

Comparative statistics of educational attainment in Bulgaria, Czech Republic, Hungary, Romania, and Poland (1990-2020)¹

Drd. Gabriela BILIGA-NISIPEANU,
Universitatea din București, Școala Doctorală de Istorie

Abstract: *This paper examines the evolution of higher/tertiary educational attainment in 5 countries from Central and Eastern Europe, namely Bulgaria, the Czech Republic, Hungary, Poland, and Romania, during their post-communist transition. Using statistical data provided by the Barro Lee Dataset, we performed a comparative analysis of this indicator on a 30-year time series and both on the general population between 25-64 and on subcategories determined by the gender and age group variables. The data shows an overall improvement in human capital, which comes with positive socio-economic consequences; however, there was no homogeneous evolution, and each country developed at its own pace. Significant disparities persist compared to the European average, and several countries included in the comparison lag behind European targets.*

Keywords: human capital, tertiary educational attainment, Central and Eastern Europe, post-communist evolutions, European targets.

The World Bank defines human capital as “*the knowledge, skills, and health that people accumulate over their lives*”² and highlights its role in “*driving sustainable growth and poverty reduction*”³. In fact, the importance of human capital for economic growth is a well-established connection. Becker argued more than 50 years ago that “*the earnings of more educated people are almost always well above average [although the gains are generally larger in less-developed countries]*”⁴. He then says that “*education and training are the most important investments in human capital*”⁵. Lutz (2013) operationalizes the connection between human capital and education by referring to human capital as “*the stock of educated adult people, which is the result of past education flows for younger adults in the more recent past and for older ones quite some decades ago*”⁶. One way of measuring this stock is by quantifying formal education either through educational attainment or by mean years of schooling.

Most of the existing literature either focuses on the global picture by looking at developments in the educational stock or takes some singular case studies.

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² World Bank, *The Human Capital Index 2020 Update : Human Capital in the Time of COVID-19*, World Bank, Washington DC, 2020, accessible at https://openknowledge.worldbank.org/handle/10986/34432?cid=GGH_e_hcpexternal_en_ext, accesed on 03.10.2022.

³ *Ibidem*.

⁴ Gary S. Becker, *Human capital: A theoretical and empirical analysis, with special reference to education*. University of Chicago press, 2009, p.17.

⁵ *Ibidem*.

⁶ Wolfgang Lutz, and Samir Kumar KC, “Demography and human development: Education and population projections”, in *UNDP-HDRO Occasional Papers*, 2013/04, 2013, p.2.

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Barro and Lee concentrate their analysis on the relationships between human capital and economic growth, education and fertility, and education and political development (Barro & Lee, 1993, 2013, 2015). Sachs and Warner use educational attainment and its established connection to human capital in predicting cross-country growth (Sachs & Warner, 1995, 1997a, 1997b). Cohen and Leker discussed the significant impact of education on life expectancies (Cohen & Leker, 2014), showing that “*older people, who on average have a lower educational level, have higher mortality rates*”⁷. Lim et al. (2018) ranked countries based on human capital formation. They indicated that “*countries that have improved the production of human capital tend to have been more successful in fostering economic growth*”⁸. Benhabib and Spiegel (1994) looked at how human capital influences economic growth, and one of the elements they found relevant for this relation was that “*countries with higher education tend to close the technology gap faster than others*”⁹. Lutz and Samir (2011) argue that “*almost universally, women with higher levels of education have fewer children. Better education is associated with lower mortality, better health, and different migration patterns*”¹⁰. Previously, Lutz has also shown that “*better education does not only lead to higher individual income but also is a necessary (although not always sufficient) precondition for long-term economic growth*”¹¹, all while also indicating that the level of education also matters “*for more industrialized countries, tertiary education of younger adults also is an important determinant of economic growth*”¹². At the same time, regarding the differences between the levels of education, Ziesemer has determined that “*more tertiary education leads to more equality*”¹³.

Given the positive connection between human capital and education, we are interested to see how higher/tertiary educational attainment (TEA) evolved in five former communist countries from Central and Eastern Europe, namely Bulgaria, the Czech Republic, Hungary, Romania, and Poland. For this, we are looking for answers to three questions: 1) how did the levels of TEA evolved in the general population (25-64) in the last three decades, 2) how are the levels of

⁷ Daniel Cohen and Laura Leker, “Health and education: Another look with the proper data”, 2014, p. 72.

⁸ Stephen S. Lim, Rachel L. Updike, Alexander S. Kaldjian, Ryan M. Barber, Krycia Cowling, Hunter York, Joseph Friedman et al. “Measuring human capital: a systematic analysis of 195 countries and territories, 1990–2016” in *The Lancet*, Vol. 392, no. 10154, 2018, pp. 1217-1234, p.1230.

⁹ Jess Benhabib and Mark M. Spiegel, “The role of human capital in economic development evidence from aggregate cross-country data” in *Journal of Monetary economics*, vol. 34, no. 2, 1994, pp. 143-173, p.160.

¹⁰ Wolfgang Lutz, and Samir Kc, “Global human capital: Integrating education and population”, in *Science*, Vol. 333, no. 6042, 2011, pp. 587-592, p. 587.

¹¹ Wolfgang Lutz, Jesus Crespo Cuaresma, and Warren Sanderson, “The demography of educational attainment and economic growth”, *Science*, vol.319, no. 5866, 2008, pp. 1047-1048.

¹² *Ibidem*.

¹³ Thomas Ziesemer, “Gini coefficients of education for 146 countries, 1950-2010” in *Bulletin of Applied Economics*, Vol.3, no. 2, 2016, pp.1-8, p.7.

TEA impacted by the gender and age groups variables 3) how do these values relate to the European averages and targets. We are focusing on higher/tertiary education because, in the process of formation and accumulation of human capital, higher education represents the highest possible form of formal education and, therefore, the one that has the potential to bring the highest economic returns.

The higher education systems in Bulgaria, the Czech Republic, Hungary, Poland, and Romania have increased quantitatively after the Second World War aligning with the trends in the rest of the world. Still, towards the end of the communist regimes, the values flattened out or even contracted in some countries. In the graphical representations accompanying the analysis in this article, we have included the year 1985 precisely to help readers understand the late-stage dynamics of the educational policies carried out by the communist regimes. Immediately after the fall of communism in these countries, there was a quantitative expansion of their higher education systems. The liberalization of access restricted during the communist period mainly supported this quantitative growth.¹⁴ At the same time, these countries have undergone significant socio-economic and political changes. Their transition processes culminated in their accession to the European Union, which validates the success of the reforms undertaken by these countries. Clearly, these reforms could not have been sustained without human capital, and therefore, an analysis such as ours in a broader context can explain the different speeds of progress achieved and why certain gaps persist. Leeuwen & Foldvari have researched the problems of human capital and human capital accumulation in Central and Eastern Europe (2008, 2013). Some differences are relevant between their analysis and our approach. Firstly, their analysis is not limited just to higher education. Secondly, they assess the stocks available in a different time frame and, depending on the articles, with different combinations of countries from the area. Thirdly, their comparison unit was different. While we set our analysis within the framework of the European Union, they referred to the United States or Russia. In the context of our analysis, their studies help to describe the human capital base from which these countries started. In the conclusions of one of their studies, they indicated that in the 1990s, “*Eastern Europe had about 70 – 80% of the USA’s human capital in per capita terms*”¹⁵.

Considering our research questions and the general context in these countries, we propose a comparative analysis of three variables:

- an analysis of TEA levels in the general population 25-64 (this category overlaps with the working-age population, thus having more socio-economic implications in our context). We will frame the performance of these countries in the European context;

¹⁴ For more information on the post-communist evolutions in higher education in these countries, please consult: Dobbins, M. (2011). *Higher education policies in Central and Eastern Europe: Convergence towards a common model?*. Springer.

¹⁵ Bas Van Leeuwen and Péter Földvári, “How much human capital does Eastern Europe have? Measurement methods and results”, in *Post-Communist Economies*, Vol. 20, no. 2, pp. 189-201, 2008, p.199.

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- an analysis of TEA levels on genders (male-female) while also tracking the balance between the two over time;
- an analysis of TEA levels on age subgroups (25-34; 35-44; 45-54; 55-64), including gender-specific developments.

We based our analysis on statistical data provided by the *Barro-Lee Estimates of Educational Attainment from 1950 to 2015*. We also considered other datasets¹⁶ but we settled upon the Barro-Lee data set, mainly given their continuous efforts to update the information. In this dataset, the two authors reconstructed, in 5-year intervals, a complete data set of historical enrollment ratios subdivided by education level, gender, and age groups and provided information on average years of schooling and educational levels. The version we worked with was last updated in September 2021, but the data was available only up to 2015. However, using the sources indicated by the authors, in this case, EUROSTAT (EDAT_LFSE_03), we identified the relevant information for 2020. This dataset allows us to compare attainment levels across countries, genders, age groups, and time. By addressing a 30-year period that overlaps with the post-communist transition and EU integration, we will be able to observe inter-cohort variations and identify trends that might serve as predictions for future developments.

Since most of the literature accompanying the datasets on educational attainment mentioned above presents data globally and then grouped by regions¹⁷, our analysis presents the opportunity to identify differences and similarities between these countries and to discuss the most visible trends in the proposed variables and how these align with the European framework. However, this is a quantitative analysis, so there will be little explanation as to why we had these levels of educational attainment. In a separate study, we will address the qualitative aspects of higher education in these countries.

Conventionally, educational attainment is expressed as “a *percentage of all persons in a given age group for which a specific level of education is the highest level they have completed*”¹⁸. In order to operationalize the levels of education, the International Standard for Classification for Education (ISCED) ladder¹⁹ is used. Because there may be confusion between educational attainment and completion rate, we should mention that according to Barro and Lee (2015), the higher level includes

¹⁶ See, for example, Cohen& Soto, 2007-last updated by Cohen& Leker in 2014; de la Fuente& Doménech- last updated in 2010; IIASA and VID dataset 2018

¹⁷ The countries in our proposed analysis are included in the Eastern Europe and Central Asia region. This region is not significant for subsequent historical developments or for their membership in the European Union.

¹⁸ OECD, “Educational attainment”, in *OECD Factbook 2015-2016: Economic, Environmental and Social Statistics*, OECD Publishing, Paris, 2016.

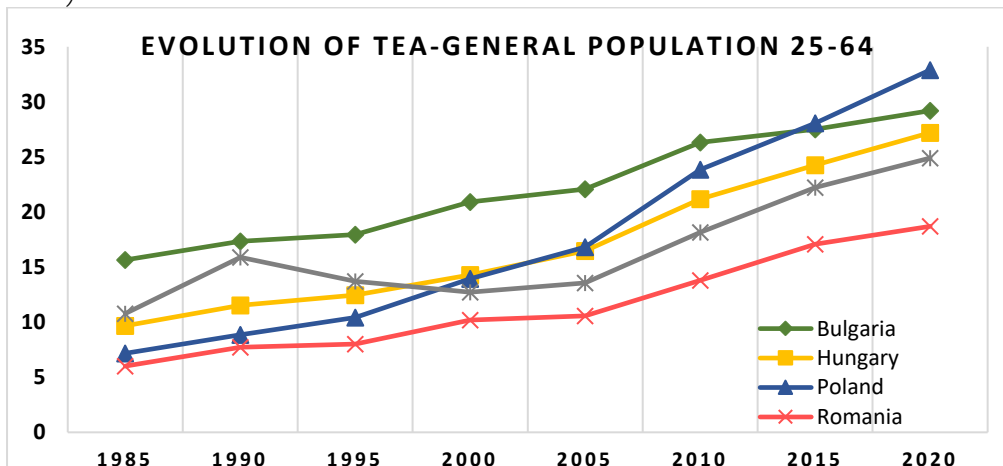
¹⁹ For the operationalization of the ISCED ladder, please access: [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=International_Standard_Classification_of_Education_\(ISCED\)#Implementation_of_ISCED_2011_28levels_of_education.29](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=International_Standard_Classification_of_Education_(ISCED)#Implementation_of_ISCED_2011_28levels_of_education.29).

“those who undertook post-secondary, tertiary-level education (ISCED categories “5,” “6,” and “7”), whether or not they completed the full course”.²⁰

1. Tertiary educational attainment in the general population between 25-64

The analysis of tertiary educational attainment in the general population (25-64) has indicated that since the fall of communism, all five states have increased their stocks, but at different speeds and with different degrees of success. Overall, the average value of higher educational attainment has more than doubled in the past 30 years. Nevertheless, there are pronounced variations among the states and a significant discrepancy between the first and the last state in the hierarchy. The distance between the highest and lowest-ranked states remained similar throughout the reference period. In 1990 the ratio between the highest and the lowest positioned state was 2.25, while in 2020, this gap slightly decreased to 1.76. Romania maintained this last position throughout the entire reference period, while the first position was first held by Bulgaria and then by Poland.

Fig.1: The evolution of TEA as a % in the general population 25-64 (1985-2020)



Source: plotted by the author using data from the *Barro-Lee Estimates of Educational Attainment from 1950 to 2015, 2021*.

The development trajectories of these countries were heavily influenced by the country’s initial conditions and performance. Although it had the second slowest growth rate after the Czech Republic, Bulgaria was the group’s leader until 2015, when Poland surpassed it. Bulgaria started with the most favorable values and then had a positive trajectory however, the growth was below the group average. For Poland to reach the top position, it had to increase its educational attainment by almost four times. On this matter, Romania had the second highest growth, approximately 2,5 times. Both countries started with the

²⁰ Robert J. Barro and Jong Wha Lee, *Education matters: Global schooling gains from the 19th to the 21st century*. Oxford University Press, 2015, p.38.

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lowest values of the group, but only Poland managed to catch up, while Romania remained behind the group. This pattern indicates that those countries that started from the lowest values had higher growth potential, but the deficit to recover was also more prominent, and even notable results were sometimes not enough. A similar observation was made by Lim et al. (2018) when after ranking 195 countries by human capital formation between 1990 and 2016, indicated that “*progress has been slow in selected countries that started at a high baseline [...] but perhaps most importantly, progress has also been slow in countries with historically low human capital*”.

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Table 1: The increase in the size of the population with TEA in 2020 compared with 1990

Country	The increase in size
Poland	3.71
Romania	2.42
Hungary	2.36
Group Average	2.17
Bulgaria	1.68
Czech Republic	1.57

Source: computed by the author using the *Barro-Lee Estimates of Educational Attainment from 1950 to 2015*, 2021.

On closer examination of specific national cases, the particularities of each country case are evident. With 17.35% TEA, Bulgaria had the best performance compared to the other communist countries in Central and Eastern Europe around the same time, indicating that access to higher education was less restricted. With this value, it even outperformed some of the members of the European Community (see, for example, the cases of Spain or Portugal). Because of that, we do not see a spectacular increase as it happened in other former communist countries in the area. There was simply no deficit to be recovered.

Of the five countries, the Czech Republic experienced difficulties maintaining a positive trend. If we talk about absolute growth, it was the least performant by increasing the percentage of higher educated people in the general population with only 9.23 points in 2020 compared with 1990. It was the only country to have seen a sharp decline in higher education attainment throughout the 1990s and early 2000s, which was later recovered (2010-2020). To some degree, this decline was caused by the dropout in male attainment. Nevertheless, there is also another possible explanation. Until January 1993, the Czech Republic and Slovakia formed Czechoslovakia. Although Barro & Lee present separate data for Slovakia and recreate student flows, including for the period before separation, several side effects could have impacted the final figures. One

²¹ Stephen S. Lim, Rachel L. Updike, Alexander S. Kaldjian, Ryan M. Barber, Krycia Cowling, Hunter York, Joseph Friedman et al. “Measuring human capital: a systematic analysis of 195 countries and territories, 1990–2016” in *The Lancet*, Vol. 392, no. 10154, 2018, pp. 1217-1234.

hypothesis could be the collapse of the internal mobility of students within Czechoslovakia, from Slovak territories to universities in the Czech parts. By separating into two different statal entities, this mobility became external and, thus, a more bureaucratically challenging process. This explanation appears to hold up when we go back to the figures for Slovakia, where we have an overall growth for the entire period.

Among the five countries, Poland registered the most dramatic increase in higher educational attainment levels, registering in 2020 a difference of 24.04 points compared to 1990. The growth has been steady, and given the current performance, which places Poland above the European average, we could say that any reforms and strategies intending to increase TEA in the general population have been successful. Currently, Poland is the only country in the group with a value of TEA of more than 30%.

As mentioned, Romania has more than doubled the percentage of higher educated people in the general population. Still, this was not enough to recover the difference from the other countries in the group and to align with European trends. As mentioned, Romania maintained the last position of the hierarchy of our analysis unit constantly over the previous 30 years.

Hungary had the most linear growth among the five countries, always close to the group average. In the end, the size of TEA in the population between 25-64 more than doubled in the reference period.

Table 2: The difference between the last and the first year included in the analysis

Country	1990	2020	Difference
Bulgaria	17.35	29.2	11.85
Czech Republic	15.9	24.9	9
Hungary	11.52	27.2	15.68
Poland	8.86	32.9	24.04
Romania	7.72	18.7	10.98
Average	12.27	26.58	14.31

Source: computed by the author using the *Barro-Lee Estimates of Educational Attainment from 1950 to 2015, 2021*.

The chart above also indicates that developments were slower in the first ten years of the post-communist transition. A partial explanation for this evolution relies on how the results on this indicator are visible. At the beginning of the 1990s, we can still see the results of the enrolment policies implemented towards the end of the 1980s, when, as indicated above, the education systems in most of these communist countries contracted to the maximum. The most significant progress in educational attainment took place in these countries between 2000-2010, overlapping with the period when these countries negotiated and became members of the European Union and with the beginning of the implementation of the Bologna process. In terms of growth rate between two consecutive

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periods, all countries reached the highest point in 2010, after which, although the trends remained positive, the expansion was less pronounced or, in some cases, indicated stagnation. This issue reflects a possible contraction of the higher education systems, as it was, for example, in the case of Romania.

Table 3: The growth rate between two consecutive periods (1990-2020)

Country/ Year	1990 *	1995	2000	2005	2010	2015	2020
Bulgaria	10.86	3.52	16.5 4	5.49	19.2 0	4.56	6.10
Hungary	19.13	8.25	14.5 1	15.4 1	28.5 2	14.5 4	12.1 2
Poland	23.57	17.83	33.4 3	20.7 5	41.7 4	17.7 4	17.2 1
Romania	28.45	3.76	27.3 4	3.53	30.5 9	23.8 6	9.48
Czech Republic	47.50	13.84	-	6.61	34.1 0	22.2 3	12.1 1
Average of the group	25.90	3.90	16.9 2	10.3 6	30.8 3	16.5 9	11.4 1

* Was computed using 1985 data as a reference point

Source: computed by the author using the *Barro-Lee Estimates of Educational Attainment from 1950 to 2015, 2021*.

All things considered, if we compare the results of these countries with the European average, except for Poland, which outperforms all the other states, the results are below the average of the member states²², as illustrated in the table below.

Table 4: Values recorded by the states on TEA and on the European average

Country/EU	2005	2010	2015	2020
EU 27 Average	21.6	23.8	26.8	30.3
Poland	16.82	23.84	28.07	32.9
Bulgaria	22.08	26.32	27.52	29.2
Hungary	16.48	21.18	24.26	27.2
Czech Republic	13.55	18.17	22.21	24.9

²² The Czech Republic, Hungary and Poland became members of the European Union in 2004 and Romania and Bulgaria joined in 2007.

Romania	10.56	13.79	17.08	18.7
Average of the group	15.90	20.66	23.83	26.58

Source: computed by the author using the *Barro-Lee Estimates of Educational Attainment from 1950 to 2015, 2021*, and the Eurostat Database (EDAT_LFSE_03).

This comparison is especially relevant because increasing higher educational attainment is one of the targets agreed upon at the European level in the framework of the Higher Education Area. Each member state has committed to a growth target that may vary from the EU general target depending on national circumstances. For 2020, the target was to raise the tertiary educational attainment rate to at least 40% of the population aged 30-34 for the entire European Union, and as of 2019, the goal was reached. However, the situation for the states included in our comparison is more complex since some of them benefited from preferential targets, as illustrated in the table below.

Table 5: Tertiary level attainment (age 30-34²³)

Indicator	2010	Target by 2020	Value in 2020	Target by 2030*
European Union	32.6	40.5	41.1	45 *at least
Bulgaria	28	36	33.3	
Hungary	26.1	34	33.2	
Poland	34.8	45	47	
Romania	18.3	26.7	24.9	
Czech Republic	20.4	32	35	

Source: European Commission, *Education and Training Monitor 2021*²⁴

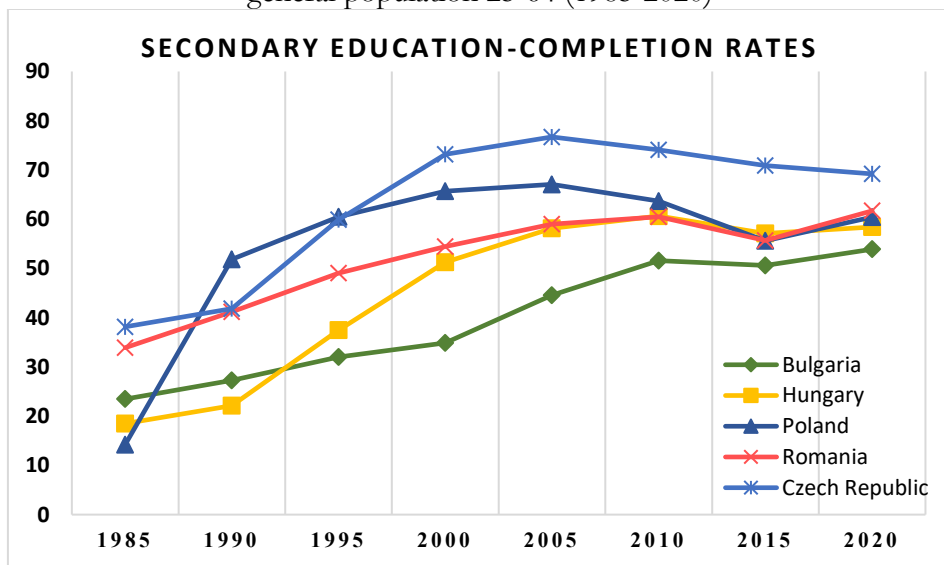
Poland is not only the group's best performer but also exceeds the European targets. As of 2020, the share of 30–34-year-olds with tertiary educational attainment in Poland was 47%, well above the 2030 target of 45%. On the other side, three countries missed their targets in 2020: Romania, Bulgaria, and Hungary. Of the three, Hungary was very close to reaching its target with a difference of -0.8 points. It is also worth mentioning that some of these countries have benefited from exemptions and their targets, which were lower than the values assumed for the whole Union (except for Poland, which assumed a target above the EU target). However, this will not be the case for 2030, when it was set as a target for all member states to reach at least 45% tertiary educational

²³ There is a discrepancy on how the European Union measures this indicator. Until 2020 it referred to the age group 30-34 and from 2021 it was extended to 25-34.

²⁴European Commission, *Education and Training Monitor 2021*, accessible at: <https://op.europa.eu/webpub/eac/education-and-training-monitor-2021/en/chapters/chapter2.html#ch2-5>, accessed on 18.10.2022.

attainment for their entire population. Given the current growth trends, these countries are unlikely to reach this new target. Several demographic factors, including lower birth rates, emigration, and an increasing percentage of students studying abroad cumulated with difficulty attracting students outside the traditional age group, also support this assumption. A look at graduating cohorts of post-secondary education indicates a decline in the cohorts available for enrolment in tertiary university studies, as the number of people that completed secondary education falls behind.

Fig.2: The evolution of secondary education completion rate as a % in the general population 25-64 (1985-2020)



Source: plotted by the author using data from the *Barro-Lee Estimates of Educational Attainment from 1950 to 2015, 2021*.

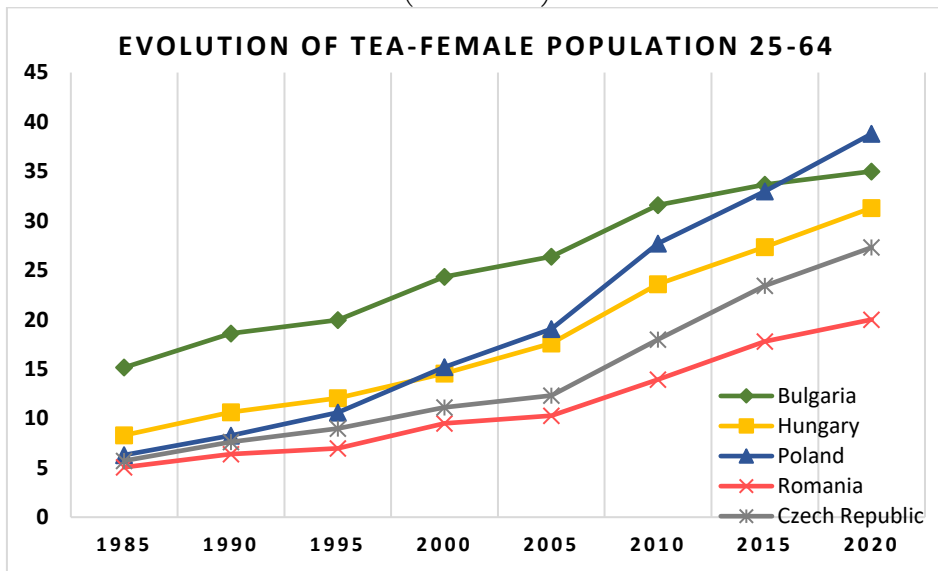
This chart indicates that secondary educational attainment has also fluctuated in the last 30 years. However, the trend was downward for most of the countries. Given the requirement of secondary education to gain access to higher education, such results should be a cause for concern, especially in the context of specific targets for growth agreed upon in the European context.

2. Tertiary educational attainment by sex

Higher educational attainment increased on both genders however, the growth was unbalanced. At the starting point in 1990, the male TEA was higher than the female TEA except for Bulgaria, where female TEA had already surpassed male TEA by 2.55 points. What followed was a sustained growth in female attainment that was consistent across all countries and culminated with an inversion point after which the percentage of tertiary-educated females was

higher than that of tertiary-educated males. In Hungary and Poland, that moment happened in the 1990s, while in Romania it happened after 2005, and in the Czech Republic around 2010. In the Czech Republic, female enrollments supported the general growth in TEA and attenuated the impact of the male TEA decline. Overall, the value of female TEA increased by almost three times. The highest growth was recorded by Poland (around 4.5 times), but there were also significant increases in the Czech Republic (3.5 times), Romania (3.1 times), and Hungary (2.9 times). Values increased least in Bulgaria (1.9 times), but as shown here, the female TEA values were already higher.

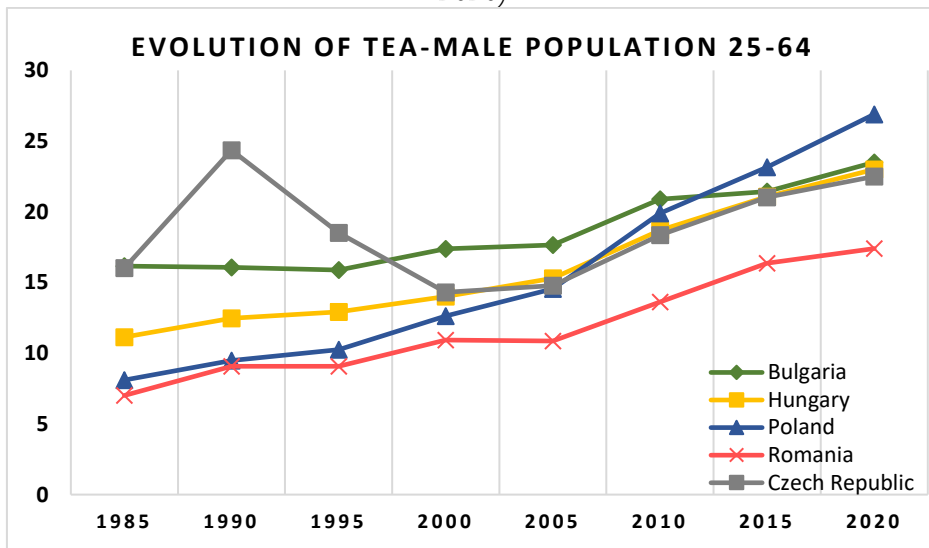
Fig. 3: The evolution of female TEA as a % female population 25-64 (1985-2020)



Source: plotted by the author using data from the *Barro-Lee Estimates of Educational Attainment from 1950 to 2015, 2021*.

The progress on male TEA was slower, especially during the 1990s and early 2000s; if we look at the graphic representation, it looks more like stagnation. The Czech Republic had in the 1990 the highest male TEA of the group, but then it decreased in the next decade. As of 2020, it was still unable to reach the values it had in the 1990s. Poland was the most successful in this subcategory, almost tripling the number of male TEA in the referenced population, from 9.48% in 1990 to 26.9% in 2020. Again, although Romania has doubled its percentage of male TEA, it continued to be the lowest ranked country in the comparison throughout the entire period and is the only country with values still below 20%, even if the other countries surpassed that milestone more than a decade ago. Overall, the value of male TEA increased by 1.6 times but at a growth rate of about half of the female TEA growth rate.

Fig. 4: The evolution of male TEA as a % male population 25-64 (1985-2020)



Source: plotted by the author using data from the *Barro-Lee Estimates of Educational Attainment from 1950 to 2015, 2021*.

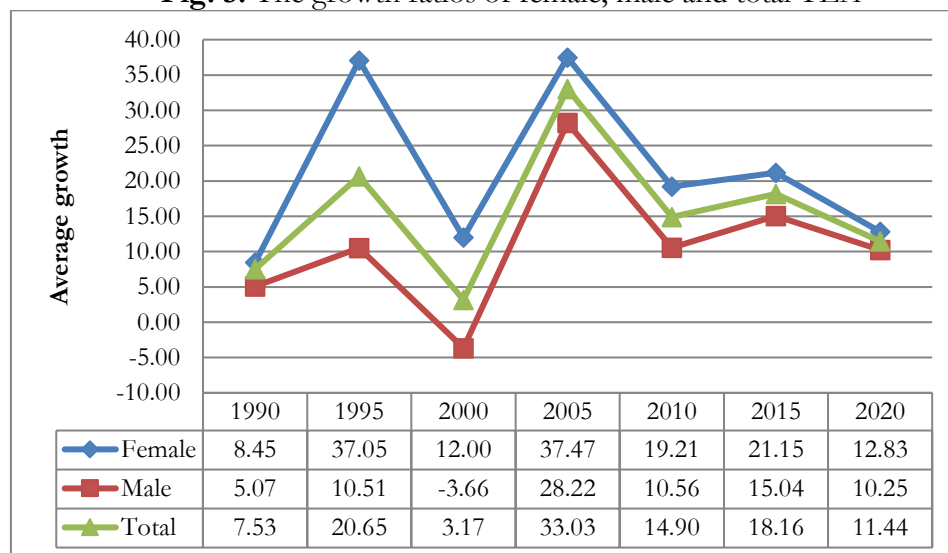
Even if the five countries indicate different developing patterns, in all cases, there is an increasing gender gap. In 2020, the last year analyzed, Romania showed the lowest discrepancy between women and men, just 2.5 points, but at this moment, there is a tendency to widen the gap in favor of females. One explanation for this situation is that compared with the other countries, in Romania, the inversion between genders took place later than in the other countries (aside from the Czech Republic). In our particular analysis, Poland is the country with the highest discrepancy between the genders, with a difference of 11.1 points. At the European level, the average difference between female educational attainment (46%) and male educational attainment (35.2%) was in 2020 around 10 points²⁵. Other countries in Central and Eastern Europe show more striking imbalances. Lithuania, Estonia, Latvia, and Slovenia had differences of more than 20 points between female and male TEA.

As mentioned, these countries started from an unbalanced situation, but at that point, the scales tipped in favor of male attainment, while we also had more pronounced extreme values. To illustrate this point, let us consider the gender ratios recorded in 1990 versus 2020. In 1990, there were 3.2 men with tertiary educational attainment in the Czech Republic for every female. On the other side,

²⁵ European Commission, *Education and Training Monitor 2021*, accessible at: <https://op.europa.eu/webpub/eac/education-and-training-monitor-2021/en/chapters/chapter2.html#ch2-5>, accessed on 18.10.2022.

in 2020, there were 1.49, respectively 1.44 females with TEA for every man in Bulgaria and Poland. However, the broader image indicates that in 1990 the gap was closer between the two genders than in 2020, and, as mentioned, the current trend widens the differences.

Fig. 5: The growth ratios of female, male and total TEA



Source: plotted by the author using data computed from the *Barro-Lee Estimates of Educational Attainment from 1950 to 2015, 2021*.

3. Tertiary educational attainment by age groups

The distribution of tertiary educational attainment varies between the age groups, but it seems that, in general, the highest levels are among younger cohorts, namely the age groups 25-34 and 35-44. These two categories had consistently high values throughout the entire period analyzed and for all five countries. Moreover, the percentage of higher educated people decreases as we advance to older age groups and even more if we go back to the first decade of the reference period. The difference in higher educational attainment figures between younger and older cohorts and their variation in time is illustrated in the table provided below:

Table 6: The distribution of TEA on age groups and in time

Country	Age Group	1990	1995	2000	2005	2010	2015
Bulgaria	15-24	3.06	12.59	3.97	15.73	5.91	4.46
	25-34	19.7	17.4	23.18	21.95	31.04	31.8
	35-44	20.9	21.51	22.56	23.91	27.85	29.7
	45-54	16.7	18.73	20.84	23.46	24.3	25.1
	55-64	11.3	13.59	16.39	18.74	21.68	23.4
Czech Rep.	15-24	2.38	6.21	3.48	2.13	4.17	6.25

	25-34	18.3	13.21	12.97	15.34	25.08	31
	35-44	18.1	15.64	14.86	14.61	17.92	22.8
	45-54	15.1	13.87	11.6	12.76	17.12	20
	55-64	10.2	11.19	11.26	11.09	12.14	14.5
Hungary	15-24	2.43	8.11	3.17	16.38	3.98	4.67
	25-34	13.32	12.45	15.01	17.95	28.11	32.1
	35-44	13.5	14.19	15.46	17.66	21.47	26.8
	45-54	10.73	12.71	14.32	15.95	17.92	20.8
	55-64	7.62	9.76	11.86	13.91	16.33	17.5
Poland	15-24	0.52	10.1	3.06	22.78	7.27	6.42
	25-34	8.93	10.66	19.13	22.85	39.22	43.2
	35-44	10.57	10.94	13.05	17.75	24.37	33.3
	45-54	9.11	10.94	11.66	13.17	15.58	19.4
	55-64	5.84	8.66	11.12	12.15	12.8	13.6
Romania	15-24	0.62	6.14	2.22	14.74	4.35	4.49
	25-34	9.1	7.06	11.34	11.67	20.55	25.5
	35-44	9.8	9.99	10.61	11.18	13.39	19.9
	45-54	6.7	9	10.56	10.2	10.79	13.3
	55-64	4.55	5.7	7.46	8.45	8.48	9.3

Source: Barro-Lee *Estimates of Educational Attainment from 1950 to 2015*, 2021.

Our analysis also indicates that gender disparity is visible within age groups. Female TEA has reached its all-time highest levels in the last 30 years, and this is visible as we look at older cohorts where values are lower, especially at the beginning of the time frame. In some countries, the differences in the last two age groups, especially in the 55-64 age group, favor the male subcategory, a representation of the initial distribution between genders that subsequently rolled over. This shift is supported by the fact that female TEA decreases more with age than male TEA; in some cases, the values go back to under 10% (Romania). These changes are a consequence of the changes in composition between cohorts.

As mentioned, the magnitude of changes differed depending on the country and age group, with increases happening slowly in those age groups outside the traditional enrolment age. The slow pace of these changes allows us to consider that in these “older” age groups, the natural process of successive generations replacing one another determined the increments rather than of a high number of people reentering the educational systems. Following an analysis of the Cohen-Soto dataset, Cohen and Leker made the following assumption: *“people may enroll at school until the age of 25. Hence, before a cohort turns 25, its average level of schooling attainment rises as a share of the cohort continues to go to school. But once a cohort has reached*

that age, its average level of schooling attainment will evolve only due to changes in its composition²⁶. This is not to say that people outside the traditional schooling age groups do not enroll back in school. However, the proportion in which this phenomenon occurs is less statistically significant. The statistical data available at the European level on the participation of the adult population in training activities validate this premise. Adult participation (25-64) in learning was another benchmark used to monitor education and training and set the target for member states of “at least 15% of adults should participate in lifelong learning”²⁷. As of 2020, this target was not reached. All the countries included in this comparison fell well behind, both the target and the European average, as highlighted by the data provided in the table below.

Table 7: Participation rate in education and training (last four weeks) of the adult population (25-64)

Country/EU	2005	2010	2015	2020	Target 2020
European Union - 28 countries (2013-2020), 27 countries 2020	9.6	9.3	10.8	9.1	15
Bulgaria	1.3	1.6	2	1.6	
Czech Republic	5.6	7.8	8.5	5.5	
Hungary	3.9	3.0	7.1	5.1	
Poland	4.9	5.2	3.5	3.7	
Romania	1.6	1.4	1.3	1	

Source: Eurostat (TRNG_LFSE_01)

As anticipated, the time series provided above indicates that progress in adult learning was not significant in the last 15 years, and when the countries registered higher values, they could not maintain the growth tendency afterward. Furthermore, if we consider the gender and age-group variables, only the latter seems to impact engagement in adult learning significantly. In this case, the gap between genders is less significant. Female participation is, in most cases, higher, however, the gender ratio²⁸ does not surpass 1.40. Even so, significant disparities persist between age groups. Both at the European level and in the five selected countries, the participation rate in adult learning is fueled by the 25-34 age group. It drops down in the next two age categories and then becomes almost insignificant in the age group 55-64 (it varies between 3.7 for the Czech Republic in 2015 and 0 for Romania and Bulgaria for the entire referenced period).

²⁶ Daniel Cohen and Laura Leker, “Health and education: Another look with the proper data”, 2014, p.7.

²⁷Eurostat, *Education and Training 2020*, accessible at <https://ec.europa.eu/eurostat/web/education-and-training/eu-benchmarks>, accessed on 10.10.2022.

²⁸ Calculated by dividing female attainment to male attainment.

„Comparative statistics of educational attainment in Bulgaria, Czech Republic, Hungary, Romania, and Poland (1990-2020)”, *Astra Salvensis*, X (2022), no. 20, p. 139-156.

4. Comparative Conclusions

Through the analysis performed, we were able to capture the evolution and composition of tertiary education stocks across Bulgaria, the Czech Republic, Hungary, Poland, and Romania while also identifying significant variations in the gender and age group variables. The data available indicate significant improvement in human capital in all these countries by increasing the stock of tertiary educated people in the general population (25-64). Poland was on the *fast track*, while for the others, the path was slower. We have seen in the case of Romania that despite recording the second-highest growth, it was not enough to catch up with other countries in the region. This challenge points to a more difficult path for those countries that started from low values, requiring more effort and resources. To further sustain this argument, we should also consider the other side of the scale, Bulgaria, which had the best results on this indicator at the beginning (a value more than double than in Romania), remained at the top throughout the entire reference period, although its growth in the meantime has been among the lowest.

In all these countries, the values for female TEA caught up and surpassed the values of male TEA. Given the restrictions imposed by the communist regimes, this also indicates that in all these countries, the access of females to higher education has significantly improved. At the same time, these evolutions also led to an increasing gender gap that aligns with the existing European trends. Most likely, this gap will persist and even widen in the future. Since this gender gap persists between the age groups as well, we could see the evolution in time of TEA, and we can notice how this gap fades as we shift to older cohorts. In the cases where the inversion took place later (Romania, Czech Republic), it reverses.

Even if progress was notable across all ages-groups, the younger part of the population, especially within the 25-34 age group, primarily fueled the expansions. Given the low values of adult education in these countries, any improvements in the older cohorts were mainly due to changes in composition between cohorts. Following this assumption, it is safe to assume that the values of tertiary attainment will further improve in the future as the growth tendency maintained constant among the younger cohorts in the last 30 years.

All things considered, aside from Poland, these countries fall behind the European average. We discussed the European targets implemented within the European Higher Education Area framework and have shown that even if the number of higher education graduates has more than doubled in the last decade, the results are lower than the targets officially assumed by Romania, Bulgaria, and Hungary, indicating that improvements are very much still necessary. Moreover, at the current growth rate, closing this gap in the future will be a slow process, especially if we look at the results of secondary education attainment, which is compulsory to enter higher education, and if we account for current demographic trends.

In the end, the analysis we conducted offers preliminary insights into the developments that occurred in these countries. There is no doubt that the improvements and shortcomings we have seen reflected by numbers are the consequence of the educational politics undertaken by these countries during their post-communist transition. More attention will be given to this relation in a future study when we will run a qualitative assessment of the policies and reforms taken in these states.

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