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THE IMPACT OF MILITARY EXPENDITURES ON EXTERNAL DEBT IN SOUTHEAST EUROPEAN COUNTRIES

Uticaj vojnih rashoda na spoljni dug u zemljama jugoistočne Evrope

Abstract

This paper examines the relationship between military expenditure and external debt in Southeast European countries from 2000 to 2022, using Feasible Generalized Least Squares (FGLS) regression on panel data. The findings reveal a statistically significant and positive correlation, indicating that higher military spending contributed to the growth of external debt in the region during the analyzed period. Additionally, the research identifies a strong link between external debt, arms exports, and the presence of a domestic military industry, suggesting that this sector could play a crucial role in mitigating external debt. Given these results, the paper highlights the importance of prioritizing peaceful conflict resolution and exploring models of military integration. By doing so, countries in the region can allocate more resources to productive sectors, fostering economic growth while enhancing regional stability and attractiveness for both domestic and foreign investment.

Keywords: *Military expenditures, external debt, Southeast Europe, arms exports, panel data analysis*

Sažetak

Ovaj rad ispituje odnos između vojnih rashoda i spoljnog duga u zemljama jugoistočne Evrope u periodu od 2000. do 2022. godine, primenom regresije Izvodljivog generaliziranog najmanjeg kvadrata (FGLS) na panel podacima. Rezultati ukazuju na statistički značajnu i pozitivnu korelaciju, što znači da veća vojna potrošnja doprinosi povećanju spoljnog duga u ovom regionu tokom analiziranog perioda. Osim toga, istraživanje otkriva snažnu povezanost između spoljnog duga, izvoza naoružanja i postojanja domaće vojne industrije, što sugerise da sektor odbrane može imati značajnu ulogu u smanjenju spoljnog zaduživanja. U radu se ističe značaj mirnog rešavanja sukoba i pronalaženju modela vojne integracije u privredu društva. Na taj način, države regiona moći će usmeriti više resursa ka produktivnim sektorima, podstići privredni rast uz istovremeno jačanje regionalne stabilnosti i podsticanje kako domaćih tako i stranih investicija.

Ključne reči: *Vojni rashodi, spoljni dug, jugoistočna Evropa, izvoz naoružanja, panel analiza podataka*

Introduction

Over the past two decades, Southeast European countries¹ have avoided armed conflicts but were direct or indirect participants in those of the late 20th century. Slovenia, Bosnia and Herzegovina, Serbia, Montenegro, North Macedonia, and Croatia were directly involved, while NATO members Greece, Romania, Bulgaria, Albania and Turkey participated indirectly. The impact and consequences of these conflicts still affect the political and social relations between SEE countries [26, p. 30]. As transition states with persistent tensions and conflict risks, they provide an ideal sample for investigating the link between military expenditures and external debt. Security threats compel these countries to modernize their armed forces, train personnel, join military alliances, and increase defense spending. Meanwhile, past wars have strained fiscal resources and impoverished populations, making international borrowing a likely solution to fund growing military budgets.

From an economic perspective, investing in defense and security contributes to the long-term peace and stability of a state, which is a fundamental prerequisite for attracting new investments and fostering economic growth. Strengthening a state's defense capabilities reduces the likelihood of armed conflict within its territory, thereby allowing economic resources to be allocated toward growth and development rather than the costly reconstruction of war-damaged infrastructure. In the broadest sense, military expenditure represents financial resources allocated by country for the needs of its armed forces. According to Stockholm International Peace Research Institute (SIPRI), military expenditure encompasses all current and capital spending on armed forces, defense ministries, paramilitary forces trained for military operations, and military space activities. This includes costs related to personnel (such as salaries, pensions, and social services), operations and maintenance, procurement of weapons and equipment, military research and development, infrastructure investments (including military bases), and military aid provided by donor countries.

Military expenditures have always represented a trade-off between economic growth and national security, especially in unstable regions. Large military expenditures can significantly affect the budget distribution within a country. There is a dilemma whether directing these resources into health, education, social programs or possibly other industries would provide another form of security for the population and at the same time contribute to greater economic growth. The amount and structure of a state's military expenditures depend not only on the level of the gross domestic product or the level of development of the state's economy, but also on numerous other factors. The five most important factors are economic, political, strategic, psychological and moral [14, p. 540]. All these factors, together, play a decisive role in determining the level of military expenditure of a country.

The impact of military expenditures on external debt can be observed in three aspects. Firstly, government actions driven by the immediate threat of war or decisions to modernize defense systems – whether through the introduction of entirely new systems or the overhaul of existing ones – often disrupt budgetary balance. This disruption is primarily due to the high costs involved, which are particularly burdensome for developing and underdeveloped countries. In such situations, to provide additional funds for financing these expenditures, states first attempt to do it by using tax policy instruments or inflation instruments. However, developing and underdeveloped countries, especially those with unstable tax systems or unfavorable inflation history, opt for external borrowing due to the inability to tax their citizens additionally. Such borrowing entails the obligation to pay interest on that debt which further burdens the state budget. The final consequences of such decisions can be excessive accumulation of debt, trade deficit, overvalue of domestic currency and slowing down of economic growth [30, p. 235].

Secondly, the part of the military expenditure that is intended for the import of arms and military equipment absorbs the foreign currency necessary for international purchase and sale transactions. If the state lacks foreign currency, that is, if foreign exchange reserves are small, the state must borrow externally, which leads to an increase

1 Serbia, Montenegro, Bosnia and Herzegovina, Bulgaria, Romania, Slovenia, Croatia, North Macedonia, Greece, Albania and Turkey.

in external debt [15, p. 178]. Thirdly, the domestic military industry may also generate demand for foreign currency due to imports of machinery and inputs from abroad, which also may affect the level of external debt [21, p. 147].

Military expenditures can negatively impact the credit rating and access to international capital markets. High military expenditures generally indicate the country's strategic vulnerability or its positioning in an unstable region. Additionally, a significant allocation of the state budget to the defense sector can reduce available resources for servicing debt, so if the investors believe that the country would not be able to service its debt due to high military expenditures, they may lower the country's credit rating.

Military expenditure is certainly one of the possible determinants of the budget deficit, especially in countries located in geo-strategically hazardous areas such as the SEE. Regardless of all the risks to economic growth and the development of the state, the trend of allocating financial resources to military expenditures is on the rise, all under the pretext of preserving national security and safety due to internal and external threats. States are therefore arming themselves to secure their borders but also to protect themselves from all forms of terrorism.

Acknowledging all mentioned above, the impact of military expenditure on external debt originated mostly from the state's course of actions regarding the source of funding. Therefore, there is a channel of impact through the government budget and thus public debt, as a contributing part of the external debt. Considering the relationship between military expenditure and external debt may provide valuable insights when determining economic priorities, political strategies, and social consequences for the state. This is of particular importance for decision-makers deciding on strategic policies, economists, and researchers dealing with issues of sustainable development and international relations.

The main goal of this paper is to examine the relationship between military expenditure and external debt in SEE countries during the 2000-2022 period. The main hypothesis is that military expenditure influences the increase of external debt in Southeast European countries. The purpose of this paper is also to examine the impact of other macroeconomic variables, such as

foreign exchange reserves, arms export and import, and GDP, on external debt.

After a comprehensive literature review in part two, part three outlines the research methodology, defining the model and variables used. This part also provides an overview of trends in external debt and military expenditures in Southeastern European countries during the analysed period. Empirical data and analysis are presented in this part as well, where we employ a combination of FE and FGLS regression to assess the impact of military expenditures and other factors on external debt across 11 SEE countries from 2000 to 2022. Part four presents the regression results, followed by a discussion of the findings. Finally, part five concludes the paper and offers recommendations for future research.

Literature Review

Many scientists analysed the impact of military expenditures on economic growth. However, just a few researched the relationship between military expenditures and individual economic indicators such as external debt. The results obtained in analyses of the military expenditures impact on economic growth are various and depend on the chosen state sample and the chosen time series. Dunne and Uye [14] in their meta-analysis, which included a total of 102 previous articles that observed this relationship, determined that a negative effect of military expenditure on economic growth was found in 35% of articles, a positive effect in 20%, and that the conclusion is unclear or insignificant in 40%. Brzoska [11], followed by Looney and Frederiksen [25] were among the first to point out that the increase in the state's indebtedness due to military needs reduces the country's economic growth rate.

In countries that have high military expenditures, the link between military expenditures and external debt is very important because it contributes to the negative effects of external debt on the country's economy. Excessive state borrowing for the purpose of servicing military needs can harm economic growth and contribute to the accumulation of external debt. There are two ways in which military expenditures affect the growth of external debt. Firstly, military expenditures are financed either from taxes or

from loans. Therefore, if the state does not provide enough money from its sources for military expenditures, the alternative is foreign loans. Secondly, foreign exchange reserves are needed for the import of weapons, which accounts for a large part of military expenditure. It is precisely the insufficient foreign exchange reserves that can lead to a greater accumulation of external debt [16, p. 2].

Lane [22], in his work that included 55 countries with low and middle income, in the period from 1970 to 1998, indicated the determinants that affect the external debt of a state and draws a conclusion that military expenditures are not one of the determinants that have a significant impact on external debt. Dunne et al. [15] did a research based on the ARDL model (Autoregressive Distributed Lag), with a sample of three Latin American countries (Chile, Brazil and Argentina), and conclude that military expenditures have a positive and significant impact on external debt in Chile, but not in Brazil and Argentina.

Feridun [17] conducted an econometric analysis on the example of Argentina and concluded that military expenditures did not significantly affect the debt crisis in Argentina (1999-2001) and that military expenditures and external debt are two independent variables. In the paper published by Smyth and Narayan [30], the impact of military expenditures on external debt was explored, using the example of six Middle Eastern countries (Oman, Syria, Bahrain, Yemen, Iran and Jordan) in the period from 1988 to 2002. The countries that are statistically considered to be the largest arms importers in the world are positioned in this region. This indicator is significant because there are suppositions in the literature that the import of weapons can affect the external debt (if the foreign exchange reserves are not sufficient to make the purchase from the available reserves). The obtained panel analysis results implied that military expenditures in this region have a statistically significant impact on the increase of external debt.

Zaman et al. [31] in their paper determined the long-term and short-term effects of the increase in economic activity and real military expenditures on the external debt of Pakistan in the period 1980-2008. Using Johansen's multivariate cointegration framework, they concluded that the impact of military expenditures on external debt

is insignificant and inelastic in the short term, but that it is significant and elastic in the long term. Alexander [2] examined the relationship between military expenditures and external debt in more affluent NATO member countries using the ARDL model and then applying the Arellano-Bond technique. Using the available panel data for NATO countries that are also members of the Organization for European Cooperation and Development, for the period from 1988 to 2009, it is concluded that military expenditures significantly affect the debt.

Azam and Feng [3] analyzed the relationship between military expenditures and external debt using fixed and random effects models on a sample of 10 Asian countries (China, India, Indonesia, Pakistan, Thailand, Malaysia, Philippines, Bangladesh, Sri Lanka and Papua New Guinea) in the period from 1990 to 2011. They identified a positive effect of military expenditures and a negative effect of foreign exchange reserves and the rate of economic growth on external debt. Caruso and Domizio [11] investigated the impact of increasing military expenditures in the US on the increase of external debt in European countries. On panel data for 13 European countries, they first tested panel unit root, then tested panel cointegration, then checked the short and long-term relationship between the variables using the Arellano-Bond and FMOLS estimators and finally conducted a VaR analysis for each country separately. They concluded that the external debt of European countries is linked in the long term to the increase in US military expenditures.

Khan et al. [21] used the sample of 35 countries importers of weapons and military equipment in the period from 1990 to 2011 to conclude that the ratio of military expenditures and external debt varies depending on the level of development of countries and regions. They divided the sample countries into 5 regions: Middle East and North Africa, South and East Asia, Latin America, Sub-Saharan Africa and Europe, Central Asia. In the regions of the Middle East and North Africa, South and East Asia and Latin America, they found a positive and significant impact of military expenditure on public debt (as a part of external debt), while in the regions of Sub-Saharan Africa and Europe, as well as Central Asia, the relationship is statistically insignificant and negative.

Georgantopoulos and Tsamis [18], used a sample of North African countries (Egypt, Tunisia, Morocco and Algeria) for the period from 1988 to 2009, conducted a regression analysis with a time lag, and did not find evidence that military expenditures are a significant determinant of external debt, except in the case of Egypt. They concluded that the changes of military expenditures in countries such as Egypt should be carefully monitored because they could be a significant macroeconomic tool for reducing external debt, especially in periods of economic crises [18, p. 272]. They attribute the obtained results to the different levels of development and liquidity of the sample countries. Also, they indicate that the obtained results can be sensitive to the chosen time series, the variables as well as the chosen methodology. Similar to them, Eid [16], with the sample of the same North African countries (Egypt, Tunisia, Morocco and Algeria), only in the period 1995-2000, used a model based on Pedrona (2004) cointegration analysis and the ARDL model, and also did not find evidence that would lead to a significant connection between the increase in military expenditures and the increased accumulation of external debt. It indicates that the increased accumulation of external debt together with a fluctuating exchange rate can make developing countries, as recipients of foreign currency loans, vulnerable to economic shocks because debt repayment requires generating income, most often from exports.

Nikolaïdou [27] determined the impact of military expenditures and arms imports on the public debt of Greece in the period from 1970 to 2011 through regression analysis applying the ARDL model. In his work, he considered separately the impact of military expenditures on the public debt, and the impact of arms imports on the public debt. He concluded that military expenditures and arms imports are positively correlated with the public debt of Greece and have a negative effect on it. An increase in military expenditures and an increase in arms imports led to an increase in public debt in Greece. Abbas and Wizarat [1] also found a positive correlation between military expenditures and external debt through application of the fixed effects model in the analysis of the impact of military expenditures on the external debt of five South Asian countries (India, Pakistan, Bangladesh, Nepal and Sri

Lanka), in the period from 1990 to 2015. Their conclusion was that a \$1 billion increase in military spending in the observed countries leads to an increase in external debt by \$7.2 billion. They proposed a more efficient use of available resources and the redirection of military expenditures into productive investments that will enable economic growth and greater employment. They concluded that the peaceful settlement of disputes between states also reduces the need for military expenditures. Peace is a factor that also ensures foreign direct investments.

Odehnal and Neubauer [28] examined the economic, security and political significance of military expenditures in NATO countries to determine the relationship between military expenditures and external debt through application of the standard linear model that they estimate with the method of ordinary least squares (OLS) and the method of general least squares (GLS) and using fixed and random effects methods. Separating NATO members into old and new ones, they found a positive correlation (negative impact) of the increase in military expenditures on external debt, both in old and new NATO countries.

The conclusions regarding the relation between military expenditures and external debt are various and depend on the selected sample of states, time and the chosen model. Therefore, the importance of the analysis of these relations on the sample of Southeast European countries can be important, considering the conflicts that occurred in this area in the recent past.

Methodology and data

The main scope of our empirical analysis is the relationship between military expenditures and external debt in the Southeast European countries from 2000 to 2022. The growth of military expenditures is a general trend in the world, both in states directly involved in conflicts and those that are not [25, p. 87]. At the summit held in Wales in 2014, the member states of the NATO alliance² made a declaration that the military expenditure will reach the level of 2% of GDP by 2024 [28, p. 1].

² All countries of Southeast Europe, apart from Serbia and Bosnia and Herzegovina, are members of the NATO alliance. Since BiH is applying to join the NATO alliance, it can be said that only Serbia is trying to maintain neutrality in relation to military alliances.

Table 1: Military expenditure in SEE 2000-2022, % of GDP

Year	SRB	BGR	ROU	BIH	HRV	SVN	MNE	MKD	GRC	TUR	ALB
2000	5.2	2.7	2.5	3.3	3.0	1.1	4.9	1.9	3.5	3.7	1.2
2001	4.0	2.9	2.4	3.2	2.7	1.3	4.4	6.1	3.3	3.6	1.3
2002	4.2	2.8	2.3	3.9	2.7	1.4	4.1	2.6	3.1	3.8	1.3
2003	3.4	2.7	2.1	2.4	2.0	1.4	3.2	2.3	2.5	3.3	1.3
2004	3.0	2.4	2.0	1.9	1.7	1.4	2.8	2.4	2.6	2.7	1.4
2005	2.3	2.2	2.0	1.5	1.7	1.4	2.7	2.0	2.8	2.4	1.4
2006	2.2	2.1	1.8	1.4	1.7	1.5	2.3	1.8	2.8	2.4	1.6
2007	2.3	2.2	1.5	1.2	1.6	1.4	1.7	2.0	2.7	2.2	1.8
2008	2.1	2.1	1.4	1.2	1.8	1.5	1.9	1.7	3.0	2.2	2.0
2009	2.2	1.7	1.3	1.4	1.8	1.6	1.8	1.7	3.2	2.5	1.5
2010	2.1	1.6	1.2	1.3	1.7	1.6	1.8	1.4	2.8	2.3	1.6
2011	2.0	1.3	1.2	1.1	1.8	1.3	1.7	1.3	2.5	2.0	1.5
2012	2.0	1.3	1.2	1.1	1.7	1.2	1.7	1.2	2.4	2.0	1.5
2013	1.9	1.5	1.3	1.1	1.6	1.0	1.5	1.2	2.4	1.9	1.4
2014	1.9	1.3	1.3	1.0	1.8	1.0	1.5	1.1	2.4	1.9	1.3
2015	1.8	1.2	1.5	1.0	1.8	0.9	1.4	1.0	2.5	1.8	1.2
2016	1.7	1.2	1.4	0.9	1.6	1.0	1.4	1.0	2.6	2.1	1.1
2017	1.8	1.2	1.7	0.9	1.6	1.0	1.4	0.9	2.6	2.1	1.1
2018	1.6	1.4	1.8	0.9	1.6	1.0	1.4	0.9	2.7	2.5	1.2
2019	2.2	3.1	1.8	0.8	1.6	1.1	1.3	1.2	2.6	2.7	1.3
2020	2.1	1.6	2.0	0.8	1.7	1.1	1.7	1.3	3.1	2.4	1.3
2021	2.0	1.5	1.9	0.9	2.0	1.2	1.6	1.5	3.9	1.9	1.2
2022	2.3	1.5	1.7	0.8	2.2	1.2	1.6	1.6	3.7	1.2	1.6

Source: Stockholm International Peace Research Institute – SIPRI, 2024.

Turkey has the largest fund allocations for defense. These allocations ranged from a minimum of 1.8% of the GDP (2015) to a maximum of 3.7% (2000). Greece is right behind Turkey with the smallest allocations in 2013 and 2014 (2.4% of GDP) and the highest in 2021 (3.9% of GDP). Military expenditures are considered one of the most significant determinants of the 2009 debt crisis in Greece. The reason was the uncontrolled import of weapons accompanied by numerous scandals and corruption affairs [27, p. 18]. Romania reached the highest level of military expenditures in 2000 (2.5% of GDP) and the lowest between 2010 and 2012 (1.2% of GDP). The lowest allocation of GDP funds for military expenditures in Bulgaria occurred in the period from 2015 to 2017 (1.2%) and the highest in 2019 (3.1%).

Serbia allocates significant funds for the modernization of weapons and military equipment, as well as for the investment in the military industry. Those allocations reached their maximum in relation to GDP in 2000 (5.2%, consolidation of the armed forces after the bombing) and their minimum in 2018 (1.6%). Croatia, like Serbia, had the largest allocation of resources for the military in 2000

(3% of GDP), and then that share gradually decreased until 2007 (1.6%) and increased again until 2022 (2.2%). The funds intended for the military expenditures in Croatia were spent on the restoration and modernization of defense capacities after the war and the obligations that the Croatian armed forces have based on their membership in the NATO alliance.

Slovenia leads the group of Balkan countries with significantly lower investments in the defense sector. Until 2010, allocations ranged between 1.1% and 1.6% of the GDP. After that, that share decreased until 2015 (0.9%) and then increased slightly but did not exceed 1.2%. Albania had a balanced allocation of financial resources towards the military (1.2% to 1.6% of their GDP). The allocation of financial resources from GDP directed towards the army of Bosnia and Herzegovina had a constant downward trend starting from 3.9% (in 2002) to 0.8% (in 2022). In North Macedonia as well, there is a downward trend in allocations for military expenditures from GDP, which ranged from 6.1% (in 2001) to 0.9% (in 2017). After that period there is a slight growth of 1.6% (year 2022). Compared to other countries, the military expenditures of Montenegro are

significantly lower and are proportional to the size of the country and the number of inhabitants. The trend of allocation for military spending was in decline from 2005 (2.7%) to 2019 (1.3%). In 2022, Montenegro set aside 1.6% of GDP for defense purposes. Military expenditures were spent on the modernization of defense capacities and obligations based on membership of the NATO alliance.

To analyse the determinants of external debt via regression analysis we first estimate the following model:

$$ExDebt_{it} = \beta_0 + \beta_1 MExp_{it} + \beta_2 FxR_{it} + \beta_3 M_{it} + \beta_4 X_{it} + \beta_5 GDP_{it} + \beta_6 D_{it} + u_{it} \quad (1)$$

The dependent variable is the external debt ($ExDebt_{it}$) of SEE country i ($i=1, \dots, 11$) in year t . According to the criteria of the World Bank, countries are over-indebted if the share of external debt in GDP is greater than 80%, debt is considered medium if the share is between 48% and 80% and debt of a country is low if the share is less than 48% [12, p. 367]. Based on this criterion, the over-indebted countries on SEE are Greece, Montenegro, Slovenia and North Macedonia. Countries with medium debt are Croatia, Serbia, Bosnia and Herzegovina, Bulgaria, Romania, Turkey and Albania.

As independent variables, we used different factors which could increase or decrease the external debt.

Apart from military expenditures as independent variable, the idea is also to show the influence of other variables on external debt, especially considering earlier papers that indicated that military expenditures may affect economic growth and foreign exchange reserves, so indirectly, through these indicators, they affect external debt. Arms imports can also deplete foreign exchange reserves, potentially contributing to an increase in external debt. Bearing that in mind, the independent variables also include arms import (AM), arms export (AX), foreign exchange reserves (FxR), and GDP. We suppose that AX and FxR positively influence external debt, while it is opposite for AM.

Finally, we include dummy variable to account for the presence of a domestic arms-producing industry. Using the SIPRI database, we determine that Montenegro and Albania do not have a domestic military industry, while

other countries do. The dummy variable for the presence of an arms-producing industry is assigned a value of 1 if such an industry exists and 0 otherwise. The underlying assumption is that countries with a domestic arms industry may experience different impacts on external debt, as some purchases can be sourced domestically while imports continue to play a significant role.

The source of data for the external debt, GDP and foreign exchange reserves variables is the World Bank database. The data are at the end of year. The data source for the military expenditures and arms imports and export variables is the SIPRI database³. All variables are expressed in nominal terms (USD). Data processing was conducted using the STATA program. The panel data used in the research is classic, strongly balanced, macro panel data. Namely, each time series in the model is of the same length, that is, each comparative observed unit has the same number of time series observations, which indicates balanced panel data.

After conducting the analysis of the fixed effects regression panel model (1), selected based on the Hausman test, the stationarity of the dependent variable was tested using the Levin-Lin-Chu test (2002) [23].⁴ Data stationarity is exceptionally important in research since, as Gujarati states, if the regression analysis were to be conducted on non-stationary data, the research results would be false [19, p. 798]. The testing starts with the null hypothesis that the series is not stationary, i.e., that it has a unit root, while the alternative hypothesis implies that the series is stationary. According to the results of the Levin-Lin-Chu test ($p = 0.0098$), the null hypothesis is rejected ($p = 0.0098 < 0.05$), and stationarity is accepted.

We also tested autocorrelation in panel data using Wooldridge test, and results show that data have first-

³ SIPRI is an independent international institute with a mission to research international conflicts, armament, arms control and disarmament, as well as military costs and expenditures. It was founded in 1966 with the goal to provide databases, perform analyzes and make recommendations based on open sources and research results related to military topics of public interest. This institute is the most prominent research center dealing with military and security issues in the world.

⁴ Levin, Lin, and Chu recommend using their unit root test procedure for moderate-sized panels and it requires that the panels be strongly balanced, with 10 and 250 individuals (in this case countries) and 25 to 250 observations per individual (country) [23]. As all requirements are fulfilled, LLC test was conducted.

order autocorrelation ($\text{Prob}>F=0.0000$). Then, we tested heteroskedasticity. Modified Wald test for groupwise heteroskedasticity in fixed effect regression model shows that heteroskedasticity is present for dependent variable ($\text{Prob}>\chi^2 = 0.0000$). Finally, taking into consideration that in our panel, N is bigger than T ($N=1,608$, $T=23$), we tested cross-sectional dependence using test of Pesaran (2004) [29]. The result shows the presence of cross-sectional dependence on our panel ($\text{Pr} = 0.0000$).

Considering the presence of heteroskedasticity, recent literature dealing with the estimation of heterogeneous panels suggests that the choice of an appropriate model is sensitive to specifying the correct source of heteroskedasticity [5], [6], [9]. Keeping this in mind and since the cross-sectional dependence in our panel data regression is present, we applied panel robust estimation techniques to ensure reliable standard errors and avoid biased inferences. Specifically, we utilized the Feasible generalized least squares (FGLS) regression [3]. We first start with FE regression (1) to get the estimated residuals $\hat{\varepsilon}_{it}$. Second, we run the regression

$$\begin{aligned} \hat{\varepsilon}_{it}^2 = & \alpha_0 + \alpha_1 |MExp_{it}| + \alpha_2 |Fxr_{it}| + \alpha_3 |M_{it}| \\ & + \alpha_4 |X_{it}| + \alpha_5 |GDP_{it}| + \alpha_6 |D_{it}| + v \end{aligned} \quad (2)$$

Finally, we divide all the variables from (2) by it and run the new regression

$$\begin{aligned} \frac{ExDebt_{it}}{\hat{\varepsilon}_{it}} = & \frac{\beta_0}{\hat{\varepsilon}_{it}} + \frac{\beta_1 MExp_{it}}{\hat{\varepsilon}_{it}} + \frac{\beta_2 Fxr_{it}}{\hat{\varepsilon}_{it}} + \frac{\beta_3 M_{it}}{\hat{\varepsilon}_{it}} \\ & + \frac{\beta_4 X_{it}}{\hat{\varepsilon}_{it}} + \frac{\beta_5 GDP_{it}}{\hat{\varepsilon}_{it}} + \frac{\beta_6 D_{it}}{\hat{\varepsilon}_{it}} + \frac{\varepsilon_{it}}{\hat{\varepsilon}_{it}} \end{aligned} \quad (3)$$

which represents FGLS regression [8]. This method will address the problem of heteroskedasticity by weighting the model using the inverse variance of the errors. It will mitigate autocorrelation by removing systematic patterns in the residuals, while cross-sectional dependence will be reduced by modeling the covariance structure among the observed units. In this way, the FGLS method is expected to substantially improve the efficiency of the estimates [7]. Also, FGLS is suitable when the number of cross-sectional units (N) is large, and the time dimension (T) is small [4].

Results and discussion

The regression results are summarized in Table 1. All coefficients on independent variables are statistically significant at the 5% level, whereas the import of arms and military equipment is not statistically significant at the 1% level. The Wald χ^2 (6) value is notably high (3,982.32), and the probability ($\text{Prob} > \chi^2$) is less than 0.05, confirming that the selected variables are significant at the 5% level.

Alternatively, running the regression without the import variable yields the results presented in Table 2. The Wald χ^2 (5) value is notably high (4,650.76), and the probability ($\text{Prob} > \chi^2$) is less than 0.01, confirming that the selected variables are significant at the 1% level. When the regression is rerun without the arms export variable, the key findings remain largely unchanged. Military expenditures, GDP, and foreign exchange reserves retain their significance and expected signs.

The findings confirm a positive and statistically significant relationship between military expenditures and external debt, aligning with expectations. These results are largely consistent with previous research referenced

Table 2. FGLS regression results, 5% level of significance

External debt	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
Military expenditures	11.8522	2.2608	5.24	0.000	7.4209 – 16.2834
GDP	0.8173	0.0490	16.66	0.000	0.7211 – 0.9135
Fx reserves	-5.1315	0.1545	-33.21	0.000	-5.4344 – -4.8287
Military ind. (dummy)	4.89e+10	2.19e+09	22.34	0.000	4.47e+10 – 5.32e+10
Export of arms	-216.5881	35.0037	-6.19	0.000	-285.1943 – -147.9821
Import of arms	-21.4172	9.1636	-2.34	0.019	-39.3776 – -3.4567
Const.	7.31e+09	6.25e+08	11.70	0.000	6.09e+09 – 8.54e+09

Source: Authors calculations.

in the literature, which also indicate a strong correlation between these two variables. This suggests that higher military spending is closely linked to rising external debt, implying that countries in the region primarily finance defense expenditures through borrowing. Moreover, military expenditures are funded through government budgets, which, in most SEE countries, have been in deficit for the majority of the observed years. These budget deficits are predominantly covered through borrowing, particularly from international markets. This further implies a possible indirect positive relationship between military expenditures and public debt (as a component of external debt), though this remains an open area for further research.

Foreign exchange reserves exhibit a negative and statistically significant impact on external debt, implying that larger reserves help mitigate debt accumulation. An increase in foreign reserves is associated with a decrease in external debt levels, which aligns with economic logic because higher reserves provide a cushion for debt repayment and enhance investor confidence in a country's financial stability.

The effect of arms imports on external debt is negative but not statistically significant at the 1% level, suggesting a relatively limited role in external borrowing. One possible explanation for this result lies in the reliability of the data. In many countries, military equipment imports lack transparency or are subject to various restrictions, such as state secrecy. As a result, actual import figures may be higher than the officially reported data.

GDP shows a positive and statistically significant influence on external debt, demonstrating that economic growth is associated with an increased capacity to borrow externally. Also, higher GDP allows countries to access international financial markets on more favorable terms,

while a stronger economy can support higher debt levels without compromising fiscal stability.

Additionally, the dummy variable for the presence of a domestic arms-producing industry is highly significant and positive, suggesting that countries with an established arms industry tend to have higher levels of external debt. This may be due to increased domestic military procurement and borrowing associated with defense industry development. At the same time, the initial investments in military industry projects are usually very high in the beginning, and demand constant investment in following years, which is typical for countries with domestic arms-producing industry.

On the other hand, the impact of arms exports appears to be largely negative, indicating a significant influence on external borrowing. While arms exports can generate substantial foreign currency revenue, potentially aiding debt servicing and reducing borrowing needs, they also pose economic risks. In some cases, they may improve the balance of payments and enhance a country's ability to meet external obligations. Additionally, a strong arms export sector can drive technological advancements, job creation, and industrial growth, ultimately boosting productivity and tax revenues, which could help lower reliance on external borrowing.

All these findings underscore the complex interplay between military expenditures, economic indicators, and debt accumulation, emphasizing the fiscal implications of sustained defense spending. Given that external debt can influence economic growth in both positive and negative ways, military spending in SEE should be considered when evaluating its broader impact on GDP growth. Understanding the fiscal implications of defense spending could provide valuable insights for economic policy and long-term growth strategies in the region.

Table 3. FGLS regression results, 1% level of significance

External debt	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
Military expenditures	10.7205	1.9771	5.42	0.000	6.8453 – 14.5956
GDP	0.8100	0.0452	17.92	0.000	0.7214 – 0.8986
Fx reserves	-5.1431	0.1233	-41.69	0.000	-5.3849 – -4.9013
Military ind. (dummy)	4.72e+10	1.79e+09	26.36	0.000	4.37e+10 – 5.07e+10
Export of arms	-174.209	29.3172	-5.94	0.000	-231.6697 – -116.7483
Const.	6.85e+09	5.19e+08	13.19	0.000	5.83e+09 – 7.87e+09

Source: Authors calculations.

Conclusion

Our analysis confirms that military expenditures play an important role in the accumulation of external debt in Southeast European countries. Given the region's history of geopolitical tensions and past conflicts, military spending remains a priority, often requiring external borrowing. Policymakers should explore alternative security strategies, such as regional military cooperation, to reduce dependence on debt-financed defense spending. Additionally, economic policies should focus on strengthening foreign exchange reserves and fostering GDP growth in ways that do not lead to excessive debt accumulation.

The findings provide valuable insights for policymakers, emphasizing the importance of prioritizing peaceful conflict resolution to ensure economic stability. For instance, shifting the structure of defense expenditures to emphasize more productive areas, such as research and development, could foster innovation that benefits both the military industry and broader societal standards of living. In many developed countries, the defense sector serves as a hub for innovation, with advancements extending beyond military applications. By reallocating financial resources from defense to sectors like health, education, social programs, and industry, SEE countries could stimulate economic growth while maintaining a sustainable and balanced approach to national security. This strategy would not only improve the population's well-being but also create a safer and more attractive environment for both domestic and foreign investments, ultimately contributing to long-term regional stability and prosperity.

Several key areas for further research arise from this analysis. First, identifying an appropriate balance between national security needs and economic constraints is crucial. Determining the optimal level of defense spending to ensure security without excessive debt reliance would support strategic budget planning. Second, while this article focuses on external debt, military spending could affect other economic variables, such as GDP growth, inflation, employment, and investment flows. Future studies could explore these interconnections to provide a more comprehensive understanding of the broader

economic consequences of defense spending. Third, military expenditures are often influenced not only by security concerns but also by political and strategic factors. Investigating whether defense budgets are primarily shaped by economic capabilities or political decisions could clarify variations in spending patterns across different SEE countries. Fourth, one key recommendation for mitigating the negative impact of military expenditures on external debt is increasing investment in the development of new military technologies and equipment. Over the medium to long term, this could generate positive effects on GDP growth, boost exports, and potentially reduce imports. In this way, it is possible to strategically streamline military spending and achieve favorable macroeconomic outcomes. Finally, it is important to acknowledge the limitations of this analysis, primarily stemming from data accessibility issues, the lack of clear and transparent policies regarding military expenditures and investment, and the considerable heterogeneity of countries and their security policies.

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