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The growth effects of Bulgaria and Romania's EU accession: A synthetic control method examination

Andrzej Cieślik, Mehmet Burak Turgut

ABSTRACT

Objective: The article aims to evaluate the growth effects of the 2007 Eastern enlargement of the European Union (EU) for the New Member States (NMS).

Research Design & Methods: To study the growth effects of the 2007 Eastern enlargement we apply the synthetic control method (SCM). The synthetic control method (SCM) is a statistical method that contains two groups: the treatment group that included Bulgaria and Romania and the control group that included Armenia, China, Egypt, India, Iran, Israel, Kazakhstan, Kyrgyzstan, Moldova, Morocco, Mexico, Montenegro, Malaysia, Russia, Serbia, Thailand, Tajikistan, and Turkey. These groups served to evaluate the effects of a treatment related to the EU accession.

Findings: We found that the 2007 EU enlargement had substantial uninterrupted positive effects on the economic growth of Bulgaria and Romania. However, these effects have become noticeable only since 2014, seven years after the EU accession. Therefore, we should not expect that the EU accession immediately contribute to increased growth rates of the NMS.

Implications & Recommendations: We demonstrate that the real GDP per capita of Bulgaria and Romania increased on average by 188 and 644 USD per year relative to their synthetic counterparts between 2007-2019, respectively. The actual yearly real GDP per capita growth rate for the same period in Bulgaria and Romania was 1.6% and 4.6% larger than the growth rate of these countries, respectively, if they did not become EU members in 2007. Therefore, our results support the positive growth effects of the EU accession.

Contribution & Value Added: We focused on the effects of the second enlargement of the EU to the East that took place in 2007 and so far has not received substantial attention in the literature. Our results document the significant positive effects of the EU accession on the rates of growth in Bulgaria and Romania. Therefore, this article, at least to our knowledge, is the first article that focuses on estimating the growth effects of the 2007 EU enlargement.

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INTRODUCTION

Scholars have been interested in the effects of European integration since the foundation of the EU and received increased attention after the subsequent waves of its enlargement. The collapse of communism and the successful transition of the Central and East European (CEE) economies were followed by the EU enlargement to the East in three consecutive waves in 2004, 2007, and 2013. The first Eastern enlargement of the EU occurred on May 1, 2004, and ten economies became new members. This enlargement included eight CEE countries and two Mediterranean countries: Cyprus, Czechia, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia. The 2004

enlargement was the largest one-time enlargement in the EU history. The second Eastern enlargement took place in 2007 and included two CEE countries, *i.e.* Bulgaria and Romania. Finally, the third enlargement that occurred in 2013 encompassed only Croatia.

While the first wave of the Eastern enlargement has received quite a large dose of attention in the literature, the subsequent waves received much less attention. The main goal of this article is to evaluate the growth effects of the 2007 Eastern enlargement of the EU for the NMS. The accomplishment of this goal requires comparing the actual growth of the NMS following their EU accession with their counterfactual growth, the growth that would take place if these countries had not become EU members. However, the only observable data is the growth rates of the NMS after they became EU members. Therefore, the counterfactual data is unobservable which hinders the comparison of the actual and counterfactual growth rates. We tackle this issue using the synthetic control method (SCM) that has recently gained popularity in evaluating the economic effects of various policy changes.

The feasibility of the SCM requires similar pre-treatment characteristics across treated and untreated units. In our case, the untreated units (*i.e.* the control group), or the donor pool, should consist of countries that share similar economic and institutional features with Bulgaria and Romania, the NMS, before the 2007 EU enlargement took place. The natural candidates for the donor pool were the countries that emerged as the result of the breakup of the Soviet Union and former Yugoslavia but still were not admitted to the EU. These countries have similar characteristics to the NMS as for many years, their economies operated under central planning and gradually switched to the market economy only after the collapse of communism in the late 1980s and the early 1990s.

We designed a natural experiment by constructing the treatment group that included Romania and Bulgaria, and the donor pool that embraced the countries that did not join the EU but shared similar pre-EU accession characteristics to the treatment group. We then applied the SCM framework to evaluate the impact of the treatment, the EU membership, on the outcome, and the real GDP per capita growth. By using the SCM, we could estimate the dynamic effects of the EU accession having controlled for the time-varying heterogeneity at the country level. These are the main advantages of the SCM over traditional empirical research methods, *i.e.* the panel data analysis (PDA) or the differences-in-differences(Diff-in-Diff) that are limited to measuring only the average effect of the treatment and controlling for the time-invariant individual-level heterogeneity.

Our findings showed that the EU accession added 188 and 644 USD per year to the real GDP per capita of Bulgaria and Romania between 2007 and 2019, respectively. This translates into a yearly 1.6% and 4.6% larger GDP growth rate for Bulgaria and Romania, respectively, as an outcome of the EU accession. Another interesting point is that the positive and uninterrupted growth effect of the 2007 EU accession on the economies of Bulgaria and Romania started following 2014, seven years after becoming EU members. Since the free movement of labour for the workers of these countries in the EU was restricted until 2014, the degree of integration is consequential to economic growth. This finding also implies that a long post-treatment period is necessary to evaluate the growth effects of European integration due to the gradual adjustment of the NMS to the new institutional framework.

This article is organized in the following way. In the next section, we will review the empirical literature on the growth effects of European integration with a special focus on the use of the SCM. The subsequent section will outline the research methodology and discuss the dataset and estimation results. The last section will provide conclusions, discuss the limitations of the employed research methodology, and outline directions for future studies.

LITERATURE REVIEW

There are several approaches in the economic literature to study the effects of European integration on the rate of per capita GDP growth. On the one hand, traditional neoclassical growth theories assuming constant returns to scale, perfect competition and homogeneity of factors and products predict that economic integration stimulates income convergence (see Barro and Sala-i-Martin, 2004). On the other hand, according to new growth and economic geography theories that relaxed the restrictive

assumptions of neoclassical economics (Romer, 1986; Lucas, 1988; Krugman, 1991; Aghion *et al*., 1998; Fujita *et al*., 1999) quite the opposite may happen.

The empirical evidence on the growth effects of economic integration also remains unsettled. In one of the earliest contributions, Landau (1995) reported no effects of the EU accession on growth in the group of OECD economies during the 1950-1990 period. This finding was supported by Vanhoudt (1999) who found no positive effects of European integration on the growth of the member states compared to non-EU members. At about the same time, Henrekson *et al*. (1997) reported statistically significant growth effects of the EU membership based on cross-sectional regressions. Subsequently, in his panel study of OECD economies, Torstensson (1999) detected a positive growth effect of European integration resulting from transfers of capital and 'know-how.'

Badinger (2005) reported no significant long-run growth effects of economic integration but at least he found transitory growth effects. Böwer and Turrini (2010) ran panel regressions from 1960 to 2008 and concluded that the period of EU accession was distinguished by, having controlled for a wide range of economic factors, significantly higher growth rates of GDP per capita. Finally, Cuaresma *et al*. (2013) estimated that the EU accession had a positive effect on economic growth in the long run and inferred that it was more beneficial for poorer countries.

Our article finds itself in the literature that applies the SCM as a useful alternative to the popular PDA and Diff-in-Diff approaches. An important drawback of the previously used research methodologies is to find the right benchmark for comparison. Eichengreen and Boltho (2008) tried to construct a world where integration did not take place and concluded that incomes would be lower in Europe without integration. Hence, they argued that one needs to have a counterfactual to estimate the ex-post effects of economic integration. However, their approach does not specify how to construct the counterfactual world which is the key element in counterfactual experiments. The SCM methodology can convincingly address this issue.

This methodology was first employed by Abadie and Gardeazabal (2003) to study the impact of terrorism in the Basque country. They constructed the synthetic equivalent of the Basque country as the comparison group using the combination of similar Spanish regions and compared the rate of growth in the actual Basque country with the growth rate that would have occurred in the counterfactual country free of terrorism. They found that as a result of terrorism GDP per capita in the real Basque country was 10% lower compared to the counterfactual Basque country.

In another study that applied SCM, Abadie *et al*. (2010) investigated the effects of a tobacco-control program legislated in California in 1988. They created synthetic California by using a weighted average of the US states and estimated the cigarette sales in California that would have occurred in the absence of this legislation. In their subsequent study, Abadie *et al*. (2015) used the fall of the Berlin Wall as a natural experiment to evaluate the effects of the 1990 German unification on the rate of growth in West Germany employing the SCM. The synthetic West Germany was constructed as a weighted average of Austria, Japan, Netherlands, Switzerland, and the United States. They reported the negative effects of the unification on growth in West Germany during the 1992-2003 period. Billmeier and Nannicini (2013) evaluated the impact of economic liberalization episodes in the world on real GDP per capita using the SCM. They found either positive or nonnegative impacts of economic liberalization on the trajectory of real income per capita. In a more recent article, Campos *et al*. (2022) measured the impact of the 1994 referendum in Norway on its productivity and concluded that Norway incurred a significant loss of productivity by not joining the EU. In another application of the SCM, Kantorowicz and Spruk (2021) determined the impact of the level of institutional reforms on the economic growth of the transition countries.

The SCM methodology also serves to investigate the effects of the EU enlargements including the 2004 Eastern enlargement. Campos *et al*. (2019) generally remained inconclusive regarding the effects of European integration on the rate of growth in the CEE countries when the EU accession date was set to 2004. They reported the positive effects only when the EU accession date was set to 1998. However, this left four years of pre-intervention data to construct synthetic control. This seems short in comparison with the prior studies that employed the SCM such as Abadie *et al*. (2003) and Abadie *et al*. (2015). Moreover, their sample ended in 2008 which left only five years of post-treatment data to

evaluate the effects of EU accession. In contrast, Cieślik and Turgut (2021) estimated that the 2004 EU accession had immediate and positive effects on the rates of economic growth of the NMS in the first few years following the EU enlargement. The effects of the EU accession became more visible since 2007 when the NMS joined the Schengen zone.

In contrast to the aforementioned studies, we focused on the effects of the second enlargement of the EU to the East that took place in 2007. The closest to our article in this vein is Hagemejer *et al*. (2021) in which the authors studied the 2007 EU enlargement using the SCM. We extended their analysis in the following ways. Firstly, we excluded Ukraine from the control group since Ukraine was subject to a huge negative idiosyncratic shock in 2014 which can cause downward bias in the predictions of synthetic units. Secondly, we contemplated SCM in a way to prevent one country from dominating the synthetic units. For example, in Table A2 on p.140 in Hagemejer *et al*. (2021), the weight of Belarus is 0.9 in synthetic Romania which makes the synthetic unit highly sensitive to the developments in the Belarusian economy. Thirdly, we provided a placebo test and sensitivity analyses to verify the robustness of our results and a comparison of predictors between treated and synthetic units to ensure the resemblance of the latter to the former.

RESEARCH METHODOLOGY

Methodology

The SCM is an empirical research method that estimates the effect of treatment through the comparison of the real outcome and its counterfactual during the post-treatment period. Assume that $Y_{1,j}^t$ is the actual value and $Y_{0,j}^t$ is the counterfactual value of the outcome variable of the treated unit j, in our case the real GDP per capita of Bulgaria or Romania, and T_0 is the intervention or treatment time, accession to the EU is the treatment and 2007 is the time in our case. Then, the effect of the treatment can be expressed as:

$$\tau_j^t = Y_{1,j}^t - Y_{0,j}^t; \forall\, t \geq T_0 \tag{1}$$

The main challenge here was to obtain the post-2007 real GDP per capita values of Bulgaria or Romania if they did not join the EU in 2007 since these values were not observed. The SCM accomplishes this by creating a synthetic unit, a counterfactual scenario, that is the weighted average of the units from a control group that best resemble the pre-treatment characteristics of the treated unit. Consider that data for $J+1$ countries are observed between $t = 1, \dots, T$, and among them, $j = 1$ is the treated country and $j = 2, \dots, J+1$ are the countries in the control group. Assume that vector W contains the weights of the countries in the control group denoted by w_j. The literature recommends choosing the weights by minimizing the difference between the characteristics of the treated unit and the synthetic control before the treatment takes place (see Abadie and Gardeazabal, 2003; Abadie *et al*., 2010 for further details). Then, the synthetic unit of the treated country j would be equal to:

$$Y_{0,j}^t = \sum_{j=2}^{J+1} w_j Y_{jt} \tag{2}$$

The multiplication of weights by the outcome variable of the countries in the control group produced synthetic Bulgaria or Romania and the difference of the post-treatment real GDP per capita between the actual and the synthetic Bulgaria or Romania gives the effect of the EU membership on growth estimated by the SCM:

$$\tau_j^t = Y_{1,j}^t - Y_{0,j}^t = Y_{1,j}^t - \sum_{j=2}^{J+1} w_j Y_{jt}; \forall\, t \geq T_0 \tag{3}$$

In summary, the SCM estimates the effects of treatment through the comparison of the real outcome and its counterfactual during the post-treatment period. The synthetic control estimator is applicable when the fit between actual and treated units is good, in other words, the units in the donor pool and treatment groups share similar pre-treatment characteristics. Another crucial point in the application of the SCM is that the units in the control group should not be affected by the treatment and subject to huge idiosyncratic shocks during the post-treatment period (Abadie *et al*., 2015).

Data and Sample

The treatment group for the SCM consisted of Bulgaria and Romania following their accession to the EU in 2007. We included the following countries in the donor pool: Armenia, China, Egypt, India, Iran, Israel, Kazakhstan, Kyrgyzstan, Moldova, Morocco, Mexico, Montenegro, Malaysia, Russia, Serbia, Thailand, Tajikistan, and Turkey. We did not include Croatia and Ukraine in the donor pool because Croatia became an EU member in 2013, and Ukraine was subject to a huge negative idiosyncratic shock in 2014 and the following years due to revolutions and civil unrest set out in 2014 and the subsequent war with Russia.

We identified the countries in the donor pool based on two features: i) they did not become EU members in the study period, and ii) their GDP per capita predictors were similar to the values of the treatment group before the EU accession. In addition to not being a member of the EU, we required the countries in the control group to have characteristics similar to the treated countries to avoid overfitting. Moreover, the selection of countries was also dictated by the data availability, in particular human capital. This is why we were not able to select some key countries such as Belarus and Georgia into the donor pool. We run sensitivity analysis by dropping human capital from predictors and adding countries to the donor pool that are dropped due to insufficient human capital data.

We employed country-level balanced panel data for the period 1994-2019 extracted from the most recent version of Penn World Table version 10.0 accessible at: https://www.rug.nl/ggdc/productivity/pwt/. The data included the outcome variable, Y_{it}, that was the PPP adjusted real GDP per capita in country j at time t. The pre-EU accession characteristics were proxied by the standard economic growth predictors including the human capital, labour share in GDP, the investment and the government consumption over GDP, openness to international trade, and the price level and are in line with the empirical growth literature (Levine & Renelt, 1992; Barro, 2012).

The accession of Bulgaria and Romania to the EU took place in 2007 giving us 13 years of pre-treatment and 12 years of post-treatment data, both are long enough samples to fit data and evaluate the effects of the treatment. Even though the data goes back to an earlier period, we started the sample from 1994 to avoid structural breaks as the majority of the countries in our treatment and control group started their transitions to the market economy at the beginning of the 1990s.

RESULTS AND DISCUSSION

Baseline Results

We determined the weights of each country in the control group by minimizing the difference of outcome variables and growth predictors between the actual and synthetic Bulgaria and Romania. Table 1 reports the weights of each country used in the synthetic versions of these countries. The weighted average of Israel, Malaysia, Russia, and Tajikistan constructs the synthetic Bulgaria since all other countries in the donor pool obtained weights close to zero. Synthetic Romania uses the weighted average of the same countries of synthetic Bulgaria plus Armenia and Egypt.

Table 1. Synthetic weights for Bulgaria and Romania

Treated country	Donor pool country	Synthetic control weight
Bulgaria	Israel	0.0493
	Malaysia	0.2187
	Russia	0.3807
	Tajikistan	0.3512
Romania	Armenia	0.0574
	Egypt	0.1412
	Israel	0.0383
	Malaysia	0.0370
	Russia	0.5056
	Tajikistan	0.2134

Source: own study.

We compare the actual values of the average pre-EU accession real GDP per capita and its predictors for Bulgaria and Romania with their synthetic counterparts, respectively, to evaluate the fit of the SCM. The empirical results in Table 2 show that the fitted values obtained from the SCM are generally very close to the actual pre-treatment values of the predictors for Bulgaria and Romania. The average fitted values of real GDP per capita, human capital, labour share in GDP and government consumption share in GDP were almost the same as the average actual historical values. The fit was relatively poor in the trade openness variable since, on average, imports exceeded exports both in Bulgaria and Romania between 1994-2006 whereas SCM produced opposite results. Overall, the fit of the SCM was acceptable.

Table 2. Pre-treatment characteristics

Indicators	Bulgaria		Romania	
	Actual	Synthetic	Actual	Synthetic
Real GDP per capita	9994.3	9967.0	9186.5	9186.5
Predictors				
Human capital	2.90	3.01	2.93	2.93
Labour share in GDP	0.46	0.46	0.50	0.50
Investment rate	0.12	0.18	0.15	0.15
Government consumption rate	0.30	0.27	0.26	0.26
Trade openness	-0.06	0.05	-0.04	0.04
Price Level	0.22	0.26	0.25	0.25

Notes: The real GDP per capita and the GDP predictors for Bulgaria and Romania under the actual column are the historical values for the period between 1994 and 2006 whereas the same variables under the synthetic column are constructed using the synthetic control weights.
Source: own study.

As already mentioned, the applicability of the SCM crucially depends on the pre-treatment fit of the outcome variable between treated and synthetic groups. Figure 1 shows this fit by displaying the path of the GDP per capita of Bulgaria and Romania and their synthetic counterparts between 1994-2019, respectively. For both countries, the synthetic values closely track the GDP per capita of the actual historical values during the pre-EU accession period. The pieces of evidence provided in Figure 1 and Table 2, the good fit of the outcome variable and the similar pre-EU characteristics, support the use of the SCM to estimate the effect of the accession to the EU on growth in Bulgaria and Romania.

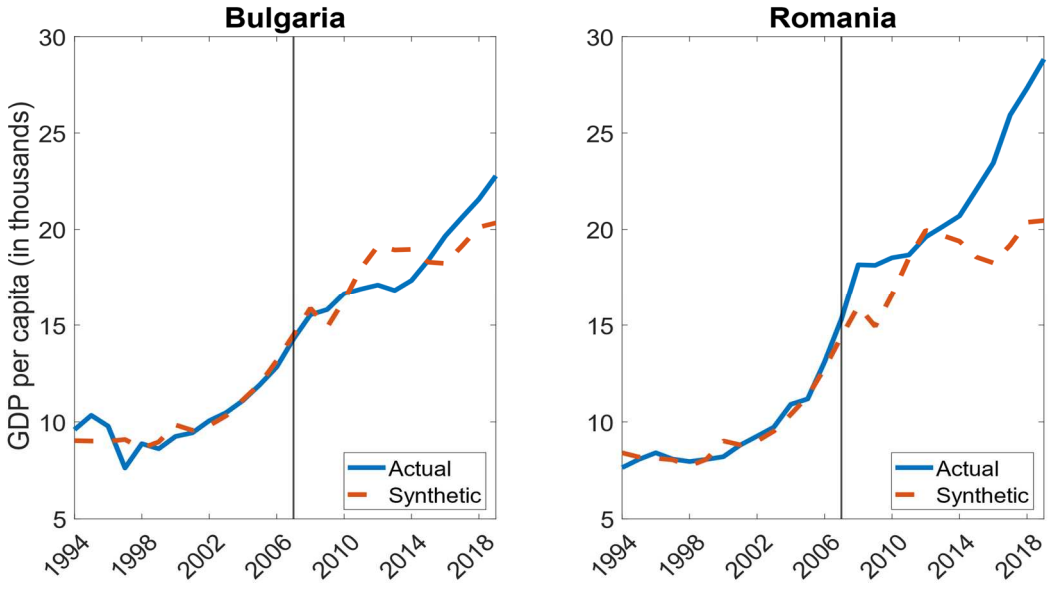

Figure 1. Trends in GDP per capita: Actual versus synthetic

Notes: The blue solid line shows the actual historical value of real GDP per capita chained PPP in 2017 USD and the red dashed line shows the fitted value of the same variable constructed using the synthetic control weights.
Source: own elaboration.

Figure 2 shows the difference between the actual real GDP per capita and its synthetic counterpart for Bulgaria and Romania. This difference is our estimate of the effect of the EU accession on the real GDP per capita of Bulgaria and Romania. We found that accession to the EU did not have a significant impact on the growth of Bulgaria and Romania up to 2014, even though the initial impact was slightly positive in the first few years. The uninterrupted effect of the EU accession becomes more visible after the end of the Eurozone crisis, in particular for Romania. From 2015 to 2019, the GDP per capita difference between the real and synthetic Romania increased sharply whereas the increase was more gradual for Bulgaria. Overall, using the SCM, we found a positive impact of the EU membership on growth in Bulgaria and Romania.

The estimations show that the actual PPP adjusted real GDP per capita was 22 774 USD for Bulgaria and 28 889 USD for Romania in 2019, whereas it was 20 334 USD and 20 456 USD for their synthetic versions, respectively, in the same year. This implies that PPP adjusted real GDP per capita of Bulgaria and Romania grew by about 188 and 644 USD more per year relative to the synthetic counterparts over the entire 2007-2019 period, respectively, on average. In relative terms, the average growth rate of the real GDP per capita in the real Bulgaria and Romania was 4.95% and 7.36%, respectively, whereas it was 3.36% and 3.49% in their synthetic counterparts. In the last period of the sample, the year 2019, we found per capita GDP in real Bulgaria and Romania to be about 12% and 40% higher than in the synthetic versions, respectively.

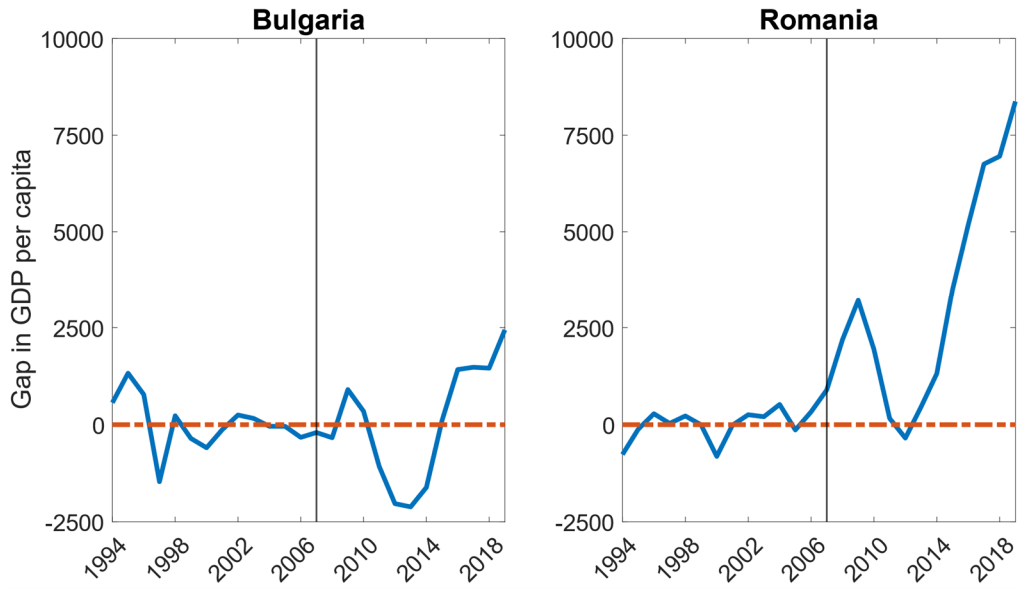

Figure 2. GDP per capita difference between actual and synthetic
Source: own elaboration.

Placebo Test

We conducted 'in-time' placebo study to verify the robustness of our previous results. We assigned the EU accession date to the year 2000, 7 years before the actual EU accession, and re-estimate the model. We chose this date because Bulgaria and Romania applied for EU membership in the mid-1990s and started implementing reforms in 2000. This would also help assess whether there were any anticipation effects of the EU accession. Then, we compared the results of the placebo enlargement with the 2007 enlargement. If the treatment effect under a hypothetical EU enlargement date was similar to the one in Figure 1, then the positive growth effect of EU enlargement in our baseline analysis lost its credibility. This is because the growth effects should be only observed following the EU membership that occurred in 2007.

Figure 3 shows the results of the 'in-time placebo' test. The path of the GDP per capita for Bulgaria and its synthetic counterpart was almost identical between the years 2000 and 2007, the post-EU accession period. We made similar observations regarding Romania. However, actual GDP per capita exceeds synthetic one after 2005 but at a very modest level. These findings are important because, in contrast to

the actual EU accession, the 2000 placebo enlargement has no significant effect on growth in both treated countries. Hence, based on this result, we can argue that the positive effects of the EU accession on the rate of growth in Bulgaria and Romania were not coincidence-driven.

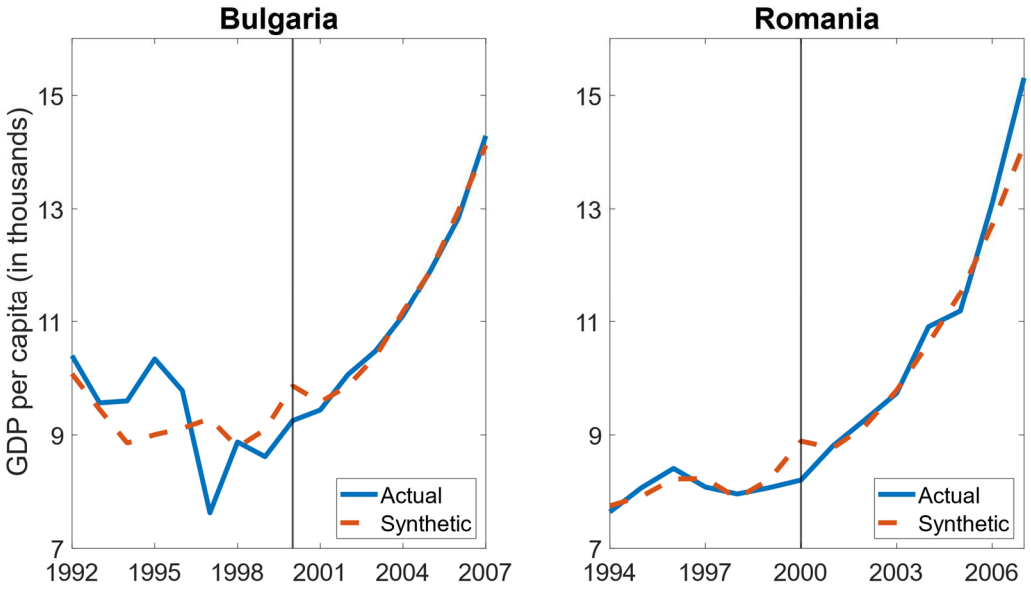

Figure 3. In-time placebo: Actual versus synthetic
Source: own elaboration.

Sensitivity Analyses

In addition to the placebo test, we conducted two sensitivity analyses to further verify the baseline results' solidity. In the first sensitivity analysis, we removed human capital from the growth predictors given in Table 2 so that we could include the countries in the donor pool that were dropped in the baseline model due to a lack of human capital data. The donor pool includes the following countries: Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Kazakhstan, Moldova, North Macedonia, Russia, Serbia, and Turkey. This allowed us to assess whether our baseline results suffer from overfitting. As mentioned by Abadie *et al*. (2015), to avoid interpolation biases and overfitting, it is important to select the countries in the donor pool that share characteristics similar to the treated countries. Since communist history and geography are important characteristics, we constrain the countries in the donor pool that share these features.

Table 3 reports the synthetic weights obtained from the first sensitivity analysis. Belarus now constitutes a very large part of the synthetic Bulgaria with a weight of 0.89 after entering into the donor pool. Such a large weight causes the synthetic Bulgaria to be very responsive to the developments in Belarus which may also cast doubts on the representativeness of the synthetic Bulgaria. The weights in synthetic Romania were distributed more reasonably. Again, Belarus plays a key role in the synthetic unit of Romania. However, the economies of Georgia and Russia also have a considerable impact according to Table 3.

Figure 4 shows the real GDP per capita trajectory of Bulgaria and Romania and their synthetic counterparts for the 1994-2019 period using the weights reported in Table 3. The trajectories of the synthetic real GDP per capita of Romania displayed in Figures 1 and 5 are very similar and the positive large difference in GDP per capita between the actual and synthetic Romania observed in Figure 1 continues to exist. On the other hand, Figure 4 produces a slightly larger synthetic GDP per capita of Bulgaria relative to Figure 1 and it is almost the same as the actual value of the same variable at the end of the sample. However, synthetic Bulgaria is already higher than the actual historical real GDP per capita before the EU accession. As argued by Abadie *et al*. (2015), the synthetic control becomes less credible when it does not track well the treated unit's pre-treatment outcome. Our sensitivity analysis confirms this argument. We observed similar growth effects for Romania in our baseline model

and sensitivity analysis since SCM produces outcome values very similar to the actual pre-EU accession values whereas growth effects disappear for Bulgaria due to poor pre-treatment fit. Moreover, synthetic Bulgaria has a large exposure to developments only in one control country, Belarus. However, sensitivity analysis also confirmed that actual growth in real GDP per capita starts exceeding the synthetic growth following 2014 as in the baseline estimation for both countries indicating the effects of the EU accession on growth become noticeable after this year.

Table 3. Synthetic weights for Bulgaria and Romania: First sensitivity analysis

Treated country	Donor pool country	Synthetic control weight
Bulgaria	Belarus	0.8946
	Russia	0.0658
	Turkey	0.0396
Romania	Belarus	0.4116
	Georgia	0.2049
	Macedonia	0.0510
	Russia	0.2552
	Turkey	0.0772

Source: own study.

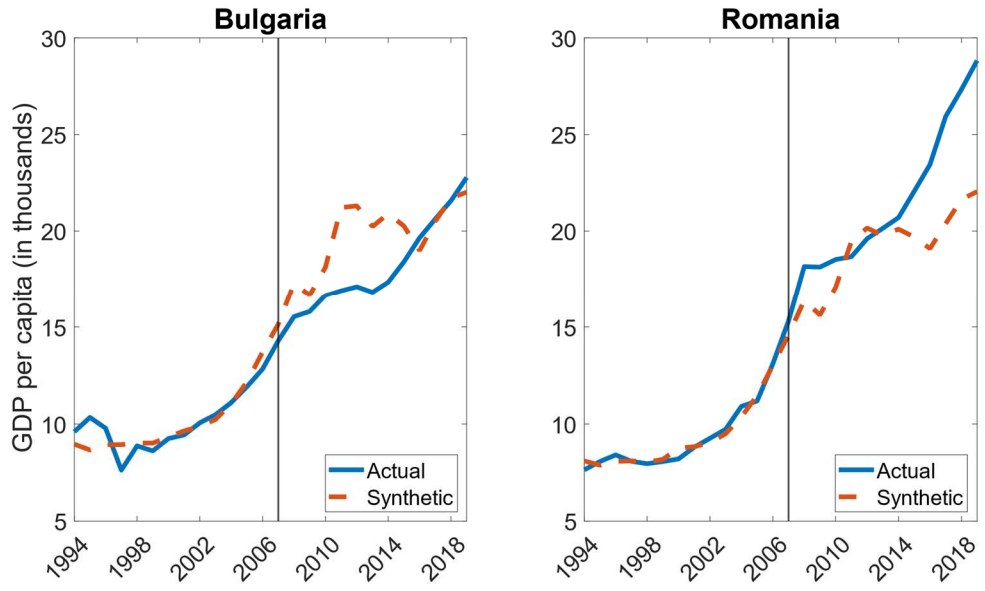

Figure 4. Trends in GDP per capita: Actual versus synthetic
Source: own elaboration.

In the second sensitivity analysis, we changed the predictors of real GDP per capita. In the baseline, we relied on the empirical growth literature in the selection of predictors but now, we relied on theoretical growth literature. According to the human capital augmented Solow model with technological progress model developed by Mankiw *et al*. (1992), the long-run real GDP per capita is determined by the following factors; shares of physical and human capital in the production, investment rates in physical and human capital, population growth rate, technological progress, and depreciation rates of capitals. Hence, our new vector of predictors consists of investment share (share of gross capital formation in GDP), population growth, human capital, total factor productivity (TFP) level, and labour share in production (share of labour compensation in GDP) from Penn World Table. This exercise allowed us to assess the sensitivity of the baseline results to a different set of predictors.

Table 4 shows the average actual and synthetic values of the predictors and Table 5 shows the weights of the countries in the synthetic units for Bulgaria and Romania with respect to the second sensitivity analysis. In general, the synthetic units closely mimic the predictors. The only exception

was TFP for Bulgaria. Relative to the weights obtained in the baseline model, Egypt and Kyrgyzstan enter while Malaysia and Tajikistan drop from synthetic Bulgaria and instead of Malaysia, Serbia takes place in synthetic Romania.

Table 4. Pre-treatment characteristics: Second sensitivity analysis

Indocators	Bulgaria		Romania	
	Actual	Synthetic	Actual	Synthetic
Real GDP per capita	9994.3	9969.0	9186.5	9186.3
Predictors				
Human capital	2.90	2.90	2.93	2.84
Labour share in GDP	0.46	0.54	0.50	0.53
Investment rate	0.12	0.15	0.15	0.15
TFP	1.16	0.83	0.76	0.76
Population growth	-0.01	0.01	-0.01	0.00

Source: own study.

Table 5. Synthetic weights for Bulgaria and Romania: Second sensitivity analysis

Treated country	Donor pool country	Synthetic control weight
Bulgaria	Egypt	0.1304
	Israel	0.0745
	Kyrgyzstan	0.2800
	Russia	0.5151
Romania	Egypt	0.1828
	Israel	0.0277
	Russia	0.4601
	Serbia	0.2176
	Tajikistan	0.1117

Source: own study.

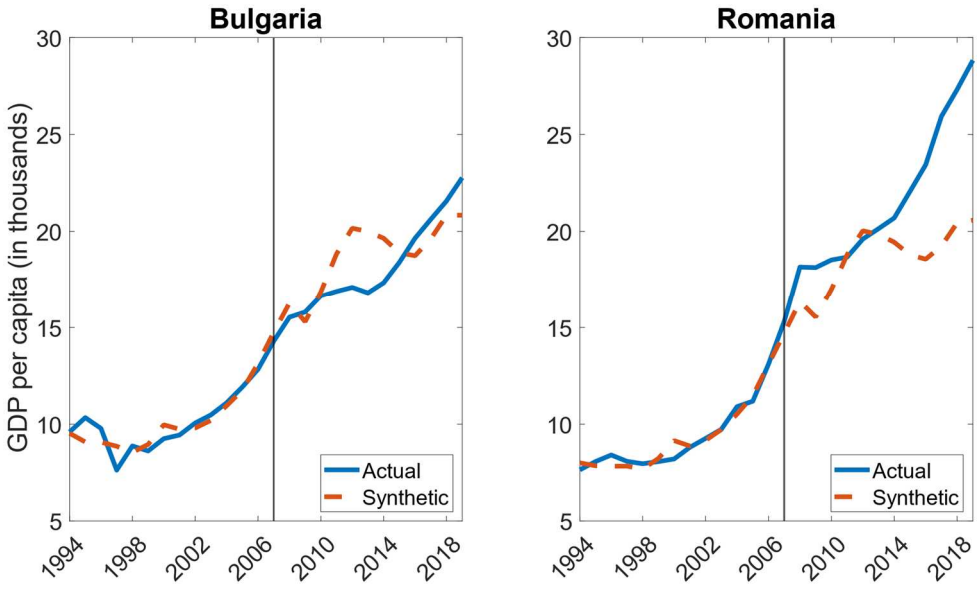

Figure 5. Trends in GDP per capita: Actual versus synthetic
Source: own elaboration.

Figure 5 displays the evolution of the actual real GDP per capita of Bulgaria and Romania for the 1994-2019 period and the synthetic counterpart using the weights reported in Table 5. Synthetic Bulgaria and Romania closely mimic the pre-treatment trajectories of the actual real GDP per capita values. Moreover, the positive differences in GDP per capita between the actual and synthetic Bul-

garia and Romania in Figure 5 are very similar to the results from the baseline analysis. The actual growth rates exceeded synthetic ones starting from 2014 and actual real GDP per capita was approximately 15% and 40% larger than the synthetic counterparts of Bulgaria and Romania, respectively, in 2019 as in the baseline model.

Discussion

We estimate that EU accession accelerated the economic growth in Bulgaria and Romania, although at different levels. Our results indicate a larger impact of EU membership on growth compared to Campos *et al*. (2019). We believe this is due to the different length of the post-EU accession period. As we showed, a sizable number of post-intervention periods are required to reliably assess the effect of the EU accession whereas the post-treatment period is short in Campos *et al*. (2019) and limited to four years. On the other hand, our results are in line with the findings of Cieślik and Turgut (2021) who found a significant effect of the 2004 EU enlargement on the new members. Finally, our estimates are comparable to the findings of Hagemejer *et al*. (2021) in which the authors found approximately 15 and 35% positive impact of the EU accession on the real GDP per capita of Bulgaria and Romania, respectively, after 12 years of membership. Although our control group and growth predictors were different from the ones in Hagemejer *et al*. (2021), similar findings between our and their articles confirmed the unquestionable positive effects of EU membership on the economic growth of these countries.

CONCLUSIONS

We estimated the growth effects of the 2007 EU accession for its two new members using the SCM. We found that this enlargement had a continuously positive effect on the economic growth of Bulgaria and Romania after the end of the European debt crisis. We estimated that over the entire 2007-2019 period, the real GDP per capita of Bulgaria and Romania grew by about 188 and 644 USD per year on average relative to the synthetic counterparts over the entire 2007-2019 period, respectively. In relative terms, the average growth rate of the real GDP per capita in the real Bulgaria and Romania was 1.5 and 2 times larger than the synthetic counterparts, respectively. In 2019, per capita GDP in the real Bulgaria and Romania was found to be about 12% and 40% higher than in the synthetic versions, respectively. The placebo test and sensitivity analyses confirmed our findings. Thus, our results document the significant positive effects of the EU accession on the rates of growth in Bulgaria and Romania.

We employed the SCM in our empirical study as it allowed us to assess the effects of the treatment by constructing a counterfactual, which was an indispensable element in comparative studies. Nonetheless, this research methodology has some potential limitations. In particular, we assumed that the countries in the control group were not affected by the 2007 EU enlargement. However, some of the countries in our donor pool maintain economic links with the treated countries through trade and financial channels which can potentially create some spill-over effects. These effects can bias our estimates and pose a threat to our results. However, it is not easy to determine the direction of the potential bias as spill-over effects could be positive for some countries, while negative for the other. For example, these effects could be positive since higher economic growth of the new members due to the EU membership can increase the demand and production in the control countries or could be negative since lower trade barriers in the NMS can hamper exports in the control countries.

An additional threat is the multi-stage nature of the EU accession process that cannot be captured by a specific single date as a result of some conditionalities. In particular, even though Bulgaria and Romania officially accessed the EU in 2007, the work restrictions for their citizens in Western Europe were removed only gradually starting in 2012, and mostly in 2014. Hence, our estimates might not fully reflect the effects of the EU accession since free labour mobility is an integral part of the single market. This may play a role in no positive effects of the EU accession reported between 2007 and 2013. As a result, our estimates may not be interpreted as the effects of the full EU accession during this period. The assembled empirical evidence supports this view since the effects of the EU accession on growth became noticeable starting in 2014.

With regard to the latter point, extending the SCM to account for multiple treatment effects, such as the EU accession and free movement of labour, could be an important research agenda for future studies. This kind of extension would be useful in differentiating between the effects of partial and full economic integration. Another possible extension could be to identify and evaluate the effects of particular growth channels of the EU membership. In this article, we studied only the overall effects of the EU accession on growth. However, assessing the effects of particular growth channels such as increased international openness to trade and foreign direct investment, or improved institutional quality would allow for providing more specific policy recommendations. Finally, SCM could also be useful in assessing how the effects of European integration vary with the degree of monetary integration. Again, this might require the SCM to account for the multiple treatment effects from the EU perspective: first, the accession to the EU, and then to the Eurozone membership.

REFERENCES

Abadie, A., & Gardeazabal, J. (2003). The economic costs of conflict: A case study of the Basque Country. *American Economic Review*, *93*(1), 113-132. https://doi.org/10.1257/000282803321455188

Abadie, A., Diamond, A., & Hainmueller, J. (2010). Synthetic control methods for comparative case studies: Estimating the effect of California's tobacco control program. *Journal of the American Statistical Association*, *105*(490), 493-505. https://doi.org/10.1198/jasa.2009.ap08746

Abadie, A., Diamond, A., & Hainmueller, J. (2015). Comparative politics and the synthetic control method. *American Journal of Political Science*, *59*(2), 495-510. https://doi.org/10.1111/ajps.12116

Aghion, P., Howitt, P., Howitt, P.W., Brant-Collett, M., & García-Peñalosa, C. (1998). *Endogenous Growth Theory*. MIT press.

Badinger, H. (2005). Growth effects of economic integration: evidence from the EU member states. *Review of World Economics*, *141*(1), 50-78. https://doi.org/10.1007/s10290-005-0015-y

Barro, R.J. (2012). *Convergence and modernization revisited* (No. w18295). National Bureau of Economic Research.

Barro, R.J., & Sala-i-Martin, X. (2004). *Economic Growth*. 2nd ed. The MIT Press, Cambridge, Massachusetts.

Bertrand, M., Duflo, E., & Mullainathan, S. (2004). How much should we trust differences-in-differences estimates?. *Quarterly Journal of Economics*, *119*(1), 249-275. https://doi.org/10.1162/003355304772839588

Billmeier, A., & Nannicini, T. (2013). Assessing economic liberalization episodes: A synthetic control approach. *Review of Economics and Statistics, 95*(3), 983-1001. https://doi.org/10.1162/REST_a_00324

Böwer, U., & Turrini, A. (2010). EU Accession: A Road to Fast-track Convergence?. *Comparative Economic Studies*, *52*(2), 181-205. https://doi.org/10.1057/ces.2010.7

Campos, N.F., Coricelli, F., & Moretti, L. (2019). Institutional integration and economic growth in Europe. *Journal of Monetary Economics*, *103*, 88-104. https://doi.org/10.1016/j.jmoneco.2018.08.001

Campos, N.F., Coricelli, F., & Franceschi, E. (2022). Institutional integration and productivity growth: Evidence from the 1995 enlargement of the European Union. *European Economic Review*, *142*, 104014. https://doi.org/10.1016/j.euroecorev.2021.104014

Cieślik, A., & Turgut, M.B. (2021). Estimating the growth effects of 2004 Eastern enlargement of the European Union. *Journal of Risk and Financial Management, 14*(3), 128. https://doi.org/10.3390/jrfm14030128

Cuaresma, J.C., Havettová, M., & Lábaj, M. (2013). Income convergence prospects in Europe: Assessing the role of human capital dynamics. *Economic Systems*, *37*(4), 493-507. https://doi.org/10.1016/j.ecosys.2013.02.004

Eichengreen, B., & Boltho, A. (2008). The economic impact of European integration. *Centre for Economic Policy Research Discussion Paper Series No. 6820*.

Fujita, M., Krugman, P.R., & Venables, A. (1999). *The Spatial Economy: Cities, Regions, and International Trade*. MIT press.

Henrekson, M., Torstensson, J., & Torstensson, R. (1997). Growth effects of European integration. *European Economic Review*, *41*(8), 1537-1557. https://doi.org/10.1016/S0014-2921(97)00063-9

Kantorowicz, J., & Spruk, R. (2024). Using synthetic control method to estimate the growth effects of economic liberalisation: Evidence from transition economies. *World Economy*, *47*(6), 2332-2360. https://doi.org/10.1111/twec.13544

Krugman, P.R. (1991). *Geography and Trade*. MIT press.

Landau, D. (1995). The contribution of the European common market to the growth of its member countries: An empirical test. *Review of World Economics*, *131*(4), 774-782. https://doi.org/10.1007/BF02707941

Levine, R., & Renelt, D. (1992). A sensitivity analysis of cross-country growth regressions. *American Economic Review*, *82*(4), 942-963. Retrieved from https://www.jstor.org/stable/2117352 on April 2, 2024.

Lucas Jr, R.E. (1988). On the mechanics of economic development. *Journal of Monetary Economics*, *22*(1), 3-42. https://doi.org/10.1016/0304-3932(88)90168-7

Mankiw, N.G., Romer, D., & Weil, D.N. (1992). A contribution to the empirics of economic growth. *Quarterly Journal of Economics*, *107*(2), 407-437. https://doi.org/10.2307/2118477

Romer, P.M. (1986). Increasing returns and long-run growth. *Journal of Political Economy*, *94*(5), 1002-1037. https://doi.org/10.1086/261420

Torstensson, R.M. (1999). Growth, knowledge transfer and European integration. *Applied Economics*, *31*(1), 97-106. https://doi.org/10.1080/000368499324598

Vanhoudt, P. (1999). Did the European unification induce economic growth? In search of scale effects and persistent changes. *Weltw'irtschaftliches Archiv*, *135*(2), 193-220. https://doi.org/10.1007/BF02707252

Authors

The contribution share of authors is equal and amounted to 50% for each of them. Andrzej Cieślik – conceptualisation, literature writing, Mehmet Burak Turgut – methodology, calculations, discussion.

Andrzej Cieślik

Full professor of economics at the Faculty of Economic Sciences, University of Warsaw (Poland). His research interests include European economic integration, foreign direct investment and international trade.

Correspondence to: Prof. dr hab. Andrzej Cieślik, Faculty of Economic Sciences, University of Warsaw, ul. Długa 44/50, 00-241 Warszawa, Poland, e-mail: cieslik@wne.uw.edu.pl

ORCID https://orcid.org/0000-0002-7834-7384

Mehmet Burak Turgut

Assistant professor of economics at the Faculty of Economic Sciences, University of Warsaw (Poland). His research interests include economic growth, macroeconomic theory and fiscal policy.

Correspondence to: Dr Mehmet Burak Turgut, Faculty of Economic Sciences, University of Warsaw, ul. Długa 44/50, 00-241 Warszawa, Poland, e-mail: mturgut@wne.uw.edu.pl

ORCID https://orcid.org/0000-0002-6231-2187

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Conflict of Interest

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