Looking at the spatial distribution of these differences, they were found to be larger in the countries of the former USSR, and smaller in countries that used to be part of the Ottoman Empire. In the remaining countries, they were average or small. This spatial distribution of the gender gap is a result of two factors. Firstly, particularly strong anti-health behaviours among men in the countries of the former USSR (especially alcoholism and nicotinism). In this regard, the obtained results converge with other studies (cf. Janssen, 2020; Trias-Llimós & Janssen, 2018; Trias-Llimós, Kunst, Jasilionis, & Janssen, 2018). Secondly, the role of man and woman in the Islamic culture. In is still necessary to conduct thorough research on the mechanisms causing the gender gap to be smaller in post-communist countries with a large percentage of Muslim population. Based on the literature, the widespread distribution of anti-health behaviours among men can also be associated with the particularly strong archetype of the 'homo-sovieticus' (Levchuk, 2009), and more precisely, 'homo post-sovieticus' (Ganev, 2017). However, confirming this hypothesis requires further thorough research.

Looking at changes in the gender gap in the period of 1990–2018, three groups of countries have been distinguished. In about half of them (the countries far abroad situated in the west and north plus Estonia and Latvia) there was a clear downward

[7] Due to incomplete data on GDP per capita, PPP (current international $), the obtained results are only partially comparable between individual countries.

trend in the analysed differences. An initially slightly upward trend, which then turned into a downward trend, was recorded in most of the analysed countries of the former USSR (Belarus, Russia, Ukraine, Moldova) plus North Macedonia. Ambiguous changes occurred in other countries located in the central and eastern parts of the Balkan Area. Brainerd (1998) points to clear correlations between market reforms and mortality in post-communist countries. This is only a step away from trying to link the gender gap in life expectancy with the economic effects of the processes of system transformation.[8] Firstly, in over 70% of the surveyed countries, there is a clear negative PCC between GDP per capita, PPP (current international $) and the gender gap in life expectancy at birth in years (see Table 3). Secondly, it is clear that in a large part of the countries at the beginning of the analysed period there was an increase in the gender gap, which only later turned into a downward trend. This can be associated with a temporary deterioration in the economic situation of the population at the beginning of the transformation process, which is referred to as 'transformational recession' (Kornai, 1993), or 'transitional recession' (Kolodko, 2000).

The hypotheses presented in the article and the applied methods of analysis do not exhaust all possible research topics in the field of gender gap in life expectancy at birth in European post-communist countries. It may be helpful here to refer to the gender-differentiated response to psychosocial stress, including stress caused by the processes of systemic transformation (Barrett & Buckley, 2009; Kühn, Dudel, Vogt, & Oksuzyan, 2017). The (physiologically founded) model of health deficit accumulation proposed by Schünemann, Strulik & Trimborn (2017) can also be used. Among the methods, e.g. the Lee-Carter model may be useful (Seligman, Greenberg, & Tuljapurkar, 2016).

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