The benefits of Schengen Area membership in the CEE countries. A synthetic approach

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Abstract

Central and Eastern European (CEE) countries have followed a swift convergence towards Western European standards. The three pillars of EU integration (European Union, Schengen Area and Euro Area) have played a crucial role in this process. Nevertheless, the speed and pattern of convergence exhibited particularities among the CEE countries. Romania and Bulgaria became fully members of the Schengen Area only in January 2025, while Romania, Bulgaria, Czech Republic, Hungary and Poland are not yet members of the Euro Area. In this paper, we estimated the benefits for the CEE countries of joining the Schengen Area, using a synthetic approach with common factors and heterogeneous effects. The results show a supplementary real GDP growth of 0.24 percent each year. The fully accession of Romania and Bulgaria in the Schengen Area starting with January 2025 has the potential to bring for the two countries even higher additional growth rates, conditioned by improving their trade openness, that is currently below the region's average, in particular in Romania. On top of this, the integration of the EU internal market can be further strengthen, given that some trade barriers are still in place (IMF, 2024).

Keywords: Schengen Area, CEE countries, trade, GDP growth, factor model, synthetic approach.

JEL classification: C54, F15, F62.

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1. Introduction

The Schengen Area was formally born in 1985, when five out of the 10 states of the European Economic Community at that time, i.e. Germany, France and the states of the Benelux Economic Union, signed in Schengen, Luxembourg, an agreement on the gradual abolition of checks at their common borders. Five years later, in 1990, the signatory countries implemented the Schengen convention, as a step towards an even closer union, ensuring the freedom of movement of people, goods, and services within their internal border. Further on, in 1997, the Treaty of Amsterdam was adopted, and the Schengen *acquis*, containing the treaties and agreements, as well as the regulations and related rules and measures, was integrated into the framework of the European Union, and later, reaffirmed in the updated Treaty on the Functioning of the European Union (see Protocol no. 12012E/PRO/19). This intergovernmental project became a key element of the single market, the European Union and the European integration process, nowadays representing 29 countries[4] (out of which 25 are European Union – EU members and 4 are European Free Trade Association - EFTA members: Iceland, Liechtenstein, Norway and Switzerland).

The Schengen agreement has had two prominent features: i) it established a common visa policy for non-EU citizens to travel in the Schengen Area with a single visa and ii) it strengthened the collective security through external borders control and the Schengen Information System (SIS) that enabled member states to share information on individuals and goods.

In 2011, Bulgaria and Romania successfully accomplished the Schengen evaluation process, with recognition from the EU Council on the preparedness to implement the Schengen *acquis* and a positive opinion from the European Parliament, however without a Council decision to lift the border checks (European Commission, 2012; 2022a). In 2022 and 2023, the European Commission reconfirmed that Bulgaria and Romania, along with Croatia had taken the measures to ensure the conditions for the application of the Schengen acquis were met, requiring only the unanimous approval of all EU Member States in the Council of the European Union to join the Schengen Area (European Commission, 2022b; 2023). However, the Council approved in late 2022 only Croatia's accession, starting with the beginning of 2023. Romania and Bulgaria have undergone a two-stage accession process to Schengen, being partially admitted in the Schengen Area (with the air and maritime internal borders) on March 31, 2024 (Council of the European Union, 2023) and fully only starting from January 1, 2025 (Council of the European Union, 2024).

The Schengen Area is built on three interlinked pillars, sustained by a robust governance: 1) effective external border management and border control; 2) absence of border control of persons crossing the internal borders; and 3) strengthened internal security, particularly in the area of police cooperation, security and migration management. The three pillars have implications over a wide-reaching set of policies and measures related to: border checks and border surveillance, information management and data protection, police cooperation, judicial cooperation in criminal matters, cross-border inter-agency cooperation, common visa, asylum, immigration and fundamental rights.

[4] These states are: Austria, Belgium, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Bulgaria and Romania (both since January 2025). The micro-state enclaves of San Marino and Vatican are accessible only through a Schengen state. The overseas territories of the Schengen countries are not part of the Schengen Area.

The absence of border control is the most recognized benefit of the Schengen *acquis*, but the reintroduction of internal border control is possible under exceptional circumstances that could threat public policy or internal security of the area of freedom, security and justice. Apart from social, political and regulatory advantages, as a direct implication of the absence of internal border controls, the Schengen Area members harness economic benefits. An extended literature emphasizes both the direct and indirect benefits, as indicated in the table below.

Table 1. The benefits of Schengen Area membership (main findings from the literature)

Direct benefits	Indirect benefits
• Reduced costs of access to Schengen labour markets; • Better consumer prices as result of higher competition and frictionless trade; • Reduced costs of transportation services, with consumer and business benefits, and sectoral contribution to a more efficient road traffic and road freight flows; • Increased revenue benefits for businesses and workers as result of the access to the border-free area on transaction costs; • Spillover effects to other sectors such as tourism and travel; • Reduction of direct budgetary spending on internal EU border control and other administrative measures, including border staff and border securitization measures costs; • Structural trade creation effect at EU level, between Schengen countries, and with third parties, with impact on openness to regional and international trade; • Potential increases of GDP and foreign direct investments, due to the economic activity boost.	• Wellbeing effects (e.g. job market opportunities, for commuters and job-seekers, savings as results of elimination of time delays and the associated value); • Diminished investment risk perception and facilitation of foreign direct investors in the domestic economy; • Cross-border supply chain optimization, EU business cycle synchronization incentives, and better positioning in the European value chains; • Labour market integration, including better labour market outcomes following the cross-border integration; • Increased cross-border supply and demand / European trade integration; • Additional trade connectivity options (e.g. better use of trade connectivity networks and a more efficient allocation of resources); • Advantages for capital markets and banking sector integration; • Reduction of the internal market fragmentation.

Source: Aussilloux and Le Hir, 2016; Böhmer et al., 2016; Davis and Gift, 2014; Felbermayr et al., 2017; Parenti and Tealdi, 2019, authors' compilation.

Romania's fully accession to the Schengen Area is expected to contribute not only to the trade creation effect of the absence of border control, but also to bring benefits to business agents, by ensuring a smoother functioning of the supply chains, reducing time, and improving the efficiency of labour and capital allocations across borders. The EU trading partners have a dominant position in the Romanian foreign trade. According to Romania's National Institute of Statistics, Romania's FOB exports to Schengen Area members stood at EUR 68.3 billion in 2023, representing 73.4 percent of total exports (EUR 93.1 billion). In the top-10 destination countries for Romanian exports in 2023, eight were Schengen Area members (except for Bulgaria and Turkiye), cumulating 56.5 percent of Romania's total exports.

This paper aims to measure the effects of Schengen Area membership over the domestic GDP growth in the Central and Eastern European (CEE) countries that are members of the European Union. Romania and Bulgaria's fully accession to the Schengen Area at the beginning of 2025 should foster economic growth and European integration of the two countries. The IMF (2024 - Regional Economic Outlook – Europe)

found evidence that the better integrated EU countries in the EU value chains experienced higher growth rates of GDP per capita and larger productivity gains.

The remainder of the study is organised as follows. Section 2 goes through the literature on the Schengen topic. It covers the main findings concerning the benefits and impact on various economic sectors and macroeconomic indicators. Section 3 describes the methodology to estimate the impact of Romania and Bulgaria's Schengen Area membership on their GDP growth. Section 4 provides details about the database, whereas section 5 reports the main findings. Section 6 validates the model's robustness and section 7 concludes.

2. Literature review

The reduction of the border effect, hence conducting international trade with fewer frictions and fewer transaction costs, is at the forefront of the Schengen Area benefits. In the past three decades, research papers documented the impact of international borders on trade (e.g. McCallum, 1995; Helliwell, 1997; Obstfeld and Rogoff, 2001; for a discussion on the border effect in research literature, see Magerman, et al., 2016).

Felbermayr et al. (2017) estimated that Schengen Area membership increased trade flows by 2.81 percent (ad valorem equivalent of 0.46 percent drop in tariffs), whilst Böhmer et al. (2016) determined an increase of import prices by 1-3 percent for the Schengen Area countries if the border controls are re-introduced between members. In a similar scenario, Aussilloux and Le Hir (2016) measured the effects of Schengen Area collapse on trade of being equivalent to a shadow tax of 3 percent on the value of traded goods and services.

European Commission (2016) determined immediate first order direct costs of border control re-establishment within Schengen Area in a range between 5 and 18 billion EUR annually, estimated only for the sectors with highly concentrated costs such as road freight, cross-border passenger mobility, tourism, and border administrative costs. Furthermore, Anna auf dem Brinke (2016) discussed the negative effects of introducing border restrictions between members, with an estimated total cost of 63 billion EUR. Barberi et al. (2016) computed that resorting to reintroduction of border controls in Schengen countries would imply an annual operational cost of around 2 - 3 billion EUR and initial unique costs of 0.1 up to 19 billion EUR, depending on the timeframe for re-establishing the border controls.

In a briefing, the European Parliament (2016) estimated that the economic impact of suspending Schengen would determine costs between 1.3 and 5.2 billion EUR per year for cross-border travelling and up to 7.5 billion EUR in extra costs for road transporters. Potential losses for the tourism industry due to border controls were estimated between 10 and 20 billion EUR per annum, out of which the direct costs of 'Non-Schengen' would be between 5 and 18 billion EUR a year.

Researchers also analysed the impact of Schengen Area membership over labour mobility. A study case on Switzerland, conducted by Parenti and Tealdi (2019) shows an increasing of cross-border commuters, with positive effects on the labour market efficiency. These outcomes are supported by the socio-economic value of travel to work, from the cost-equivalent of the time spent in border crossing, including the extra needed time and the value of time, to its impact on the quality of life. Considering these elements, in France, the estimated cost per person per year of longer crossing commuters in case of light border controls instead of free movement was estimated at around 723 EUR (Aussilloux and Le Hir, 2016).

The main results presented above, along with other assessments performed on Schengen Area membership, are summarized in Table 2, by economic sector (trade, labour) and macroeconomic indicator (prices, output).

Table 2. The impact of Schengen Area membership (main findings from the literature)

Sector or indicator of interest	Economic effects	Authors
Trade	Increase of trade by 2.81% (equivalent of an ad valorem tariff reduction of 0.46%)	Felbermayr et al. (2017)
	Increase of trade by 13%-20% over the long term in case of permanent border controls	Mayer and Umana-Dajud apud. Aussilloux & Le Hir (2016)
	Rolling back Schengen Area would lead to a decline of trading volume by 10.5%-12.5%	CEPII[5], apud. Aussilloux & Le Hir (2016)
Prices	Tariff reduction of 0.46% as result of a single Schengen border	Felbermayr et al. (2017)
	Introduction of border controls is equivalent to a shadow tax of 3% on the traded goods and services	Umana-Dajub & Mayer, apud. Aussilloux & Le Hir (2016)
	Increase of import prices between 1% and 3% if Schengen border controls are reintroduced	Böhmer et al. (2016)
Output	Loss of EU GDP by 0.14% annually (230 billion EUR) in case of full and permanent suspension of Schengen	EPRS (2016)
	Decline of EU Schengen GDP by 0.86% (equivalent of a more than 100 billion EUR per year loss) in case of reintroduction of border controls, with 0.50% reduction in France and 0.80% reduction in the EFTA countries	Aussilloux & Le Hir (2016)
Labour	Probability to cross-commute increased by 3 percentage points for commuters who live in regions that share the border with the case study (Switzerland)	Parenti & Tealdi (2019)
	A cost of 723 EUR per year per person for cross border commuters in case border controls are re-introduced	Aussilloux & Le Hir (2016)

Nevertheless, the IMF (2024 - Regional Economic Outlook – Europe) raised awareness about the trade barriers, as well as the barriers for entering markets, that are still in place in the EU internal market. According to the IMF (2024), in 2020, the trade costs inside the single market were equivalent with tariffs amounting 44 percent for the manufacturing sector, much higher than an estimated 15 percent between the US states, and even 110 percent for the EU services sectors. The barriers to enter markets are also higher in the EU than in the US. Therefore, room to further enhance the European integration still exists.

Recent research was conducted in the context of Bulgaria and Romania's accession to the Schengen Area. The European Economic and Social Committee of the EU estimated that the non-full Schengen Area membership costed Bulgaria more than EUR 834 million per year, and Romania lost EUR 2.32 billion in annual revenues from not participating with the land borders in the Schengen Area, incurring EUR 90 million per year as losses for its transport operators (Mincheva - EESC, 2024).

[5] CEPII (Centre d'Études Prospectives et d'Informations Internationales)

KPMG (2023) estimated that the CO_2 emissions associated with the postponement of Romania and Bulgaria's accession to the Schengen Area and generated by road vehicles while waiting for border control, were around 46.000 tCO_2 /year. Specifically for Bulgaria, Bobeva et al. (2024) showed that the overall expected benefits from Bulgaria's accession to the Schengen Area by land in terms of road freight transport amounts to more than EUR 773 million (considering Bulgarian-Romanian and Romanian-Hungarian borders).

3. The model

We use a synthetic approach to estimate the benefits for Central and Eastern European (CEE) countries of being Schengen Area members, conditioned by the EU membership. The analysed countries are split into two groups: members of the Schengen Area since December 2007 (labelled as "treated" countries – Czech Republic, Hungary, Poland, Slovakia, Slovenia, Estonia, Latvia, Lithuania) and countries that joined the Schengen Area only in January 2025 (labelled as "control" countries – Romania and Bulgaria). Croatia is not included in the treated group as the country acceded to the Schengen Area in January 2023 (there are very few observations available) and its accession overlapped with its adoption of the single currency.

We test if the Schengen Area membership brought higher GDP growth rates in the CEE countries by comparing the economic dynamics before and after joining the Schengen Area, by applying the synthetic difference-in-differences (SDID) methodology (Arkhangelsky et al., 2021; Clarke et al., 2023).

Insulating the effects of Schengen Area membership over GDP growth requires a proper model specification. A large number of factors or covariates drive GDP growth in the CEE countries and some factors are external, given that the analysed countries are strongly integrated into the EU economy. The influence of external factors is not necessarily homogeneous across CEE countries, as each of these countries pose certain specificities. A few analysed countries (Slovak Republic, Slovenia, Estonia, Latvia and Lithuania) are also part of the Euro Area, which should be controlled for in the model.

The covariates must be independent to the treatment variable to avoid multicoliniarity. It is well known that the complete admission in the Schengen Area increases trade and it may lead to structural changes of the economy. Therefore, covariates related to trade or economic structure are not considered in the model as they can be correlated with the treatment variable (Schengen Area membership). The final list of covariates for GDP growth contains GDP per capita, the share of population ages 65 and above, along with the implemented fiscal and monetary policies.

Concerns about heteroskedasticity and endogeneity are taken into account in the model set-up. Events such economic turbulences and pandemic rise volatility. At the same time, two-way causality between GDP growth and fiscal, monetary policy may occur. Therefore, we apply the GMM (Generalized Method of Moments) estimator. The proposed model specification is:

$$GDPg_{it} = \alpha * GDPpercapita_{it} + \beta * \Delta Population65_{it} + \mu_i + \tau_t + u_{it} \quad (1)$$

$$E[x_{it}(GDPg_{it} - \alpha * GDPpercapita_{it} - \beta * \Delta Population65_{it} - \mu_i - \tau_t)] = 0 \quad (2)$$

where $x_{it} = [Budget_{it}, Monetary_{it}]$ (3)

$$\hat{u}_{it} = \delta_i F_t + \varepsilon_{it} \quad (4)$$

$$\hat{\varepsilon}_{it} = \theta_k * \sum_{k=1}^{j} D_{EU\,it} * D_{Schengen_{it}} * D_{EuroArea\,it} + r_{it} \quad (5)$$

where $GDPg_{it}$ is the quarterly (QoQ) GDP growth rate in country *i* at time *t*, $GDPpercapita_{it}$ refers to the GDP per capita at purchasing power standard, relative to the EU average, $\Delta Population65_{it}$ measures the change in the share of population ages 65 and above in total population, μ_i are unit fixed effects and τ_t are time fixed effects. The vector x_{it} denotes to the instrumental variables: $Budget_{it}$ denotes the public budget balance over GDP, whereas $Monetary_{it}$ reflects the monetary conditions and is computed as the difference between 3-month money market interest rate and inflation rate. Lags of the instrumental variables can also be considered in the model if validated by the J-statistic. The vector F_t comprises the common factors (e.g. EU developments, regional dynamics, pandemic etc.) and δ_i are the factor loadings (the influence of common factors over the domestic GDP growth).

The equation (5) allows us to obtain the effect of fully Schengen Area membership over GDP growth, after filtering the data for other GDP growth determinants. Romania and Bulgaria are EU members, but they have not adopted yet the single currency. Therefore, the coefficient of interest θ_k to estimate the benefits of Schengen Area membership is for the product of dummy variables $D_{EU_{it}}$, $D_{Schengen_{it}}$ and (1-$D_{EuroArea_{it}}$) (for details see Annex – Table A.1).

In order to avoid potential correlation between fixed effects and the regressors, we use the Bai (2009) method to adjust the variables by removing the fixed effects. For example, the adjusted GDP growth is:

$$GDPg_{it\ adj} = GDPg_{it} - \overline{GDPg}_{i\cdot} - \overline{GDPg}_{\cdot t} + \overline{GDPg}_{\cdot\cdot} \quad (6)$$

where $\overline{GDPg}_{i\cdot} = \frac{1}{T}\sum_{t=1}^{T} GDPg_{it}$, $\overline{GDPg}_{\cdot t} = \frac{1}{N}\sum_{i=1}^{N} GDPg_{it}$ and $\overline{GDPg}_{\cdot\cdot} = \frac{1}{TN}\sum_{t=1}^{T}\sum_{i=1}^{N} GDPg_{it}$ (7)

Having all the variables in equations (1)-(3) with the fixed effects removed, the model specification, including the regressions to estimate the common factors and the impact of Schengen Area membership, become:

$$GDPg_{it\ adj} = \alpha_{adj} * GDPpercapita_{it\ adj} + \beta_{adj} * \Delta Population65_{it\ adj} + u_{it\ adj} \quad (8)$$

$$E\left[x_{it\ adj}\left(GDPg_{it\ adj} - \alpha_{adj} * GDPpercapita_{it\ adj} - \beta_{adj} * \Delta Population65_{it\ adj}\right)\right] = 0 \quad (9)$$

where $x_{it\ adj} = [Budget_{it\ adj}, Monetary_{it\ adj}]$ (10)

$$\hat{u}_{it\ adj} = \delta_{i\ adj} F_{t\ adj} + \varepsilon_{it\ adj} \quad (11)$$

$$\hat{\varepsilon}_{it\ adj} = \theta_k * \sum_{k=1}^{j} D_{EU\,it} * D_{Schengen_{it}} * D_{EuroArea_{it}} + r_{it\ adj} \quad (12)$$

The factors $F_{t\ adj}$ are not observed, hence they are detected with the Principal Component Analysis from the residuals of equation (8) (Bai, 2009; Bai and Ng, 2017). In a heterogeneous sample, some principal components may reflect individual shocks instead of common factors across countries (Bai and Ng, 2019). Moreover, Chernozhukov and Fernandez-Val (2017) recommended not using too many controls, as they do not improve considerably the results' efficiency. Therefore, we opt for a lower number of factors.

Following Arkhangelsky et al. (2021), the GDP growth in each CEE country is weighted such that a parallel trend between "treated" (members of the Schengen Area since December 2007) and "control" countries (members of the Schengen Area only since January 2025) to be obtained for the period before December 2007. The parallel trend enhances the causality assessment, and the effect of joining the Schengen Area is determined as the deviation of real data from the constructed parallel trend.

According to Arkhangelsky et al. (2021), the weights are computed with the pre-treatment data (before December 2007) to minimize the next equation (adapted to our model):

$$\left(\widehat{\omega_0}, \widehat{\omega^{sdid}}\right) = arg \min_{\omega_0 \in R, \omega \in \Omega} \sum_{t=1}^{T_{pre}} (\omega_0 + \sum_{i=1}^{N_{CO}} \omega_i GDPg_{it\ adj}^{orth} - \frac{1}{N_{tr}} \sum_{i=N_{CO}+1}^{N} GDPg_{it\ adj}^{orth})^2 + \zeta^2 T_{pre} \|\omega\|_2^2 \quad (13)$$

$$\text{where } \Omega = \left\{\omega \in R_+^N : \sum_{i=1}^{N_{CO}} \omega_i = 1, \omega_i = \frac{1}{N_{tr}} \ for\ i = N_{CO}+1, \dots, N\right\}, \quad (14)$$

$$GDPg_{it\ adj}^{orth} = GDPg_{it\ adj} - \alpha_{adj} * GDPpercapita_{it\ adj} - \beta_{adj} * \Delta Population65_{it\ adj} - \delta_{i\ adj} F_{t\ adj}, \quad (15)$$

$$E\left[x_{it\ adj}\left(GDPg_{it\ adj} - \alpha_{adj} * GDPpercapita_{it\ adj} - \beta_{adj} * \Delta Population65_{it\ adj}\right)\right] = 0 \quad (16)$$

and ζ is the regularization parameter. The GDP growth is transformed orthogonal to the covariates and factors, as indicated by Arkhangelsky et al. (2021).

The final step consists in measuring the overall effect of Schengen Area membership, conditioned by the EU membership, but being outside the Euro Area. According to the SDID methodology (Arkhangelsky et al., 2021), with unit weights, the impact of Schengen Area membership is determined from the relation below:

$$\hat{\beta} = argmin\{\sum_{i=1}^{N} \sum_{t=1}^{T} \left(GDPg_{it\ adj}^{orth} - \beta * D_{EU\ it} * D_{Schengen_{it}} * (1 - D_{EuroArea\ it})\right)^2 \omega^{sdid}\} \quad (17)$$

In our sample, there are two control countries (Romania and Bulgaria) and eight treated countries (Czech Republic, Hungary, Poland, Slovak Republic, Slovenia, Estonia, Latvia and Lithuania). The unit weights build a parallel trend between the two groups, but requires equal number of countries in each category. Extracting two countries from the sample of eight treated countries imply 28 combinations. We estimate the weights and then the Schengen Area membership effect for the 28 sub-samples and average the obtained $\hat{\beta}$ coefficient.

Effects of COVID-19 pandemic and Russian invasion of Ukraine

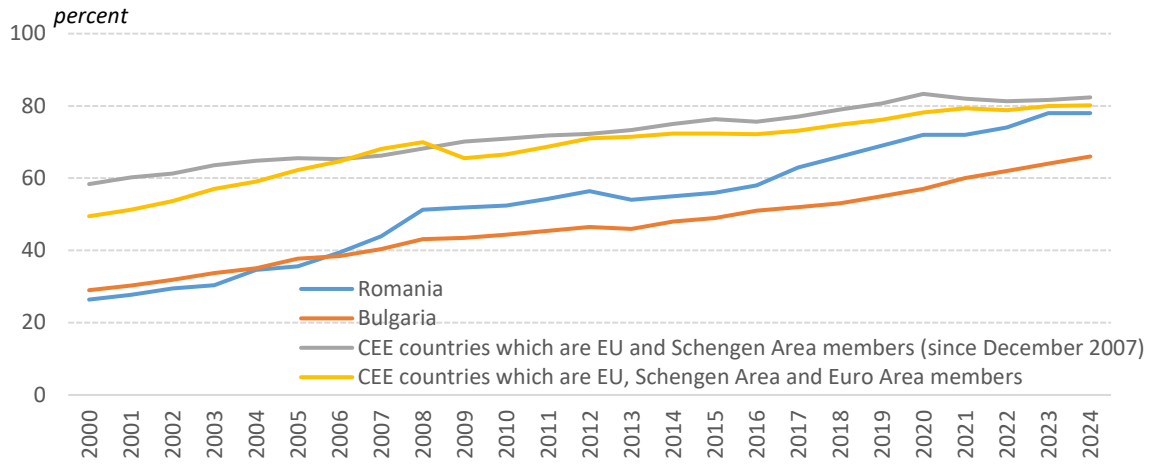
The impact of pandemic on GDP growth was severe, whilst reopening the economies led to spikes in GDP growth. The pandemic waves and mobility restrictions largely overlapped in the CEE countries because of their geographical vicinity. However, a certain amount of heterogeneity in the GDP growth rates is observed across the region during pandemic. The very difficult context was exacerbated even further by the Russia's aggression of Ukraine since the beginning of 2022. The two extreme events produced strong disturbances in the data that pose challenges from econometric perspective. The data disturbances are managed in the model by adjusting the GDP growth data such that the variance during pandemic to match the pre-pandemic variance.

4. Data

Romania and Bulgaria witnessed a strong convergence to the rest of CEE countries over the past two decades. In terms of GDP per capita at Purchasing Power Standards, Romania almost closed the gap in 2024 and Bulgaria narrowed it significantly. The GDP per capita in the CEE countries which join the membership of all three pillars of European integration (EU, Schengen Area and Euro Area) was followed

closely, on average, by the GDP per capita in the CEE countries that are only EU and Schengen Area members (since December 2007) (Figure 1).

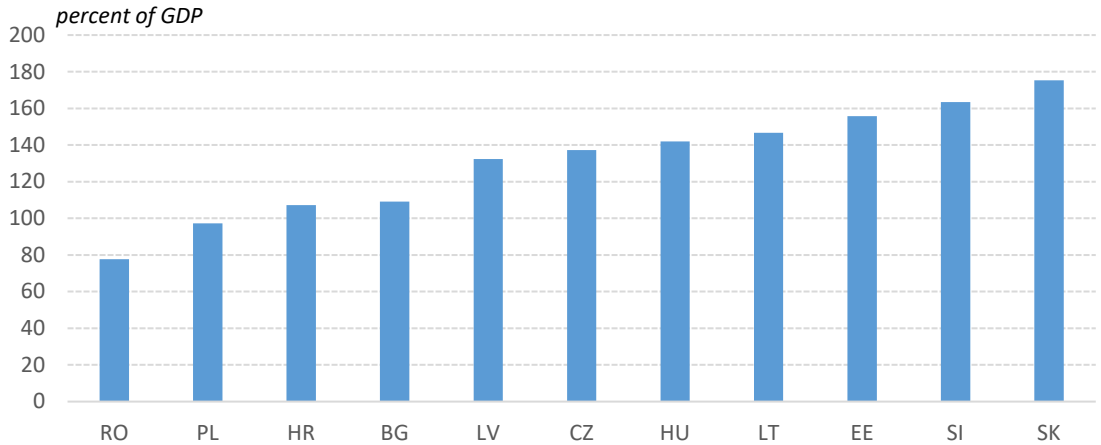
Figure 1. GDP per capita at Purchasing Power Standards in the CEE countries members of the EU, relative to the EU average



Note: CEE countries that are only EU and Schengen Area members (since December 2007): Czech Republic, Hungary and Poland; CEE countries which are EU, Schengen Area and Euro Area members: Croatia, Slovak Republic, Slovenia, Estonia, Latvia and Lithuania.
Source: Eurostat, authors' calculations.

Having in view this dynamic, one may correctly assume that the EU membership is by far the main growth engine among the three pillars of the European integration, with the remaining Schengen Area and Euro Area as being less significant for growth. However, by looking at the trade openness, which is an indicator expected to rise after joining the Schengen Area, Romania and Bulgaria are lagging their CEE peers (Figure 2). Consequently, there is upside potential for the two countries in the context of their fully Schengen Area accession since January 2025.

Figure 2. Trade openness of the CEE countries, in 2025Q1



Note: trade openness = (Imports + Exports)/GDP; RO-Romania, PL-Poland, HR-Croatia, BG-Bulgaria, LV-Latvia, CZ-Czech Republic, HU-Hungary, LT-Lithuania, EE-Estonia, SI-Slovenia, SK-Slovak Republic.
Source: Eurostat, authors' calculations.

The model compares GDP growth in Romania and Bulgaria with their CEE peers and control for other growth factors, like GDP per capita (countries with lower GDP per capita are expected to grow faster), population age, monetary and fiscal policies, as well as global and European factors. The database for model estimation contains information for the CEE countries members of the EU regarding their GDP growth rate, budget balance, 3-month money market interest rate, inflation rate, GDP per capita and the share of population ages 65 and above. The model is estimated with quarterly data that covers the period 2000Q1-2024Q1, before the partial admission of Romania and Bulgaria in the Schengen Area (details in the Annex – Table A.2).

The figures for GDP per capita and the share of population ages 65 and above are available only annual, therefore an interpolation with a polynomial function (Hermite) was performed to construct quarterly time series. The 3-month money market interest rate and inflation rate were transformed from monthly into quarterly by average. The variables were standardized by dividing the data to their variance, to improve estimator's efficiency. Moreover, the outliers were removed from the data sample with the methodology proposed by Stock and Watson (2005).

5. Estimation and results

The objective is to determine the coefficient β of $D_{EU_{it}} * D_{Schengen_{it}} * (1 - D_{nonEuroArea_{it}})$ in equation (17), which measures the effects of Schengen Area membership over the GDP growth, conditioned by the EU membership, but not being part of the single currency area. These precise cumulative conditions are imposed in the model to detect the effects for Romania and Bulgaria.

The common factors are determined using the residuals estimated from equation (8) with the adjusted variables (results in the Annex – Tables A.3 and A.4). We select the first two principal components as common factors, which explain a large share of variance in the data and control for the global and European dynamics that influence economic activity in the CEE countries, including the COVID-19 pandemic and the war in Ukraine (results in the Annex – Tables A.5 and A.6).

The model estimation requires equal number between the control and treated countries to avoid bias. Given that there are two control countries (Romania and Bulgaria) and eight treated countries (Czech Republic, Hungary, Poland, Slovak Republic, Slovenia, Estonia, Latvia and Lithuania), a number of 28 estimations (combination of 8 taken by 2) are performed. The percentiles 25, 50 (median) and 75 of the obtained distributions of the coefficient β are presented in Table 3.

Table 3. Estimation results for the coefficient of $D_{EU_{it}} * D_{Schengen_{it}} * (1 - D_{EuroArea_{it}})$ (dependent variable: orthogonal GDP growth, period: 2000Q1–2024Q1), quarterly data

Period	25th percentile	50th percentile (median)	75th percentile
All period (2000Q1-2024Q1)	-0.01%	0.06%	0.12%
All sample less the global financial crisis and the euro debt crisis (2009-2010), pandemic (2020-2021) and the onset of the war in Ukraine (2022)	-0.05%	-0.01%	0.04%

Source: Author's calculations.

The results show that a fully Schengen Area membership should add 0.24 percent to the real GDP growth (annualized data) each year in the CEE countries that are not Euro Area members (Table 3). In nominal terms, considering the data for 2024, the Romania's GDP should expand additionally, on average, by approximately 850 million EUR each year. During crisis, the Schengen Area membership acted as economic stabilizer, by releasing some pressure from the economic activity.

The results refer to the expected growth, based on the dynamics observed in the CEE countries. Nevertheless, Romania and Bulgaria could extend the benefits of Schengen Area membership beyond the estimated level, by improving their trade openness and integration in the European value chains. Romania's total foreign trade relative to its GDP, in particular, remains below the regions' average.

6. Robustness check

The results' robustness is examined by analysing the estimation methodology, specification and the period covered. A detailed presentation of the performed robustness checks, along with the results are presented below.

Methodology. The estimation technique takes into consideration the potential autocorrelation and heteroscedasticity in the data. Moreover, by extracting sub-samples of data such that to match the number of treated and control countries in the estimations, the results gain robustness to variations in the data sample.

Specification. The covariates (GDP per capita and share of population ages 65 and above), the instrumental variables (budget balance and monetary conditions) and the common factors, all support removing the heterogeneity of the observed outcome (GDP growth), thus augmenting the robustness of the estimated impact.

According to Ryan (2018) and Roth et al. (2023), the bias of the estimated impact can be reduced if the lagged explained variable is included in the model as covariate. The lagged variable control for potential unknown factors that may affect both the variable of interest (GDP growth, in our case) and the treatment (admission in the Schengen Area, in our case). Therefore, we proceed with the inclusion of the lagged GDP growth as explicative variable in the model to test its robustness.

Table 4. Estimation results for the coefficient of $D_{EU_{it}} * D_{Schengen_{it}} * (1 - D_{EuroArea_{it}})$ when the lagged GDP growth is included to the model (dependent variable: orthogonal GDP growth, period: 2000Q1–2024Q1), quarterly data

Period	25th percentile	50th percentile (median)	75th percentile
All period (2000Q1-2024Q1)	-0.02%	0.05%	0.11%
All sample less the global financial crisis and the euro debt crisis (2009-2010), pandemic (2020-2021) and the onset of the war in Ukraine (2022)	0.01%	0.07%	0.11%

Source: Author's calculations.

Although some persistence is detected in the dynamic of GDP growth in the CEE countries, the overall impact of Schengen Area membership does not change significantly after controlling for the lagged GDP

growth. The benefits remain material and symmetrically distributed across the region during normal economic conditions, as well as during crisis or turmoil (Table 4).

Period of time. The model's robustness is validated by the wide range of economic conditions experienced in the region during the analysed period, from exuberance to financial crisis, sharp temporary downfall during the COVID-19 pandemic and even a war in the vicinity. The Schengen Area is, in essence, about the free movement of people and goods. Therefore, the mobility restrictions adopted during the pandemic temporarily cancelled almost all the benefits of Schengen Area membership. When the years 2020 and 2021 marked by the COVID-19 pandemic are removed from the sample, the model detects an increase of GDP growth by 0.4 percent (annualize data) if CEE country is a Schengen Area member, considerable higher than the additional 0.24 percent of annual GDP growth estimated for the entire period (Table 5).

Table 5. Estimation results for the coefficient of $D_{EU_{it}} * D_{Schengen_{it}} * (1 - D_{EuroArea_{it}})$ (dependent variable: orthogonal GDP growth, period: 2000Q1–2024Q1), quarterly data

Period	25th percentile	50th percentile (median)	75th percentile
All period (2000Q1-2024Q1)	-0.01%	0.06%	0.12%
All sample less the global financial crisis and the euro debt crisis (2009-2010), pandemic (2020-2021) and the onset of the war in Ukraine (2022)	-0.05%	-0.01%	0.04%
All sample less the global financial crisis and the euro debt crisis (2009-2010)	-0.04%	0.01%	0.04%
All sample less the pandemic (2020-2021)	0.01%	0.10%	0.15%
All sample less the onset of the war in Ukraine (2022)	-0.01%	0.09%	0.13%

Source: Author's calculations.

The war in Ukraine had also major economic implications for many CEE countries, including Schengen Area members, in the context of the proximity to the conflict area and the energy dependence on Russia. The GDP growth declined by 3.5 percent and the inflation rate jumped by 7.9 percent, on average, in the region, with the largest impact being felt in the first year of the war (Lovin, Voinescu and Munteanu, 2025). The global financial crisis of 2009-2010 affected more the CEE countries non-members of the Schengen Area at that time, supporting the overall conclusion that the Schengen Area is beneficial for the economic expansion and provides safeguards during turmoil for its members.

Consequently, the methodology is resilient to possible data inaccuracies and high volatility during crisis. Changes in the model specification and in the period covered do not alter the estimated results. In all cases, the model proves stable and efficient, pointing towards robust results.

7. Conclusions

The Schengen Area balances the benefits of free movement with the potential response to the regional security challenges. At the same time, the Schengen Area is part of the European project of integration and development, along with the European Union and the Euro Area. Removal of border checks facilitates mobility, encourages trade and investments, stimulates competition, reduces costs and fosters economic growth. We estimated that the fully Schengen Area accession of Romania and Bulgaria, could increase the GDP growth, on average, by 0.24 percent annually (approximately 850 million EUR for Romania, as of 2024

data). On top of that, a deeper integration of the EU single market is still possible, given that some trade barriers remain in place within the EU (IMF, 2024).

Our results are aligned with the findings in the literature. Cross-border freedom of movement offers gains to all parties involved. Participating in the European value chains is even more valuable nowadays, in a global context where trade barriers are piling up. A more robust trade within the Schengen Area may offset the possible reversal of global trade openness.

From a symmetric perspective, mobility frictions and border checks led to various social and economic costs. The design of Schengen Area allows for temporary introduction of border checks for security reasons, but the economic advantages are undisputable and sustain the European integration.

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Annex

Table A.1. Membership of the CEE countries in the European integration project (date of accession)

	European Union	Schengen Area	Euro Area
Romania	January 2007	January 2025	-
Bulgaria	January 2007	January 2025	-
Croatia	July 2013	January 2023	January 2023
Czech Republic	May 2004	December 2007	-
Hungary	May 2004	December 2007	-
Poland	May 2004	December 2007	-
Slovakia	May 2004	December 2007	January 2009
Slovenia	May 2004	December 2007	January 2007
Estonia	May 2004	December 2007	January 2011
Latvia	May 2004	December 2007	January 2014
Lithuania	May 2004	December 2007	January 2015

Table A.2. The database

Indicator	**Unit**	**Frequency**	**Source**
GDP growth	Percent	Quarterly	Eurostat
Budget balance	Percent of GDP	Quarterly	Eurostat
3-month money market interest rate	Percent	Monthly	Eurostat
Inflation rate	Index	Monthly	Bank for International Settlements
GDP per capita	Purchasing power standard, index (EU=100)	Annual	Eurostat
Population ages 65 and above	Percent	Annual	World Bank

Table A.3. Estimation results (dependent variable: GDP growth adjusted, period: 2000Q1–2024Q1, GMM estimator; instrumental variables: $Budget_{it}, Monetary_{it}, Budget_{i,t-1}, Monetary_{it-1}$)

Variable	Estimated coefficient	t-Statistic
GDP per capita	0.8381	1.6437
Change in the share of population ages 65 and above	1.0840***	2.6407
No. of countries (control)	2	
No. of countries (treated)	8	
No. of observations	960	
J-statistic	0.0329	
Probability (J-statistic)	0.9984	

Note: ***/**/* indicates 1/5/10% significance level;
Source: Author's calculations.

Table A.4. Estimation results (dependent variable: GDP growth adjusted, period: 2000Q1–2024Q1, but excluding the crisis episodes (2008-2009, 2020-2021, 2022), GMM estimator; instrumental variables: $Budget_{it}, Monetary_{it}, Budget_{i,t-1}, Monetary_{it-1}$)

Variable	Estimated coefficient	t-Statistic
GDP per capita	0.2426	0.3387
Change in the share of population ages 65 and above	0.4870	1.1193
No. of countries (control)	2	
No. of countries (treated)	8	
No. of observations	740	
J-statistic	1.1357	
Probability (J-statistic)	0.7685	

Note: ***/**/* indicates 1/5/10% significance level;
Source: Author's calculations.

Table A.5. Estimation results (dependent variable: residuals from equation (8), independent variables: common factors with heterogeneous effect, period: 2000Q1–2024Q1, estimator: GLS (Generalized Least Squares) – HAC (Heteroskedasticity and Autocorrelation) robust)

Variable	Estimated coefficient	z-Statistic
PC1-heterogeneous effect country 1	0.4711***	11.6037
PC1-heterogeneous effect country 2	0.0590	1.2222
PC1-heterogeneous effect country 3	-0.0703	-1.3700
PC1-heterogeneous effect country 4	-0.0980**	-2.0393
PC1-heterogeneous effect country 5	0.4829***	9.5183
PC1-heterogeneous effect country 6	0.2974***	7.2461
PC1-heterogeneous effect country 7	-0.4787***	-11.9120
PC1-heterogeneous effect country 8	-0.2033**	-2.5346
PC1-heterogeneous effect country 9	-0.0539	-0.8313
PC1-heterogeneous effect country 10	-0.4061***	-9.2509
PC2-heterogeneous effect country 1	0.5614***	12.1473
PC2-heterogeneous effect country 2	-0.2146***	-3.8645
PC2-heterogeneous effect country 3	-0.2792***	-4.6646
PC2-heterogeneous effect country 4	-0.1343*	-1.7193
PC2-heterogeneous effect country 5	0.1260***	3.6975
PC2-heterogeneous effect country 6	-0.3739***	-3.3625
PC2-heterogeneous effect country 7	0.5834***	8.1149
PC2-heterogeneous effect country 8	0.0193	0.3428
PC2-heterogeneous effect country 9	-0.1931**	-2.1279
PC2-heterogeneous effect country 10	-0.0950	-1.5691
No. of countries (control)	2	
No. of countries (treated)	8	
No. of observations	960	
Akaike information criterion	2.8983	

Note: ***/**/* indicates 1/5/10% significance level;
Source: Author's calculations.

Table A.6. Estimation results (dependent variable: residuals from equation (8), independent variables: common factors with heterogeneous effect, period: 2000Q1–2024Q1, but excluding the crisis episodes (2008-2009, 2020-2021, 2022), estimator: GLS (Generalized Least Squares) – HAC (Heteroskedasticity and Autocorrelation) robust)

Variable	Estimated coefficient	z-Statistic
PC1-heterogeneous effect country 1	0.6986***	23.7041
PC1-heterogeneous effect country 2	0.1057**	2.1483
PC1-heterogeneous effect country 3	-0.0516	-1.0986
PC1-heterogeneous effect country 4	-0.0969**	-2.3495
PC1-heterogeneous effect country 5	0.2829***	5.0005
PC1-heterogeneous effect country 6	0.1160***	2.5874
PC1-heterogeneous effect country 7	-0.0349	-0.6184
PC1-heterogeneous effect country 8	-0.3930***	-2.6972
PC1-heterogeneous effect country 9	-0.1663***	-3.1493
PC1-heterogeneous effect country 10	-0.4604***	-4.0808
PC2-heterogeneous effect country 1	0.5365***	17.8464
PC2-heterogeneous effect country 2	-0.2465***	-4.3867
PC2-heterogeneous effect country 3	-0.1844***	-4.1092
PC2-heterogeneous effect country 4	-0.1773**	-2.5635
PC2-heterogeneous effect country 5	-0.1406***	-3.1392
PC2-heterogeneous effect country 6	-0.4439***	-4.4186
PC2-heterogeneous effect country 7	0.1415	1.1376
PC2-heterogeneous effect country 8	0.1493*	1.8771
PC2-heterogeneous effect country 9	-0.1779***	-3.2012
PC2-heterogeneous effect country 10	0.5433***	6.0557
No. of countries (control)	2	
No. of countries (treated)	8	
No. of observations	740	
Akaike information criterion	2.3774	

Note: ***/**/* indicates 1/5/10% significance level;
Source: Author's calculations.