EVALUATION OF THE ECONOMIC IMPACT OF A COUNTRY`S ACCESSION TO THE SCHENGEN AREA – THE CASE OF BULGARIA

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Abstract: The Schengen agreement further strengthens the implementation of the principles of free movement of goods, services and persons provided in the EU and beyond. This intergovernmental agreement offers a lot of challenges that need to be examined for building understanding of the complexity of consequences of a large magnitude. The aim of this study is to develop and apply a comprehensive methodology in order to evaluate the economic effects of a country`s accession to the Schengen area. The study explores different types of economic implications, including direct, potential, ecological and fiscal effects. Moreover, the universality of the methodology provides for its comprehensive and wide applicability under different context and scenarios of abolition of border control. The developed methodology has been applied in order to evaluate the economic impact on Bulgaria from the country`s accession to the Schengen area.

Introduction

The Schengen agreement was signed in 1985 as an intergovernmental initiative between five Member States. Encompassing 29 European countries, the Schengen area has effectively abolished passport and other types of border control at their mutual borders. Devoid of internal borders, it ensures unrestricted mobility for over 420 million citizens of the European Union, as well as non-EU residents and individuals visiting the EU for tourism, academic exchange, or business activities (anyone with legal status in the EU) (EC, CE 2024). The principle of free movement allows every EU citizen to travel, work, and reside in any EU country without specific formalities. The Schengen agreement reinforces this liberty by allowing individuals to traverse the Schengen area without undergoing border inspections (EC, CE 2024).

Several studies have shown that the implementation of these arrangements increases the economic benefits for the participating in the Schengen area countries and additionally boosting the Single market.

On 31 March 2024, Bulgaria and Romania joined the Schengen area by air and sea. This step, following years of negotiations and fulfilling the criteria for Schengen accession, however, now grants unrestricted access to travellers arriving only by air or sea. Land border checks will continue, pending a decision by the Council to establish a specific date for lifting the internal land border controls between Bulgaria, Romania and the other Schengen countries. Despite numerous discussions and negotiations over the years, the delayed accession of Bulgaria and Romania to the Schengen area by land continues to have adverse effects in various sectors of the national economies of both countries, including, but not limited to, increased transport costs and delays, reduced trade volumes and tourism.

Currently, there is a substantial amount of incomplete information and assessments circulating in the public purporting to represent the economic effects associated with the accession to the Schengen area. These estimations are often presented without reliable or any argumentation. There is no systematic research based on the EU principles of free movement of goods, services and persons that would help providing an objective, impartial and comprehensive methodology to assess the economic consequences of the Schengen agreement.

The aim of this study is to develop a methodology for evaluating the economic impact from the abolition of border controls between countries in the Schengen area and applying this methodology to assess the benefits for Bulgaria when completely joins the Area.

Theoretical background

The Schengen agreement, as an intergovernmental treaty, provides for the administrative facilitation of free movement between the internal borders of its member states. While no specific economic theories directly address the Schengen area, various economic principles and benefits, particularly those interconnected with the free movement of goods, services, and persons may be related in order to acquire valuable insights. In that sense, the Schengen area may be associated with the principles arising from the broader concepts of economic integration.

Following the concepts of economic integration, the liberal intergovernmentalism may be considered as one of the perspectives for generally understanding the Schengen area. As states cooperate on economic integration to maximize their national interests, the Schengen members have agreed to remove their border controls in order to enhance trade and economic growth. However, Schimmelfennig argued that liberal intergovernmentalism can only partially explains the national preferences during the Schengen crisis (Schimmelfennig, 2021). The neofunctionalist approach, on the other hand, suggests that economic integration leads to a spillover effect where increased economic cooperation necessitates political and social integration (Haas, 1958). In this regard, the application of the principles of free movement among the Schengen area member states can lead to further integration in other policy areas. Nevertheless, neither intergovernmentalism nor neofunctionalism adequately explains the current state of Schengen, despite considering the abolition of border controls as a key area of integration (Salomon & Rijpma, 2023). In a further context, a postfunctionalist perspective, focusing on the role of identity politics and public opinion in integration, may be also considered. While the economic benefits of the Schengen agreement are clear, the political and social implications can lead to resistance or crises, as seen during the refugee crisis. According to Gruszczak (2022), the migration crisis triggered divisions within European policy, leading to the politicization of the crisis through references to national identity and state jurisdiction (Gruszczak, 2022).

In terms of trade liberalization principles, the removal of trade barriers generally facilitates the flow of goods and services, contributing to economic growth and efficiency. For example, Sertić, Vučković, and Andabaka argued that the Schengen agreement boosts trade (Sertić, Vučković, & Andabaka, 2024). However, it is important to note that the effects from the removal of trade barriers can vary across different countries and sectors, especially in the context of regional specifications (Bureau, Guimbard, & Jean, 2019). Richard Baldwin's concept of global value chains (GVCs), on the other hand, provides additional principal insights that can be related to

the Schengen area. GVCs highlight how production processes are distributed across countries, creating economic interdependencies (Baldwin, 2016). The Schengen agreement, in turn, supports the effective functioning of GVCs by minimizing barriers to the movement of goods and labour, thus enhancing regional competitiveness and efficiency. While such interconnectivity fosters economic growth, contemporary challenges such as the reintroduction of temporary border controls within Schengen area during the refugee crisis and COVID-19 pandemic have exposed vulnerabilities related to potential supply bottlenecks. Such disruptions underscore the significant role of the Schengen agreement in mitigating supply chain interruptions and maintaining smooth production flows, ultimately contributing to greater economic resilience and stability in the long term.

The Schengen agreement undoubtedly has a significant economic implication for its member states and provide a solid base for a broad practical application research deriving from principles of free movement of goods. Most of the large part of the literature focuses on the adverse effect of abolition of border control, and more specifically – on the economic consequences and costs that incur from the reestablishment of border control. In her work "The Economic Costs of Non-Schengen", Brinke of the Jacques Delors Institute gives an overview of these economic costs, identifying four main areas that include trade, commuting, tourism and border controls (Brinke, 2016). Aussilloux and Le Hir, in their work "Economic Cost of Rolling Back Schengen", examined the economic consequences of reestablishing permanent border control within the Schengen area, focusing on France. The focal point of their analysis includes the direct and short-term costs resulted from longer travel time for tourists, cross-border workers, road freight transport and bilateral trade (Aussilloux, Le Hir, 2016). The European Parliamentary Research Service study "Cost of non-Schengen: the impact of border controls within Schengen on the Single Market", in general, combines literature overview, analytical and methodological notes and implications. It provides distinct key findings by applying different models to calculate the impacts of the reintroduction of border controls within the Schengen area. The study also reviews qualifications of estimates of potential economic impact arising from the introduction of identity checks, including in relation to the transport sector. The reintroduction of identity checks at the internal borders of the Schengen area has a negative impact on the economies of the European Union. The time lost as a result of such checks creates a complex economic chain of effects, with costs increasing over time (DG IPOL, EPRS, 2016).

In an official statement in 2016, the European Commission argues that the permanent reintroduction of border controls in Europe's passport-free travel zone could cost up

billions a year. Some of the EU countries, including Germany, temporarily reestablished their border controls in 2016 due to the huge number of migrants seeking asylum in the country. On this occasion, the Commission notes that the direct costs of any permanent reintroduction of border controls could amount billions per year, which includes the cost of road transport, the impact of delaying and border control of more than 1 billion cross-border journeys each year, as well as administrative and customs costs. The estimate does not take into account the impact on tourism, lower trade volumes, changes in production chains and the possible undermining of the common EU visa system (EC, 2016). Other studies on that matter include different evaluations produced by various professional bodies and organizations.

As part of the information published in a report of the National Union of Road Hauliers from Romania – UNTRR, the road hauliers presented a general assessment of the economic impact of the delayed accession of Romania to the Schengen area from the perspective of road freight transport. The assessment covers the direct costs – lost time at the border crossing point of Romania with Hungary and Bulgaria, and indirect losses (UNTRR, 2023). Data on unnecessary pollution, social impact, as well as measures needed to support the automotive industry are also included in the report. Another analysis, developed by KPMG Romania, estimates the amount of carbon emissions associated with the delayed accession of Romania and Bulgaria to the Schengen area caused by the operation of truck engines while waiting at border crossings. In this context, the authors use the term "Border Carbon Emissions" to define the total carbon emissions of road vehicles whose engines are running while waiting to cross the border and during the border control itself at physical border crossings with other EU Member States. A period of one year shall be taken into account in the analysis with regard to the assessment of CO_2 emissions. The impact assessment is the result of a comparison between border carbon emissions in a scenario where the accession of Romania and Bulgaria to the Schengen area is not present (actual scenario) and border carbon emissions in a scenario where the accession of Romania and Bulgaria to the Schengen area had to be accepted (counterfactual scenario) (KPMG Romania, 2023).

The literature review suggests that there is still need for a comprehensive methodology for assessment of all aspects of economic benefits of joining the Schengen area. And while all the studies advocate for the positive role of the Schengen agreement in terms of mutual trade and integration, the opponents of the Schengen enlargement neither provide solid argumentation nor present evidence of the adverse political or other consequences of the accession. Such risks and problems pose a significant limitation that requires a comprehensive and unified approach to the problem.

Methodology for evaluating the impact on the economy of country's accession to the Schengen area

Following the detailed analysis of the reviewed literature, applicable theoretical concepts, researches, estimations, studies and well-established good practices for evaluating the economic effects of abolition of border controls, we have developed a comprehensive methodology that is fully applicable in the context of Bulgaria`s accession to the Schengen area. The methodology allows to measure and compare the benefits under different scenarios of accession to the Schengen area – by air and sea, by land or under complete accession. Moreover, it also allows to estimate, compare and analyse both the effects on the economy and on the citizens. The methodology is divided into two main parts – economic effects that are mainly considered in terms of freight transport and economic effects that are mainly considered in terms of passenger transport.

Evaluating the impact on freight transport

The effects on freight transport that derive from saving time at border crossing points can be divided into three main categories:

- *Direct effects* – expected direct cost savings. Those costs will not be due from the moment the border controls are lifted.

- *Potential effects* – potential for alternative revenue – the possibility of obtaining additional revenues from the time that will be saved when border controls are removed.

- *Environmental effect* – expected savings from removal of border controls measured in carbon dioxide emissions.

The following approaches are applied to measure both direct and potential effects:

Direct effects on freight transport

The expectations for direct cost savings represent the direct savings arising from the absence of waiting times at border crossing points when border controls are removed. Savings have two dimensions – direct costs in terms of goods and direct costs in terms of vehicles. The direct costs of border controls in terms of goods transported are calculated as the product of goods transported through border crossing points multiplied by the average waiting time at border crossing points multiplied by a reference value per hour of time lost per tonne of goods transported. The calculation has the following mathematical formula:

$$DBCg_{BC}^{T} = GT_{BC}^{T} * AWT_{BC}^{T} * RVTLg^{T} \tag{1}$$

Whereas:

DBCg – direct border control costs in relation to the goods transported;

T – type of freight transport concerned;

BC – border control with the country concerned;

GT – goods transported in tonnes;

AWT – average waiting time at border, in hours;

RVTLg – reference value per hour of time lost, in currency per tonne per hour. Quinet E. estimated such reference value (Quinet, 2013).

The formula is applicable for both outbound flows of goods from the country (exports) and inbound flows to the country – imports. The direct cost of border control in terms of vehicles is calculated as the product of the number of vehicles passes through border control multiplied by the average waiting time multiplied by a reference value of time lost per vehicle per hour. The calculation has the following mathematical formula:

$$DBCv_{BC}^{T} = NVP_{BC}^{T} * AWT_{BC}^{T} * RVTLv^{T} \tag{2}$$

Whereas:

DBCv – direct border control costs in relation to the vehicles transporting goods;

T – mode of freight transport concerned;

BC – border control with the country concerned;

NVP – number of vehicles passings through border control;

AWT – average waiting time per vehicle at border, in hours;

RVTLv – reference value per hour of time lost per vehicle, in currency per hour. The value is based on an estimate of (but not limited to) driver remuneration costs, vehicle depreciation, fuel costs, insurance costs.

In this methodology the reference value of time lost per vehicle is calculated under the following equation:

*RVTLv= W + F*h + M*h + R + I* (3)

Whereas:

W – driver's salary plus per diem and overhead;

F – fuel costs;

M – maintenance costs and potential charges;

h – waiting time, in hours;

R – costs for hiring/leasing of the road vehicle;

I – insurance costs.

The formula is applicable to both outbound flows of goods from Bulgaria (exports) and inbound flows to the country – imports. The total expected direct cost savings of eliminating border controls with all countries analysed is the sum of the country-by-country sum of the direct costs of border controls on transported goods, calculated for country-by-country border controls, with the country-by-country sum of all direct costs of border controls on vehicles, calculated for country-by-country border controls.

$$DCS^{\mathrm{T}} = \sum_{BC=1}^{n} DBCg_{BC}^{\mathrm{T}} + \sum_{BC=1}^{n} DBCv_{BC}^{\mathrm{T}} \tag{4}$$

Whereas:

DCS – expected direct cost savings, in terms of T mode of transport.

The total direct cost savings of abolishing border controls with all countries analysed are summed across transport modes to determine the total direct effect:

$$DE^{\mathrm{T}} = \sum_{T=1}^{k} DCS^{\mathrm{T}} \tag{5}$$

Whereas:

DE – direct effects of abolishing border controls.

Potential effects on freight transport

The calculation of the potential effects has the following equation:

$$AWH^{\mathrm{T}} = HSB^{\mathrm{T}} * \frac{EWH_{24h}^{\mathrm{T}}}{24} \tag{6}$$

Whereas:

AWH – alternative working hours;

HSB – hours saved from the abolition of border control;

EWH – effective working hours during 24 hours for T type of transport;

T – the relevant type of freight transport.

In this regard, the alternative revenues from abolition of border control can be calculated using the following equation:

$$AR^T = AWH^T * ADT^T * ASP^T \tag{7}$$

Whereas:

AR – alternative revenues from abolition of border control;

ADT – average distance travelled in kilometres per 1 hour;

ASP – average sale price for 1 kilometre of distance travelled.

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Fiscal effects from freight transport

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When evaluating the alternative revenues, corresponding fiscal effects resulting from the relevant tax due should also be noted.   In this regard alternative costs shall be calculated with the following equation:

$$AC^T = AWH^T * ADT^T * ACP^T \tag{8}$$

Whereas:

AC – alternative costs resulted from utilizing the work done for the alternative working hours ;

ACP – average cost price for 1 kilometre of distance travelled.

The alternative profit shall be estimated using the following equation:

$$AP^T = AR^T - AC^T \tag{9}$$

Whereas:

AP – alternative profit.

The fiscal effects from the corresponding alternative revenues relates to the tax due

in terms of value added and corporate tax have the following mathematical formula:

$$FI_{VAT}^T = AR^T * TR_{VAT} \qquad (10)$$

Whereas:

FI – fiscal income;

VAT – value added tax;

TR – tax rate

and

$$FI_P^T = AP^T * TR_P \qquad (11)$$

Whereas:

p – profit.

The fiscal effect from t-type transport can be presented using the following equation:

$$FE^T = FI_{VAT}^T + FI_P^T \qquad (12)$$

Whereas:

FE – fiscal effect from t-type transport.

The total fiscal effect from the entire freight transport is estimated using the following equation:

$$TFE = \sum_{T=1}^{n} FE^T \qquad (13)$$

Whereas:

TFE – total fiscal effect from the entire freight transport.

Environmental effect from freight transport

The environmental effect of abolishing border controls represents the direct saving in carbon dioxide emissions for the time saved waiting for inspection at border crossings. The calculation for border control with one country has the following mathematical form:

$$ESv_{BC}^{T} = \frac{NVP_{BC}^{T} * 60. AWT_{BC}^{T} * SCIWv^{T} * EI_{CO_2}}{1000000} \tag{14}$$

Whereas:

ES – vehicle emissions saved, in tonnes;

SCIW – Specific coefficient for engine idling time while waiting for border control;

EI – average value of emissions generated at 1 minute of idling.

The total emissions saved by removing border control with all countries analysed is the total sum by countries.

$$TESv^{T} = \sum_{BC=1}^{n} ESv_{BC}^{T} \tag{15}$$

Whereas:

TES – total emissions saved, in tonnes.

The environmental effect can be measured both in volume of emissions saved (tonnes) – TESs – and in financial terms – emissions saved at a price per tonne of carbon dioxide emissions generated.

$$EEv^{T} = TESv^{T} * AEPE_{CO_2} \tag{17}$$

Whereas:

EE – environmental effect;

AEPE – average exchange price per tonne of carbon emissions.

Evaluating the impact on citizens

The methodology for the effect of the abolition of border controls on passenger transport is based on the time saved from waiting at border crossings. The effects related to passenger transport from waiting time savings at border crossing points can be divided in two main groups:

- *Direct effects* – potential savings in waiting times from the moment border controls are abolished.

- *Potential effects* – alternative income – the possibility of utilizing waiting time as effective working time and the resulting wages and corresponding fiscal

revenues for the state budget.

The following approaches are used to calculate both types of effects:

Direct effects on citizens

The direct effect is expressed by the waiting time saved at border crossing points when border controls are abolished. The total time saved is calculated as the time saved per person from removing border controls multiplied by the number of passenger journeys.

$$TS_{BC}^{P} = PP_{BC}^{P} * AWT_{BC}^{P} \tag{18}$$

Whereas:

TS – time saved in hours;

P – the relevant mode of passenger transport;

PJ – number of passenger journeys made;

AWT – average waiting time at border, in hours.

The formula is applicable to both outbound passenger flows from Bulgaria to other countries and inbound passenger flows to the country. The total time saved from abolishing border controls with all countries analysed is the total sum of each sum by country of the time saved. This gives the so-called cumulative time savings:

$$DE^{P} = CTS^{P} = \sum_{BC=1}^{n} TS_{BC}^{P} \tag{19}$$

Whereas:

DE – direct effects of abolishing border controls;

CTS – cumulative time savings from abolishing border controls with analysed countries.

Potential effects on citizens

The indirect effects represent the possibility to utilize the time saved as working time. From the citizens' point of view, it represents the possible income from the utilization of the accumulated time saved multiplied by the average wage per man-hour worked, assuming that travellers would have worked in their usual employment during the time saved.

$$PWW = CTS^{P} * AWW \tag{20}$$

Whereas:

PWW – potential working wage;

AWW – average working wage per man-hour worked.

Fiscal effects – citizens

The second effect relates to the state budget and represents the potential revenue if the hours saved are utilized as hours worked.

$$BR = PWW * SSB \tag{21}$$

Whereas:

BR – budget revenue;

SSB – social security burden.

If the time saved from reducing the border stays is used for rest, then the potential positive effect can be utilized either in rest in Bulgaria or in the host country, with any costs incurred bringing benefits to Bulgaria or the host country respectively.

Overall expected effect

Freight transport

The overall expected effect for freight transport deriving from the abolition of border controls is calculated by applying the following equation:

$$\text{OE}_{freight\ transport} = \sum_{T=1}^{k} DE^T + \sum_{T=1}^{k} PE^T + \sum_{T=1}^{k} \text{EE}^T \tag{22}$$

Whereas:

OE –overall expected effect of abolishing border controls;

DE –direct effects of abolishing border controls;

PE –potential effects of abolishing border controls;

EE – environmental effects of abolishing border controls;

T – index for mode of transport.

Passenger transport

The overall expected effect for passenger transport deriving from the abolition of border controls is calculated by applying the following equation:

$$\text{OE}_{passenger\ transport} = \sum_{T=1}^{k} DE^T + \sum_{T=1}^{k} PE^T \tag{23}$$

Whereas:

OE – overall expected effect of abolishing border controls;

DE –direct effects of abolishing border controls;

PE – potential effects of abolishing border controls;

T – index for mode of transport.

Overall economy effect

The overall economy effect deriving from the abolition of border controls is calculated by applying the following equation:

$$OEE = OE_{freight\ transport} + OE_{passenger\ transport} + TFE + BR \qquad (24)$$

Whereas:

OEE – overall economy effect.

To ensure objectivity and universal applicability, the methodology data collection relies primarily on publicly available sources, including national statistical offices, EUROSTAT, business associations, relevant border and state authorities, etc.

Results

This section provides overview of the results of the evaluation of Bulgaria`s accession to the Schengen area. The evaluation is conducted by applying the developed methodology and estimates the effect of Bulgaria`s accession to the Schengen area by both land and air based on the latest available data for 2023.

Evaluation of the impact on road freight transport

For evaluating the impact related to road freight transport, we consider a two-way effect – on the transported goods (effect on the exporters and importers of goods) and effect on the vehicles that transport goods. We base our calculation on the prolonged border crossing time that is expected to be saved by the road haulers in the event of abolition of border controls and on the freight, they are transporting for import or export – goods loaded in Bulgaria and unloaded in another Schengen country and vice-versa. Within the framework of the evaluation, we further consider two main foreign trade routes – north trade destination, that covers lorries` and goods` path through the Bulgarian-Romanian border, including crossing the Romanian-Hungarian border to the Schengen countries and vice-versa, and south trade destination – lorries` and goods` path through the Bulgarian-Greek border to the Schengen countries and vice-versa. In addition, we assume that the goods loaded in Bulgaria and unloaded in Spain and Italy and vice-versa are transported through Greece by sea. In that sense, both countries are considered as part of the south trade destination along with Greece, while the north trade destination includes the rest of the Schengen area

countries.

Consequently, the direct costs for exporters and importers of goods through the two trade destinations are estimated in terms of potential cost savings that derive from the reduction of transportation time from/to Bulgaria to/from each Schengen area country. Our calculation shows that the direct costs savings associated with Bulgarian export of goods to the Schengen area countries are estimated to exceed EUR 52 million. Conversely, the direct costs savings for the Bulgarian import of goods from Schengen area member states are projected at approximately EUR 37 million. The data reveal that export costs are substantially higher, which derives not only from the larger volume of exports compared to imports, but also from its distribution among the two routes and the different waiting time on the Bulgarian-Romanian-Hungarian and Bulgarian-Greek border crossing points. In that sense, the projected total annual direct cost savings for goods (importers and exporters) upon Bulgaria`s accession to the Schengen area by land is estimated at more than EUR 89 million based on 2023 data.

Following on by applying the methodology, we further calculate the direct costs savings for the road freight haulers. Our estimation shows that the anticipated total savings in direct costs for road freight transport upon Bulgaria's accession to the Schengen area by land are more than EUR 342 million based on 2023 data. In addition, the time lost by the road freight transport at the border crossing points also results in missed opportunities for generating alternative revenues. The alternative revenues for heavy goods vehicles transport from the abolition of land border controls in the event of Bulgaria's accession to the Schengen area, are estimated at more than EUR 278 million. A major part of this alternative revenues (around 84%) is expected to be generated through the north trade destinations – crossing the Bulgarian-Romanian and Romanian-Hungarian border. Furthermore, within the evaluation of the road freight transport alternative revenues, we also consider a deriving fiscal implication in terms of potentially missed budgetary revenues. The total value of the fiscal effect (alternative budget revenues) in the form of potentially due direct and indirect taxes amounts to more than EUR 62 million.

Table 1 presents the consolidated result of the direct and potential effects evaluation with regards to road freight transport. The overall expected effect from Bulgaria's accession to the Schengen area by land in terms of road freight transport amounts to more than EUR 773 million. With regards to air freight transport, it should be noted that in Bulgaria`s case the volume of goods transported by air represent less than 0.25% of the total volume of goods transported to and from the Schengen area countries. In that sense the effect of abolition of air border controls as regards to freight transport is negligible.

Table 1. Overall expected effect – road freight transport

Indicator	Destination – North (Bulgarian-Romanian border and Romanian-Hungarian border)	Destination – South (Bulgarian-Greek border)	Total
Direct costs for goods (EUR) (Rounded)	75 206 040	14 064 240	89 270 280
Direct costs for road freight transport (EUR) (Rounded)	288 862 818	54 020 076	342 882 895
Alternative revenues (EUR) (Rounded)	234 720 438	43 894 940	278 615 378
Fiscal effect (EUR) (Rounded)	52 492 025	9 816 506	62 308 531
Overall effect (EUR) (Rounded)	**651 281 321**	**121 795 762**	**773 077 084**

Source and notes: Own consolidated calculations following equations (1)-(13), (22) and based on the following data and assumptions:

1. Goods transported – Goods loaded in the Schengen countries and unloaded in Bulgaria / Goods loaded in Bulgaria and unloaded in the Schengen countries, according National Statistical Institute data / Short-term business statistics / Freight Road transport (FRT) / International FRT transports by country of loading and unloading and type of transport. The data is also available in EUROSTAT/ International road freight transport (road_go_int) (for information on the statistical processing, see 18.3 Data collection – Sampling methodology).
2. Number of vehicles passings through border control – vehicles` border crossings for import and export of goods are calculated based on goods loaded and unloaded divided by the average load capacity of vehicles performing international transport (17.5 tonnes average load capacity according to Eurostat data);
3. Average waiting time at border – based on information provided by the Bulgarian Industrial Association, as follows: Bulgaria-Greece border – 4 hours, Bulgaria-Romania border – 16 hours; 6 hours at the Romania-Hungarian border, based on data from UNTRR and IRU;
4. Reference value of the cost for time lost for goods – 0.6 euros per hour per ton, according to Quinet 2013;
5. Reference value of the cost for time lost per vehicle crossing – EUR 40,33 per hour per vehicle crossing, based on own calculations (Equation (3));
6. Effective working hours during 24 hours for road freight transport – based on Regulation (EC) No 561/2006;
7. Average sale price of 1.10 euros per 1 kilometre of distance travelled in the EU;
8. Average distance travelled in kilometres per 1 hour – 65 km according to public information by the Bulgarian International Transport Union;
9. Average cost price for 1 kilometre of distance travelled-0.84€/km according to "Comité national routier (CNR)" in the report titled "The Bulgarian Road Freight Transport Sector – 2021" from July 4, 2023.

Environmental effect

Table 2 presents the consolidated result of the environmental effect evaluation based on the carbon emissions generated by the road freight and passenger transport due to the prolonged time for crossing the borders between Bulgaria, Romania and Greece.

Table 2. Overall environmental effect

Indicator	Bulgarian-Romanian Border	Bulgarian-Greek Border	Total
CO_2 vehicles` over 3.5 tonnes emissions generated (tonnes)	37 222	6 138	43 360
CO_2 vehicles` under 3.5 tonnes emissions generated (tonnes)	788	260	1047
CO_2 buses` emissions generated (tonnes)	42	57	98
CO_2 cars` emissions generated (tonnes)	489	1 168	1 657
Total emissions generated (tonnes)	**38 541**	**7 623**	**46 162**
Environmental effect expressed in EUR (average exchange price per tonne of carbon emissions of 83.24 EUR/tonne)	**3 208 153**	**634 539**	**3 842 525**

Source and notes: Own consolidated calculations following equations (14)-(17) and based on the following data and assumptions:

1. Total number of vehicles passings through border control – total vehicles` border crossings on the Bulgarian-Romanian and Bulgarian-Greek borders in 2023 based on information provided from the Bulgarian Industrial Association by type of transport.
2. Average border waiting time – based on previously applied data.
3. Specific coefficient for engine idling time while waiting for border control – 1/3 of the total waiting time based on information provided by the Bulgarian Industrial Association.
4. Average value of CO_2 emissions generated at 1 minute of idling – reference values for all categories of vehicles with petrol and diesel engines based on Barlow, T. & Cairns, O. (2020); "Idling Action Research – Review of Emissions Data." Published Project Report PPR987 – TRL Limited. The values for passengers' cars are weighted through the vehicle fleet structure of Bulgaria and Romania considering the number of petrol and diesel engines in accordance with latest available Eurostat data/ Road transport equipment – stock of vehicles (road_eqs).
5. Average exchange price per tonne of carbon emissions of 83.24 EUR/tonne based on EU Emissions Trading System (EU ETS) for 2023/International Carbon Action Partnership.

Despite its conservative nature, the results of the calculation indicate a significant amount of CO_2 emissions generated – more than 46,000 tonnes of carbon dioxide, which cost amounts to more than EUR 3.8 million. In order to obtain a comprehensive understanding of the scale of the results we apply the Greenhouse Gas Equivalencies Calculator of the United States Environmental Protection Agency. In that sense, the results indicate that 46 162 tonnes of CO_2 is equivalent to greenhouse gas emissions generated from 20 934 metric tonnes of coal burned or the annual energy use of 5,461 homes. Furthermore, the estimated amount is also equivalent to greenhouse gas emissions avoided by 14,541 tons of waste recycled instead of landfilled equivaling 1,818,987 trash bags of waste. In addition, 46 162 tonnes of CO_2 emission generated from both road freight and passenger transport resulting from the extended waiting times at the land borders between Bulgaria, Romania, and Greece is equivalent to the carbon sequestered by 692,447 tree seedlings grown for 10 years or 198 square of kilometres of forests in one year.

Evaluation of the impact on citizens

The direct losses for the Bulgarian citizens resulting from the extended waiting time for border control on both Greek and Romanian land borders are estimated to a total of 242,437 days. The potential losses, calculated as alternative income if the time saved was used for work by the Bulgarian citizens, would amount to more than 12 thousand work months, or more than EUR 12 million in potential average annual gross wages. The potential losses in terms of budgetary revenue are estimated at more than EUR 5 million. For the citizens of Greece and Romania that travel to Bulgaria the direct losses amount to 217,998 days. This time could alternatively be utilized to extend their stay in Bulgaria, leading to a potential financial effect of more than EUR 36 million, representing a lost opportunity to generate alternative revenues for the Bulgarian tourism industry. Accordingly, the lost potential budgetary revenues from value-added tax due on these alternative revenues are estimated at more than EUR 3.2 million.

The time saved from border control at the airports for Bulgarian citizens amounts to 107,765 days. From 31 March 2024 this will result in direct time savings, which could be utilized by the Bulgarian citizens traveling to Schengen area countries either for leisure or for work. Consequently, within the saved time, the potential gross annual average wages that could be earned amount to around EUR 5.5 million. The potential budgetary revenues from these wages generated are estimated at more than EUR 2.2 million. Similarly to the effect for the Bulgarian citizens that travel by plane to the Schengen countries, the value of time saved from a potential abolition of air border control for citizens traveling to Bulgaria from Schengen area amounts to a total of 154, 215 days (significantly higher compare to Bulgarian citizens due to the higher

incoming passenger flow). That time could be utilized to extend their stay in Bulgaria, leading to a potential financial effect of more than EUR 25 million. Accordingly, the lost potential budgetary revenues from value-added tax due on the alternative revenues are estimated at more than EUR 2.3 million. Last but not least, benefits are also expected from the potential redirection of goods and passenger traffic by air due to the eased border controls.

Table 3. Overall expected effect – citizens

Indicator	Value
Time spent – Bulgarian citizens (days)	**350 202**
Time spent – Schengen citizens (days)	372 213
Potential working wage earned by the Bulgarian citizens (EUR)	17 825 253
Potential alternative revenues generated by the Bulgarian tourism sector (EUR)	62 159 524
Potential budget revenues (EUR)	12 960 108
Overall expected effect – passenger transport / citizens (EUR)	**92 944 885**

Source and notes: Own consolidated calculations following Equations (18)-(21), (23) and based on the following data and assumptions:

1. We assume that the majority of trips made by Bulgarian citizens to Greece and Romania and vice-versa are by land (regardless of the means of transport – passenger bus or car).
2. We use data on travel of Bulgarian citizens abroad by purpose and by country by data of the Bulgarian National Statistical Institute Visits of foreigners to Bulgaria by purpose and by country – National Statistical Institute Data. We assume that the majority of trips made by Bulgarian citizens to Schengen countries and vice versa for vacation, excursions, and business purposes are by air (excluding Greece and Romania).
3. Average waiting time at Bulgaria-Greece land borders based on expert assessments, regardless of the type of transport (passenger bus or car) – January 30 minutes; February 30 minutes; March 30 minutes; April 60 minutes; May 80 minutes; June 120 minutes; July 120 minutes; August 120 minutes; September 80 minutes; October 60 minutes; November 30 minutes; December 60 minutes.
4. Average waiting time at Bulgaria-Romania border land borders, regardless of the type of transport (passenger bus or car) – 40 minutes, based on the Romanian border police's live traffic monitoring system.
5. Average waiting time at the air borders – 30 minutes per flight in accordance with public information disseminated by the Bulgarian Ministry of Transport.
6. Working month = an average of 20 working days.
7. Average annual gross salary of employees under labour and official contracts in 2023 – EUR 1018, data from the Bulgarian National Statistical Institute.
8. Average daily expenditure of 167 euros per day based on the European Commission's current per diem rates for Bulgaria.

Table 3 presents a consolidated evaluation of the direct and potential effects related to the passenger transport, arising from a potential reduction of border waiting time. The estimated total effect on the citizens resulting from Bulgaria's non-accession to the Schengen area by both air and land, in terms of direct time savings and potential alternative revenues generated amounts to more than 720 thousand days saved equivalent to around EUR 80 million. Additionally, the loss from missed opportunities to generate additional budget revenues from taxes owed amounts to around EUR 13 million. In that sense, the overall effect with regards to the passenger transport in terms of citizens perspective arising from Bulgaria's non-accession to the Schengen area by both air and land is estimated at approx. EUR 93 million.
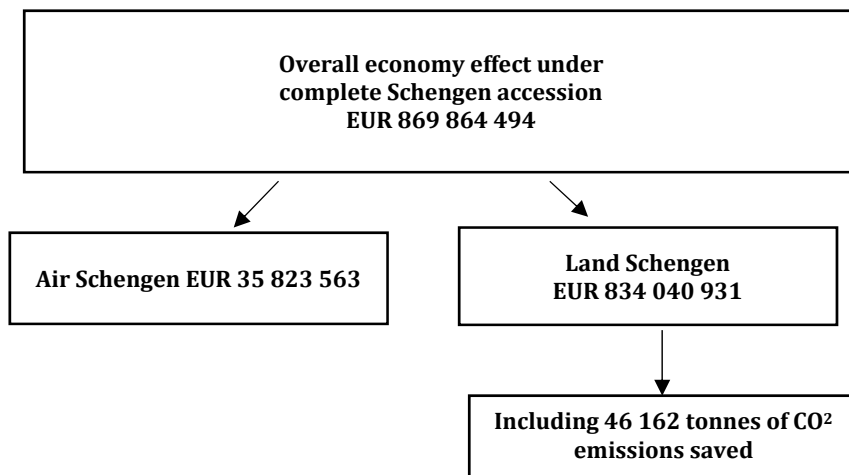
Overall economy effect

Table 4 and Figure 1 present the overall economy effect deriving from Bulgaria`s complete accession to the Schengen area.

Table 4. Overall economy effect

Effect	Total (EUR)
Overall effect – freight transport (EUR) (Rounded)	710 768 553
Overall effect – passenger transport/ citizens (EUR) (Rounded)	79 984 777
Overall environmental effect (Rounded)	46 162 tonnes CO_2 emissions generated by the road freight and passenger transport (equivalent to EUR 3 842 525)
Fiscal effect – freight transport (EUR) (Rounded)	62 308 531
Potential budget revenues – passenger transport / citizens (EUR) (Rounded)	12 960 108
Overall economy effect (EUR) (Rounded)	**869 864 494**

Source: Own calculations following equations (13), (21)-(24) and based on the previously applied calculations and data.

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┌─────────────────────────────────────────┐
│        Overall economy effect under      │
│        complete Schengen accession       │
│            EUR 869 864 494               │
└─────────────────────────────────────────┘

┌──────────────────────────┐   ┌──────────────────────────┐
│ Air Schengen EUR 35 823 563│  │      Land Schengen        │
│                          │   │      EUR 834 040 931       │
└──────────────────────────┘   └──────────────────────────┘

                               ┌──────────────────────────┐
                               │ Including 46 162 tonnes of CO² │
                               │      emissions saved       │
                               └──────────────────────────┘
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Source: Own calculations based on previously applied data.

Figure 1. Overall economy effect from air and land Schengen

The evaluation concludes that Bulgaria's non-accession to the Schengen area has a considerable negative impact on both the economy and citizens. The total negative effect of Bulgaria not joining the Schengen area is estimated at approximately EUR 870 million annually, based on 2023 data. That represents 0.93% of Bulgaria`s 2023 GDP at current prices. As it was already mentioned, on 31 March 2024 Bulgaria and Romania joined the Schengen area by air. This practically means that all of the direct and potential effect arising from the abolition of air border controls are expected to be utilized from this point on. In that sense, the overall economy effect could be redistributed by separating the air and land Schengen effects in order to evaluate their effectiveness and gain more precise and detailed results. Figure 1 presents the result from distinguishing the consolidated evaluation in terms of Bulgaria`s air and land accession to the Schengen area. As it can be seen the abolition of border controls with regards to Bulgaria land borders with Schengen countries represents a significant share of the overall effect. Last but not least, it is important to note that evaluation of the effect of air Schengen relates only to the benefits that Bulgarian business and Bulgarian citizens is expected to acquired, while transit travellers or third country travellers holding Schengen visa are not taken into account. That also applies in terms of citizens effect resulting from the abolition of land borders.

Conclusion

The comprehensive methodology presents evaluation that covers wide dimensions of the expected effects of abolition of border control (for the purpose in the concrete case – Bulgaria`s accession to the Schengen area). Those dimensions include economic

implications, citizen welfare effect, ecological considerations and consequences, as well the resulting fiscal effect associated with them. Furthermore, the methodology also presents evaluation of both direct effects and potential benefits, covered in both time and financial terms. The scope of the methodology also encompasses different aspects related to the economic and citizens benefits, arising from the abolition of border control. Finally, yet importantly, the economic implications are estimated both in the perspectives of road freight transport benefits as well as benefits to producers, exporters and importers of goods and services.

Although the methodology has been developed in the context of Bulgaria's accession to the Schengen area, it is equally applicable for evaluating the economic impact of abolition of border control for any country/group of countries regardless of the legal context. Importantly, this methodology is also equally applicable for evaluating the economic impact of the adverse effect – establishing temporary/permanent border control. Moreover, it can be also applied in order the assess what are the economic results after the abolition/introduction of border control during a certain period of time (for example – the economic impact after 10 years since the abolition of border control).

In general terms, the effects on country`s economy that derive from its accession to the Schengen area suggest that benefits may be expected throughout all types of transport – both freight and passenger as the abolition of border control constitutes the elimination of border stays, both at entry and exit. The main benefits for the entire economy could be summarized in five main areas:

- Reducing the costs for carriers by eliminating border waiting as the time saved can be utilized in new transport services (alternative revenue generation). Economic impact will thus benefit the transport sector.

- Reducing the delivery time of export and import goods – providing a direct benefit for producers and traders who export and import into the country. In that sense, reducing delivery time for export and import goods benefits all sectors of the economy that export and use imported goods – both producers of goods destined for export and consumers and the manufacturing sector that use imported goods from Schengen countries.

- It can be expected that major part of the traffic will be diverted along transport corridors where border crossings are eased.

- The elimination of border stays will also have a significant environmental effect due to the reduction of CO_2 emissions generated during vehicle stops and idling at border crossings.

- Reducing the border waiting time will also have a positive effect on the citizens.

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Conflicts of interest

The authors have no conflicts of interest to declare.

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