DOI:10.17951/h.2025.59.1.21-36

A N N A L E S
UNIVERSITATIS MARIAE CURIE-SKŁODOWSKA
LUBLIN – POLONIA

VOL. LIX, 1 SECTIO H 2025

ORHAN CENGIZ

ocengiz@cu.edu.tr
Çukurova University. Pozantı Vocational School. Department of Accounting and Taxation
Pozantı, 01470, Adana, Turkey
ORCID ID: https://orcid.org/0000-0002-1883-4754

AGNIESZKA PARLIŃSKA

agnieszka_parlinska@sggw.edu.pl
Warsaw University of Life Sciences. Institute of Economy and Finances
166 Nowoursynowska St., 02-878, Warsaw, Poland
ORCID ID: https://orcid.org/0000-0001-6640-3097

Is Military Expenditure Still Important for Economic Growth? Case for the Bucharest Nine (B-9) Countries[*]

Keywords: military expenditure; economic growth; Bucharest Nine (B-9); AMG estimator

JEL: C23; H50; O11; O40

How to quote this paper: Cengiz, O., & Parlińska, A. (2025). Is Military Expenditure Still Important for Economic Growth? Case for the Bucharest Nine (B-9) Countries. *Annales Universitatis Mariae Curie-Skłodowska, sectio H – Oeconomia*, *59*(1), 21–36.

[*] This paper is supported by the Polish National Commission for UNESCO. We are grateful for its valuable contribution. The manuscript is an extended version of the abstract titled "Is Military Expenditure Still Important for Economic Growth? Case for the Bucharest Nine (B-9) Countries" presented at the International CEO Social Sciences Congress held in Astana, Kazakhstan on 5–7 July 2024.

Abstract

Theoretical background: The economic growth (EG) effects of military expenditure (MEX) are of particular interest in the defence economics literature. Based on the theoretical background, MEX has a two-sided effect on EG. An increase in MEX stimulates aggregate demand, which increases EG, whereas increasing MEX may crowd out investment and impede EG. The empirical literature does not agree on the relationship between MEX and EG.

Purpose of the article: This paper investigates the impact of MEX on EG using annual data from 1995 to 2022 for a panel sample of the Bucharest Nine (B-9) countries, including Bulgaria, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and Slovakia.

Research methods: The augmented mean group (AMG) estimator is employed as a second-generation panel estimation technique to determine the relationship between MEX and EG.

Main findings: The AMG estimator results for the panel group indicate that MEX has a positive effect on EG. Furthermore, gross fixed capital formation and exports of goods and services contribute to EG. The empirical results vary country-specifically. For instance, MEX significantly impacts EG in Estonia, Hungary, Latvia, and Romania. In contrast, it negatively impacts EG in Czechia and Slovakia. Moreover, it has an insignificantly positive impact in Bulgaria and Poland and an insignificantly negative effect in Lithuania.

Introduction

The last two centuries were labelled with remarkable economic growth (EG) and wealth increase (Kibalnyk, 2013). Since the Industrial Revolution, EG has undoubtedly become a priority for countries, and nowadays, it continues to play a vital role in the development process. From classical economics, it is widely discussed and researched which factors are crucial to economic development. Military expenditure (MEX) is a substantial factor affecting various channels and is still crucial for many countries. MEX can represent an opportunity cost by diverting resources from productive investments such as education, healthcare, and infrastructure. This crowding-out effect may stifle long-term EG. Daněk (2015) and Alptekin and Levine (2012) highlighted the duality of this relationship, where excessive MEX could harm growth, especially in mature economies with limited fiscal space.

Indeed, the nexus between MEX and EG can be traced to the Keynesian economic model. As known from Keynesian economics, an increase in MEX as part of government expenditure fosters aggregate demand, and through the multiplier, EG rises (Malizard, 2010). Specifically, the relationship between MEX and EG is pioneered with Benoit's (1978) work. According to Benoit (1978), MEX has several roles in civil economies. Firstly, MEX contributes to meeting people's needs, including housing, clothing, and feeding. Secondly, it fosters EG by increasing human capital. Along with military expenditure, education, health, and training capabilities also rise. Thirdly, MEX creates positive externalities through facilitating big infrastructure investments (roads, dams, airports, and communication networks). Fourth, military activities are closely related to technological development that empowers the civil economy. Since military forces engage in research and development facilities, commodities and manufactured products are produced simultaneously.

The EG effects of MEX are of special interest in the defence economics literature. Researchers have employed diverse theoretical frameworks, empirical models, and case studies to explore this complex relationship. Based on the theoretical background, MEX has a two-sided effect on EG. On the one hand, it is asserted that an increase in MEX stimulates aggregate demand by promoting output and employment. Besides, MEX incentivises the human capital level of countries through several channels, covering technological education, political stability, etc. (Manamperi, 2016). Defence-related R&D often results in innovations that benefit civilian sectors, such as aerospace, computing, and telecommunications (Desli et al., 2017). On the other hand, it is also argued that MEX may crowd out investment and impede EG. In other words, a trade-off emerges between productive and non-productive government expenditures (Arshad et al., 2017). High military budgets may reduce investments in critical sectors like education, healthcare, and innovation, as suggested by Churchill and Yew (2018). Persistent military spending may lead to debt accumulation and reduce fiscal flexibility, particularly in resource-constrained economies (Ajmair et al., 2018; Nagy, 2024). Additionally, a heavy focus on defence industries may distort economic structures, limiting diversification and growth potential (Manamperi, 2016). As emphasised in the relevant literature, sometimes the effect of private investment may be larger than public investment (Brzozowski, 2023). Hence, crowding out private investment may negatively influence EG.

Nowadays, it is a fact that the world is becoming more militarised. However, thanks to globalisation, the world is expected to become more peaceful; in reality, the world is moving away from this target. The recent report of the Stockholm International Peace Research Institute (SIPRI) prepared by Tian et al. (2024) validates the militarisation of the world. The MEX reached USD 2443 billion, with an increase of 6.8% since 2009. This is also a record level of MEX. The largest increase in expenditures was recorded in the United States, China, Russia, India, and Saudi Arabia, which together accounted for 61% of global MEX. At the same time, in 2023, the MEX of the North Atlantic Treaty Organization (NATO) members was USD 1.341 billion, which equals 55% of global MEX. The share of MEX over GDP also reached 2.3%. Eleven of 31[1] NATO members[2] in 2023 reached 2% NATO target level of GDP military spending (Tian et al., 2024). Hence, it is unsurprising that the effect of MEX on EG is still important and examined by researchers.

The empirical literature does not agree on the relationship between military expenditures and EG. Therefore, new empirical findings using different sample, period, and estimator techniques can deepen our understanding of the nexus between MEX and EG.

[1] The number of NATO members was 31 in 2023. With the inclusion of Sweden, it rose to 32 in 2024.

[2] These countries are the United States, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Finland, France, Greece, and the United Kingdom (SIPRI, 2024).

The current paper investigates the impact of MEX on EG for a panel sample of the Bucharest Nine (B-9) countries, including Bulgaria, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and Slovakia, using annual data over the period 1995–2022. The main purpose of investigating the B-9 countries is that, considering recent events in the global system, militarisation has increased worldwide, and the B-9 countries represent a significant group that has a crucial role in NATO's eastern flank.

There are two expected contributions of this study to the given literature: 1) to the best of our knowledge, this is focusing on the effect of MEX on EG for a panel sample of B-9 countries; 2) we perform the AMG estimator as a second-panel data estimator that takes into the cross-sectional dependence (CSD). There are two important reasons for choosing the AMG estimator in the current study. Firstly, in the panel data econometrics, ignoring the presence of the CSD may cause inconsistent and biased results. The AMG considers the presence of the CSD. Secondly, most estimation methods in the panel data do not provide country-specific results. They only offer panel group results. However, the AMG estimator provides both panel group and country-specific results. Hence, comparing results for panel and individual country levels becomes possible.

The paper consists of five sections: Section 1 discusses the building of the B-9 initiative. Section 2 summarises the empirical literature review. Section 3 highlights the data, model, and methodology. Section 4 documents the empirical findings, and Section 5 concludes the study with policy recommendations based on the empirical findings.

An evaluation of the B-9 initiative

The Bucharest Nine States (B-9) regional initiative was established on 4 November 2015 in response to the evolving security in Europe launched by Poland and Romania. It is a broad geostrategic project known as the Three Seas Initiative, which aims to strengthen the eastern flank of the Alliance and promote cooperation between the Visegrad Group (V4), the Baltic States, Romania, the Western Balkan NATO countries and the Nordic NATO members (Denmark and Norway), as well as the non-NATO member states of Sweden and Finland.[3] There are three possible reasons for establishing this initiative among nine countries. Firstly, Poland and Romania aim to be leaders in Central and Eastern Europe (CEE) and the Black Sea region. Secondly, it aims to dampen Russia's potential threats, and thirdly, it may strengthen cooperation in terms of regional security among CEE countries (Gerasymchuk, 2019). More importantly, the introduction of B-9 cannot be considered without Russia's geopolitical aims. Hence, the B-9 initiative is seen as a proactive creation (Nagy, 2024).

[3] Finland became a NATO member in 2023, and Sweden in 2024.

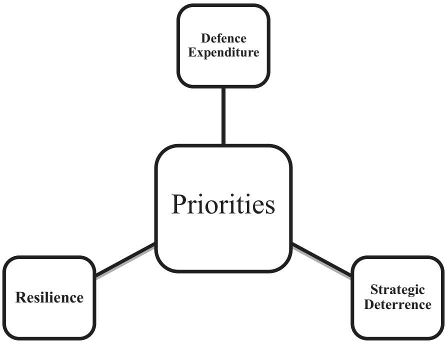

Figure 1. Main priorities of the B-9 initiative

Source: (Nagy, 2024).

As depicted in Figure 1, the main priorities of the B-9 initiative can be categorised into three frameworks. They cover defence expenditure, resilience, and strategic deterrence. The first one, defence expenditure, aims to allocate financial funds for the defence system of countries to impede potential risks from Russia. The second priority, resilience, focuses on establishing a resilient solidarity among the B-9 countries to challenge all threats. Finally, the third priority, strategic deterrence, is instrumental in shaping NATO's strategic deterrence in the CEE region (Nagy, 2024).

Most B-9 countries have a similar development process. Following the collapse of the Soviet Union and the breakup of Yugoslavia and Czechoslovakia, a new development process emerged in these countries. For example, they evolved to become members of the European Union (EU). This period also saw the dominance of liberal thoughts, which were widely imposed on CEE to catch up with advanced economies' paths (Pawłuszko, 2021).

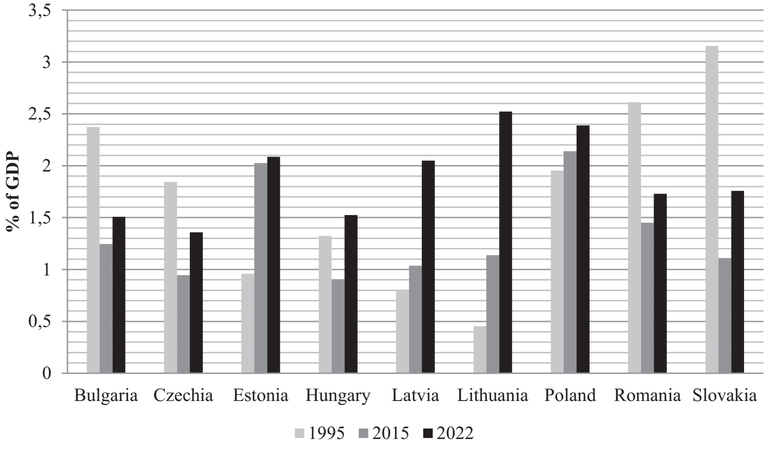

Figure 2. MEX in the B-9 countries

Source: (World Bank, 2024).

The data in Figure 2 shows the MEX in the B-9 countries, with varying percentages for each country. In 1995, the MEX percentages were as follows: Bulgaria 2.37%, Czechia 1.84%, Estonia 0.95%, Hungary 1.32%, Latvia 0.80%, Lithuania 0.45%, Poland 1.95%, Romania 2.61%, and Slovakia 3.15%. This indicates that Slovakia had the highest MEX at 3.15%, while Lithuania had the lowest MEX at 0.45% in 1995 among the B-9 countries. The most conspicuous point is that following the launch of the B-9 initiative, MEX has risen in all countries in 2022 compared to 2015. It has risen from 1.24%, 0.94%, 2.02%, 0.90%, 1.03%, 1.13%, 2.14%, 1.45%, and 1.10% to 1.50%, 1.35%, 2.08%, 1.52%, 2.04%, 2.52%, 2.38%, 1.73%, and 1.75% in Bulgaria, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and Slovakia, respectively from 2015 to 2022. The highest MEX share belongs to Lithuania with 2.52%, and Czechia has the lowest share of MEX with 1.35% in 2022 among the B-9 countries.

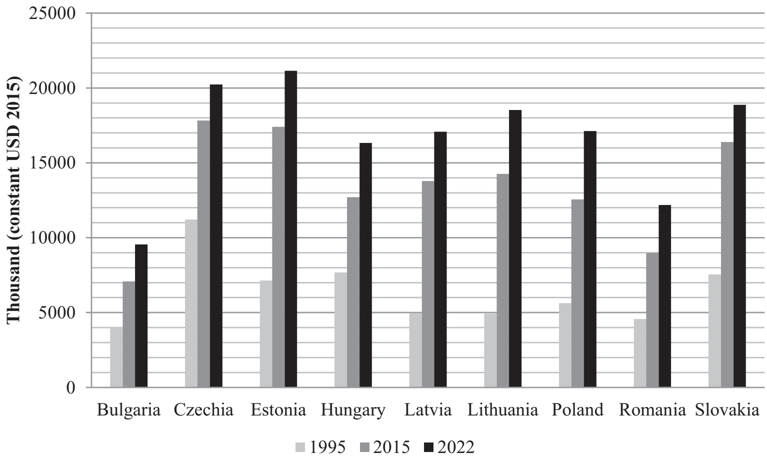

Figure 3. GDP per capita in the B-9 countries

Source: (World Bank, 2024).

Figure 3 depicts GDP per capita (with constant 2015 USD) in the B-9 countries. Notably, EG has progressively increased in all countries. GDP per capita was USD 4.025, USD 11.219, USD 7.137, USD 7.675, USD 4.969, USD 4.936, USD 5.628, USD 4.570, and USD 7.542 in Bulgaria, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and Slovakia, respectively in 1995. It has reached USD 7.078, USD 17.829, USD 17.402, USD 12.717, USD 13.786, USD 14.263, USD 12.560, USD 8.976, and USD 16.390 in Bulgaria, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and Slovakia, respectively in 2015. As of 2022, Estonia has the highest GDP per capita at USD 21.14, followed by Czechia at USD 20.237, Slovakia at USD 18.877, Lithuania at USD 18.535, and Bulgaria at the lowest at USD 9.550. Therefore, it is clearly shown that the B-9 countries have been labelled with significant EG for the last 30 years.

Following the collapse of the Soviet Union, the integration of these countries into the world economy accelerated, and they adopted liberalisation policies, including deregulations, liberalised markets, and reduced government interventions. However, the solid economic performance of these countries cannot be solely attributed to a liberalisation of the economy. The government sector is essential in enhancing economic development in the B-9 countries. Therefore, a critical question about how MEX affects EG in the B-9 countries inevitably emerges.

Literature review

The literature on the MEX-EG nexus has evolved significantly in recent years, with new empirical evidence incorporating more advanced econometric techniques, larger datasets, and more complex approaches to understanding the complexity of the relationship. Recently, studies have moved beyond the simple linear models and have focused on more sophisticated methodologies such as panel data analysis, dynamic models, and non-linear approaches better to capture the diverse effects of MEX on EG.

As Churchill and Yew (2018) mentioned, military spending can affect the real economy through supply, demand, and national security. The demand channel is obtained from the Keynesian perspective and supports the state that MEX can stimulate EG through demand-side effects. Increased government spending on the military can lead to higher aggregate demand, employment, and investment, which can boost EG, especially during periods of economic downturn. Studies conducted in developed countries, especially during or after wars, often show a positive relationship between MEX and EG. Some studies, like those by Daněk (2015) or Temitope and Olayinka (2021), found a positive correlation between MEX and EG in developing countries, suggesting that MEX could create a conducive environment for economic development by improving infrastructure and stability.

The supply channel is associated with the school of neoliberalism, which treats national defence as a public good that generates opportunity costs. It points to costs through crowding out private investment in the economy (inflation), an unsustainable international financial position due to equipment purchases, and other macroeconomic indicators (e.g. excessive public debt). Critics argue that MEX has an opportunity cost; resources allocated to the military could have been used more productively in other sectors like health, education, and infrastructure. Researchers like Odehnal et al. (2021), Dunne and Tian (2016) and Manamperi (2016) suggest that in developing countries, especially those with high levels of military spending, there is a negative relationship between MEX and EG. This is because such expenditures often lead to reduced human capital and productive capacity investments.

Additionally, Arshad et al. (2017) pointed out that military expenditures are crucial for national security, which is considered a key factor in the survival and functioning of any economy. This is consistent with Adam Smith's premise that every state's primary responsibility is to protect its citizens from any domestic or foreign threats. So, an increase in military spending on war and security threats leads to higher EG. However, if the increase in expenditure results from rent-seeking behaviour, then the consequences can be adverse due to the country's involvement in the arms race and destructive wars. In line with these arguments, several studies focused on the association between MEX and EG. For instance, Hirnissa et al. (2009) examined the nexus between MEX and EG for a case of ASEAN-5 with annual data from 1965 to 2006. The empirical findings revealed the long relationship between two variables in Indonesia, Thailand, and Singapore. Alptekin and Levine (2012) researched the association between MEX and EG by employing a meta-analysis of 32 studies. The authors' results show that the positive relationship between MEX and EG is observed in developed countries. Malizard (2010) analysed the relationship between MEX and EG in France using annual data from 1960 to 2008. The Granger-causality result indicates a two-way causality relationship between MEX and EG.

Gerace (2002) scrutinised the relationship between MEX, non-military expenditures, and EG in the USA from 1951 to 1997. Empirical findings suggest that MEX has no significant effect on EG. Similarly, Ajmair et al. (2018) examined the effect of MEX on EG in Pakistan from 1990 to 2015. Their findings reported that MEX does not affect EG. Abdel-Khalek et al. (2020) found no relationship between MEX and EG in India. Saba and Ngepah (2019) tested the causality relationship between MEX and EG in 35 African countries from 1990 to 2015. The empirical findings indicate that in the 14 countries of the panel sample, there is a unidirectional causality running from EG to MEX; in the 12 countries, there exists feedback causality; and in 2 countries, there is a one-way causality running from MEX to EG. Likewise, Desli et al. (2017) looked into the causality nexus between MEX and EG in 138 countries with data from 1988–2013; they found that there is a causality running from MEX to EG only in developing countries. In contrast, causality exists between EG and MEX except in the least developed countries. Töngür and Elveren (2017) documented the negative effect of MEX on EG for a panel sample of 82 countries by performing data belonging to 1988–2008. The literature summary regarding the countries, methods, and findings is presented in Table 1.

Table 1. Empirical literature summary

Study	Country	Method	Findings
Gokmenoglu et al. (2015)	Turkey 1988–2013	Johansen co-integration and Granger causality tests	One-way causality from EG to MEX
Daněk (2015)	28 EU countries 1993–2013	Cluster analysis	There is a positive relationship between MEX and EG in the case of more resource-abundant countries and a negative relationship in the case of more resource-constrained countries

Study	Country	Method	Findings
Dunne and Tian (2016)	97 countries 1960–2014	OLS	MEX negatively affects EG
Manamperi (2016)	Turkey and Greece 1970–2013	ARDL and VECM	MEX negatively affects EG in Turkey, and there is no association in Greece
Arshad et al. (2017)	61 countries 1988–2015	Least Square Dummy Variable (LSDV)	MEX and arms imports have a negative impact on EG
Waszkiewicz (2020)	Visegrad Countries 1993–2015	Causality test	No long-term causality between MEX and EG
Temitope and Olayinka (2021)	Nigeria 1981–2017	ARDL	MEX positively affects EG
Nugroho and Purwanti (2021)	27 Lower-Middle Income Countries 2002–2018	System GMM	MEX does not affect EG
Odehnal et al. (2021)	27 NATO countries 1993–2019	ARDL	MEX positively affects EG
Raifu and Aminu (2023)	14 MENA countries 1981–2019	Moments Quantile Regression	MEX enhances EG
Woźniak and Lewkowicz (2023)	173 countries 1949–2020	Panel data	MEX's effects on EG are shallow

Source: Authors' own study.

Researchers argue that the relationship is not straightforward (Nugroho & Purwanti, 2021; Waszkiewicz, 2020; Woźniak & Lewkowicz, 2023) and may depend on various factors such as institutional quality, geopolitical stability, and the stage of economic development. Therefore, MEX could have a negligible or mixed impact on EG. As can be seen, the literature on the relationship between MEX and EG is diverse and ambiguous, reflecting the issue's complexity. The relationship varies depending on factors such as the level of economic development, the geopolitical context, the methodological approach, and the specific periods the study covers. Therefore, there is no single universal answer, and the impact of MEX on EG must be assessed in the context of a specific country or region.

Data, model, and empirical strategy

Data and model

The current paper examines the impact of MEX on EG for a panel sample of the B-9 countries, i.e. Bulgaria, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and Slovakia. The World Bank's annual data from 1995 to 2022 were used. Our empirical model is constructed as follows:

$$\mathrm{GDP_{it}} = \mathrm{f(MEX_{it}, CAP_{it}, EXP_{it})} \tag{1}$$

In Eq. (1), GDP represents economic growth, MEX is military expenditures, CAP is capital formation, and EXP is total exports. Table 2 explains the variables, units of variables, and data sources.

Table 2. Data description

Variable	Definition	Measurement	Source
GDP	Economic growth	Gross domestic product per capita, 2015 constant USD	World Bank (2024)
MEX	Military expenditure	Military expenditure (% of GDP)	World Bank (2024)
CAP	Capital formation	Gross fixed capital formation (% of GDP)	World Bank (2024)
EXP	Total exports	Exports of goods and services (current USD)	World Bank (2024)

Source: Authors' own study.

Our empirical model in Eq. (1) is converted to logarithmic form as expressed in the following equation:

$$\mathrm{lnGDP_{it}} = \beta_0 + \beta_1 \mathrm{lnMEX_{it}} + \beta_2 \mathrm{lnCAP_{it}} + \beta_3 \mathrm{lnEXP_{it}} + \mu_{it} \tag{2}$$

In Eq. (2), *I* and *t* denote country and period, respectively, β is the coefficient of the parameters, and μ_{it} is the error term.

Empirical strategy

In econometric analysis, the empirical strategy consists of several stages. All stages of econometric strategy begin with preliminary tests. Preliminary tests determine the appropriate estimator for the model. In other words, it is important to determine the appropriate tests for the following stages in line with preliminary analyses. The first crucial step is testing the existence of CSD in the model. In the case of CSD, indicating that any shocks may spread to each other requires performing second-generation panel estimation techniques.

In our study, we provide the descriptive statistics of variables in the first stage. In the second stage, we test the CSD and slope homogeneity. We utilised Breusch and Pagan's (1980) Lagrange multiplier (LM) test, Pesaran's (2004) scaled LM and CD tests, and Baltagi et al.'s (2012) bias-corrected scaled LM to examine the CSD in the model.

Moreover, Pesaran and Yamagata's (2008) Delta (Δ) test is utilised in the analysis to determine slope homogeneity. Following the CSD and slope homogeneity test, we performed Pesaran's (2007) cross-sectionally augmented Im-Pesaran-Shin (CIPS) unit root test to test the stationary conditions of variables. In the case of the CSD and slope heterogeneity, performing the second-generation panel unit root test is essential, as it provides robust results. Hence, the CSD and slopeheterogeneity exist in our model. Thus, we proceed with the CIPS unit root test as a second-generation unit root test. The test for the CIPS unit root test can be expressed as follows (Qudrat-Ullah & Nevo, 2022):

$$\mathrm{CIPS(N,T)} = \frac{1}{N}\sum_{i=1}^{N} t_i(N,T) \tag{3}$$

where $t_i(N, T)$ is cross-sectional augmented Dickey–Fuller (CADF) test statistics (Ng et al., 2020) and can be written as the following equation (Shaikh & Malik, 2023):

$$\mathrm{CADF} = t(N,T) = \frac{\Delta y_i^L \bar{A}_i y_{i-1}}{(\Delta y_{i-1}^L \bar{A}_i y_{i-1})^{\frac{1}{2}}} \tag{4}$$

In the presence of the CSD, using the panel data estimators that ignore the CSD may offer biased results. Hence, it is convenient to perform second-panel data estimators in the presence of the CSD. For this purpose, we employed the AMG estimator Eberhardt and Bond (2009) developed as a second-generation estimator. There are important superiors of this method. Firstly, it allows the CSD to incorporate the common dynamic effect parameter (Wang & Dong, 2019). Secondly, it is possible to apply this method when there are non-stationary variables (Destek, 2020). The estimation of the AMG estimator consists of two stages (Wang & Dong, 2019).

Stage 1:

$$\Delta y_{it} = \alpha_i + \beta_i \Delta x_{it} + \vartheta_i f_t + \sum_{t=2}^{T} \gamma_i \Delta D_t + \mu_{it} \tag{5}$$

Stage 2:

$$\hat{\beta}_{AMG} = \frac{1}{N}\sum_{i=1}^{N} \hat{\beta}_i \tag{6}$$

where y_{it} and x_{it} denote dependent and independent variables, respectively. β_i is the coefficient parameters; *ft* represents the unobserved common factor; γ_i is the coefficient of the time dummies; $\hat{\beta}_{AMG}$ denotes the mean group estimator for AMG, and μ_{it} is the error term (Wang & Dong, 2019).

Empirical findings

In the first stage of our empirical findings, we document the descriptive statistics of variables (Table 3).

Table 3. Descriptive statistics of variables

Specification	lnGDP	lnMEX	lnCAP	lnEXP
Mean	9.248695	0.416378	3.143812	24.19753
Median	9.329522	0.466766	3.141764	24.21071
Maximum	9.985401	1.148848	3.618632	26.79019
Minimum	8.172039	-0.788837	1.493400	21.41685
Std. Dev.	0.429737	0.343198	0.222172	1.239602

Specification	lnGDP	lnMEX	lnCAP	lnEXP
Skewness	-0.470656	-0.515541	-1.662284	-0.193863
Kurtosis	2.389204	3.337765	14.56682	2.255879
Jarque-Bera	13.22097	12.36077	1520.864	7.392512
Probability	0.001346	0.002070	0.000000	0.024816
Sum	2330.671	104.9272	792.2406	6097.777
Sum Sq. Dev.	46.35315	29.56401	12.38951	385.6897
Observations	252	252	252	252

Source: Authors' own study.

As indicated in Table 3, lnEXP has the highest mean and median values. It is followed by lnGDP, lnCAP, and lnMEX. Also, lnEXP has the highest standard deviation with 1.23, followed by lnGDP with 0.42, lnMEX with 0.34, and lnCAP with 0.22.

Table 4. Results of CSD and slope homogeneity tests

Variable	Breusch-Pagan LM	Pesaran scaled LM	Bias-corrected scaled LM	Pesaran CD
lnGDP	959.1648 [0.000]	108.7960 [0.000]	108.6294 [0.000]	30.96685 [0.000]
lnMEX	277.1796 [0.000]	28.42329 [0.000]	28.25663 [0.000]	6.673684 [0.000]
lnCAP	147.3881 [0.000]	13.12722 [0.000]	12.96055 [0.000]	6.462151 [0.000]
lnEXP	980.4632 [0.000]	111.3061 [0.000]	111.1394 [0.000]	31.31067 [0.000]
Slope homogeneity tests				
Delta ($\tilde{\Delta}$)			Delta $(\tilde{\Delta})_{adj}$	
	Test statistic	*p*-value	Test statistic	*p*-value
	8.094	0.000	8.931	0.000

Note: The values in the [] denote probability.

Source: Authors' own study.

The CSD test results reject the null hypothesis of no CSD in the model at the 1% significance level. This means that CSD exists among the B-9 countries. Hence, a shock occurs in one of the B-9 countries and transmits to others. Moreover, the slope homogeneity test results indicate a slope heterogeneity in the model.

Table 5. The CIPS unit root test results

Variables	Deterministic	At level	At first difference	Order of integration
lnGDP	Constant	-2.210	-3.528	I(1)
	Constant & trend	-1.920	-3.831	
lnMEX	Constant	-2.044	-5.049	I(1)
	Constant & trend	-2.830	-5.262	
lnCAP	Constant	-2.158	-4.962	I(1)
	Constant & trend	-2.681	-5.177	
lnEXP	Constant	-2.479	-4.577	I(1)
	Constant & trend	-2.642	-4.984	

Note: The critical values for the constant are: -2.21, -2.33, and -2.57 for 10%, 5%, and 1%, respectively. Critical values for the constant & trend are: -2.73, -2.86, -3.1 for 10%, 5%, and 1%, respectively.

Source: Authors' own study.

The CIPS unit root test result is reported in Table 5. According to the results, lnGDP and lnCAP are a unit root process at levels in both constant and constant & trend at a 1% significance level. Both variables become stationary at first difference. Moreover, lnMEX has a unit root test at a level in the constant model. However, it is stationary at a level in the constant & trend model at a 10% significance level but has a unit root at 5% and 1% levels. It becomes stationary at the first difference at 1% in all models. Finally, lnEXP is stationary at a level in the constant model at a 5% significance level. However, it has a unit root at a level in the constant & trend model at a 1% significance level. It also becomes stationary at the first difference in the constant & trend model at a 1% significance level.

Table 6. AMG long-run results

Countries	Constant term	lnMEX	lnCAP	lnEXP
Bulgaria	3.130 [0.000]	0.023 [0.578]	-0.050 [0.024]	0.231 [0.000]
Czechia	6.252 [0.000]	-0.060 [0.001]	0.290 [0.000]	0.087 [0.000]
Estonia	4.669 [0.000]	0.231 [0.000]	0.350 [0.000]	0.143 [0.000]
Hungary	6.799 [0.000]	0.057 [0.056]	0.131 [0.034]	0.071 [0.000]
Latvia	3.416 [0.000]	0.060 [0.064]	0.221 [0.000]	0.210 [0.000]
Lithuania	4.523 [0.000]	-0.010 [0.692]	0.055 [0.200]	0.175 [0.000]
Poland	4.220 [0.002]	0.241 [0.129]	0.025 [0.799]	0.173 [0.001]
Romania	2.916 [0.000]	0.118 [0.007]	0.059 [0.271]	0.224 [0.000]
Slovakia	5.605 [0.000]	-0.077 [0.020]	0.035 [0.663]	0.140 [0.000]
Whole panel	4.615 [0.000]	**0.064 [0.089]**	**0.124 [0.006]**	**0.162 [0.000]**

Note: The values in the [ ] denote probability.
Source: Authors' own study.

The AMG estimator results for the whole panel indicate that MEX positively affects EG. Furthermore, gross fixed capital formation and exports of goods and services contribute to EG. The empirical results vary country-specific. For example, MEX has a significantly positive impact on EG in Estonia, Hungary, Latvia, and Romania. In contrast, it has a negative effect on EG in Czechia and Slovakia. Moreover, it has an insignificantly positive impact in Bulgaria and Poland and an insignificantly negative effect in Lithuania. The relationship between MEX and EG is unclear in the existing literature, and different results may be found. For example, the positive effect of MEX on EG is in line with the studies of Temitope and Olayinka (2021), Odehnal et al. (2021), and Raifu and Aminu (2023); the negative effect of MEX is in line with Dunne and Tian (2016) and Arshad et al. (2017). Moreover, the insignificant effect is in line with Nugroho and Purwanti (2021).

Gross fixed capital formation has a positive effect on EG in the whole panel, Czechia, Estonia, Hungary, and Latvia. In contrast, it negatively influences EG in Bulgaria. In addition, total exports have a positive impact on the panel group and all countries.

Conclusions and recommendations

Despite high liberalisation, the government plays a crucial role in the economy. Based on the Keynesian economic model, government interventions have been expanded to stimulate aggregate demand by accelerating government expenditures. MEX is one of the fundamental government expenditures with two side effects on the economy. The current study examines the impact of MEX on EG in the B-9 countries.

Although country-specific results vary across the panel, MEX stimulates EG in most countries. For instance, MEX has a significantly positive impact in Estonia, Hungary, Latvia, and Romania. In contrast, it has a negative effect in Czechia and Slovakia. Moreover, it has an insignificantly positive impact in Bulgaria and Poland and an insignificantly negative effect in Lithuania. The research results confirm those of previous studies and show differentiation depending on the level of economic development or the geopolitical context.

Due to security and political results, countries may increase MEX, stimulating EG. However, it should be kept in mind that, in the long run, it can be challenging to sustain increased military expenditures. In other words, increasing military expenditures can burden the government budget, government debt, and inflation. The government should balance the growth effect of military expenditures with the negative effect of crowding out private investment in military expenditures. In order to realise sustainable EG, investment in capital formation and promoting exports is crucial for the B-9 countries.

References

Abdel-Khalek, G., Mazloum, M.G., & El Zeiny, M.R.M. (2020). Military expenditure and economic growth: The case of India. *Review of Economics and Political Science*, *5*(2), 116–135. **https://doi.org/10.1108/REPS-03-2019-0025**

Ajmair, M., Hussain, K., Abbassi, F.A., & Gohar, M. (2018). The impact of military expenditures on economic growth of Pakistan. *Applied Economics and Finance*, *5*(2), 41–48.

Alptekin, A., & Levine, P. (2012). Military expenditure and economic growth: A meta-analysis. *European Journal of Political Economy*, *28*(4), 636–650.

Arshad, A., Syed, S.H., & Shabbir, G. (2017). Military expenditure and economic growth: a panel data analysis. *Forman Journal of Economic Studies*, *13*, 161–175.

Baltagi, B.H., Feng, Q., & Kao, C. (2012). A lagrange multiplier test for cross-sectional dependence in a fixed effects panel data model. *Journal of Econometrics*, *170*(1), 164–177. **https://doi.org/10.1016/j.jeconom.2012.04.004**

Benoit, E. (1978). Growth and defense in developing countries. *Economic Development and Cultural Change*, *26*(2), 271–280.

Breusch, T.S., & Pagan, A.R. (1980). The lagrange multiplier test and its applications to model specification in econometrics. *The Review of Economic Studies*, *47*(1), 239–253. **https://doi.org/10.2307/2297111**

Brzozowski, M. (2023). The relationship between private and public investment in developing countries with different levels of human capital. *Annales Universitatis Mariae Curie-Skłodowska, sectio H – Oeconomia*, *57*(3), 7–31. **http://dx.doi.org/10.17951/h.2023.57.3.7-31**

Churchill, S.A., & Yew, S.L. (2018). The effect of military expenditure on growth: an empirical synthesis. *Empirical Economics*, *55*, 1357–1387. **https://doi.org/10.1007/s00181-017-1300-z**

Daněk, T. (2015). Military expenditures and economic growth: The case of EU countries. *Ekonomický Časopis*, *63*(8), 853–868.

Desli, E., Gkoulgkoutsika, A., & Katrakilidis, C. (2017). Investigating the dynamic interaction between military spending and economic growth. *Review of Development Economics*, *21*(3), 511–526. **https://doi.org/10.1111/rode.12268**

Destek, M.A. (2020). Investigation on the role of economic, social, and political globalization on environment: evidence from CEECs. *Environmental Science and Pollution Research*, *27*, 33601–33614. **https://doi.org/10.1007/s11356-019-04698-x**

Dunne, J.P., & Tian, N. (2016). Military expenditure and economic growth, 1960–2014. *The Economics of Peace and Security Journal*, *11*(2), 50–56. **https://doi.org/10.15355/epsj.11.2.50**

Eberhardt, M., & Bond, S. (2009). Cross-section dependence in nonstationary panel models: A novel estimator. *MPRA Paper No. 17692*. https://mpra.ub.uni-muenchen.de/17870/

Gerace, M.P. (2002). US military expenditures and economic growth: Some evidence from spectral methods. *Defence and Peace Economics*, *13*(1), 1–11. **https://doi.org/10.1080/10242690210966**

Gerasymchuk, S. (2019). *Bucharest Nine: Looking for Cooperation on NATO's Eastern Flank?* Friedrich Ebert Stiftung.

Gokmenoglu, K.K., Taspinar, N., & Sadeghieh, M. (2015). Military expenditure and economic growth: the case of Turkey. *Procedia – Economics and Finance*, *25*, 455–462. **https://doi.org/10.1016/S2212-5671(15)00757-1**

Hirnissa, M.T., Habibullah, M.S., & Baharom, A.H. (2009). Military expenditure and economic growth in Asean-5 countries. *Journal of Sustainable Development*, *2*(2), 192–202.

Kibalnyk, L.O. (2013). Impact of world financial crises on geoeconomic transformations. *Annales Universitatis Mariae Curie-Skłodowska, sectio H – Oeconomia*, *47*(4), 57–66. https://journals.umcs.pl/h/article/view/1545

Malizard, J. (2010). Causality between economic growth and military expenditure: The case of France. *Defense & Security Analysis*, *26*(4), 401–413.

Manamperi, N. (2016). Does military expenditure hinder economic growth? Evidence from Greece and Turkey. *Journal of Policy Modeling*, *38*, 1171–1193. **http://dx.doi.org/10.1016/j.jpolmod.2016.04.003**

Nagy, T.A. (2024). *The Bucharest Nine: Enhancing Security on NATO's Eastern Flank*. https://www.gmfus.org/

Ng, C.F., Choong, C.K., & Lau, L.S. (2020). Environmental Kuznets curve hypothesis: asymmetry analysis and robust estimation under cross-section dependence. *Environmental Science and Pollution Research*, *27*, 18685–18698. **https://doi.org/10.1007/s11356-020-08351-w**

Nugroho, D.A., & Purwanti, E.Y. (2021). Impact of military expenditure on economic growth encouraging or constraining?. *JEJAK: Journal of Economics and Policy*, *14*(1), 9–20. **https://doi.org/10.15294/jejak.v14i1.26062**

Odehnal, J., Neubauer, J., Olejníček, A., Boulaouad, J., & Brizgalová, L. (2021). Empirical analysis of military expenditures in NATO nations. *Economies*, *9*, 107. **https://doi.org/10.3390/economies9030107**

Pawłuszko, T. (2021). The rise of geopolitics in Poland and Eastern Europe: The Three Seas and the Bucharest Nine initiatives. *The Copernicus Journal of Political Studies*, *1*, 5–26. **http://doi.org/10.12775/CJPS.2021.001**

Pesaran, M.H. (2004). General diagnostic tests for cross section dependence in panels. *IZA Discussion Paper*, *1240*. https://docs.iza.org/dp1240.pdf

Pesaran, M.H. (2007). A simple panel unit root test in the presence of cross-section dependence. *Journal of Applied Econometrics*, *22*(2), 265–312. **https://doi.org/10.1002/jae.951**

Pesaran, M.H., & Yamagata, T. (2008). Testing slope homogeneity in large panels. *Journal of Econometrics*, *142*(1), 50–93. **https://doi.org/10.1016/j.jeconom.2007.05.010**

Qudrat-Ullah, H., & Nevo, C.M. (2022). Analysis of the dynamic relationships among renewable energy consumption, economic growth, financial development, and carbon dioxide emission in five sub-Saharan African countries. *Energies*, *15*, 5953. **https://doi.org/10.3390/en15165953**

Raifu, I.A., & Aminu, A. (2023). The effect of military spending on economic growth in MENA: Evidence from method of moments quantile regression. *Future Business Journal*, *9*, 7. **https://doi.org/10.1186/s43093-023-00181-9**

Saba, C.S., & Ngepah, N. (2019). Military expenditure and economic growth: Evidence from a heterogeneous panel of African countries. *Economic Research / Ekonomska Istraživanja*, *32*(1), 3586–3606. **https://doi.org/10.1080/1331677X.2019.1674179**

Shaikh, O., & Malik, Z. (2023). The EKC hypothesis in BRICS-4 countries and USA: a novel second generation panel data analysis. *International Journal of Creative Research Thoughts*, *11*(3), e377–e391.

SIPRI. (2024). Military Expenditure Database. **https://doi.org/10.55163/CQGC9685**

Temitope, L.J., & Olayinka, A. (2021). Military expenditure and economic growth: evidence from Nigeria. *American Journal of Economics*, *11*(1), 10–18. **https://doi.org/10.5923/j.economics.20211101.02**

Tian, N., Da Silva, D.L., Liang, X., & Scarazzato, L. (2024). Trends in world military expenditure, 2023. *SIPRI Fact Sheet*.

Töngür, Ü., & Elveren, A.Y. (2017). The nexus of economic growth, military expenditures, and income inequality. *Quality & Quantity*, *51*, 1821–1842. **https://doi.org/10.1007/s11135-016-0368-4**

Wang, J., & Dong, K. (2019). What drives environmental degradation? evidence from 14 sub-Saharan African countries. *Science of the Total Environment*, *656*, 165–173. **https://doi.org/10.1016/j.scitotenv.2018.11.354**

Waszkiewicz, G. (2020). Defence spending and economic growth in the Visegrad countries. *Panoeconomicus*, *67*(4), 539–556. **https://doi.org/10.2298/PAN170709029W**

World Bank. (2024). https://data.worldbank.org/

Woźniak, R., & Lewkowicz, J. (2023). Can we have more butter and guns simultaneously? An endogeneity perspective. *The Polish Journal of Economics*, *314*(2), 28–46. **https://doi.org/10.33119/GN/168221**