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THE EXAMINATION OF THE DYNAMIC LINK BETWEEN DEFENSE BURDEN AND UNEMPLOYMENT: THE EVIDENCE FROM THE POST-SOVIET COUNTRIES

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The Eastern Bloc had been dissolved by the end of the Cold War period, and the New World Order was established. The rapid liberalization process accelerated transition to the free market economy. In this transition period, however, numerous political tensions occurring between some countries also transformed into conflicts and wars. Therefore, countries allocate their scarce resources to their national security rather than their development objectives, simultaneously gradually increasing their defense expenditures. Accordingly, the present study aims to examine the existence of the dynamic relationship between defense burden and unemployment for the selected nine post-Soviet countries that emerged after the collapse of the Soviet Union. By incorporating the annual data set of the nine post-Soviet countries over the period between 1996 and 2021, the results revealed that defense burden had no influence on unemployment in the short run, but did have a positive effect in the long run.

Keywords: defense burden, unemployment, post-Soviet countries, panel data

JEL Classification: C33, F51, H56, P20

INTRODUCTION

Together with the unprecedented pace of globalization, the collapse of the Eastern Bloc by the end of the Cold War brought a new political and economic order for the ex-communist economies. The desire to adopt the free-market economy embracing price mechanisms and institutional reforms such as liberalization of trade and capital accounts led regimes to induce radical and structural changes in those economies. It should be noted that the process of transition to the free-market economy occurred differently in different countries, that being due to their respective economic conditions, geopolitical concerns, and

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institutional capabilities. In this context, the biggest number of the post-Soviet Union countries (except for the Baltic countries, namely Estonia, Latvia, and Lithuania) experienced severe economic, political, and security issues. For political and security reasons, the Commonwealth of Independent States (CIS) were eager to allocate more resources to their military operations instead of investing in developmental aspects aiming to alleviate all forms of poverty.

On the other hand, the economic effects of defense expenditures are among the most profound and intricate topics that have drawn special attention from scholars, both theoretically and empirically. Nevertheless, many of those studies have mainly discussed the effects on economic growth attributed to defense expenditures. Also worthy of noting is the fact that the interconnectedness between the output growth and unemployment is indicated by the famous macroeconomic phenomenon called Okun's Law, which indicates an inverse relationship between the output growth and unemployment, which is why a possible nexus between defense expenditures and unemployment deserves to be paid special attention to since the latter relates to the output growth. In this respect, this paper aims to pursue the dynamic link between unemployment and defense burden, which is measured by the ratio of overall defense expenditures to the gross domestic product (GDP) for the selected post-Soviet countries.

Considering the interaction between defense expenditures and unemployment, there are three mechanisms standing out commonly referred to in the literature so far. The first mechanism is the spillover effect. With the construction of the military infrastructure, rising military spending would lead to productivity gains via a technology spillover to the private sector, which enables companies to demand more labor due to increasing labor productivity. The second mechanism is referred to as the reallocation effect and it induces frictional unemployment due to contraction in the military sector. From this aspect, the reallocation effect sets to the extent that employees in the military sector tend to shift to the private sector due to the decline in military spending. The third mechanism implies that military expansion may exacerbate the pressure on the general government budget. Governments tend to collect additional taxes in order to alleviate the strain on the general government budget associated with military expansion. Thus, military expansion can create an additional tax burden on employers, which in turn could influence labor demand or supply (Tang, Lai & Lin, 2009; Sanso-Navarro & Vera-Cabello, 2015; Zhong, Chang, Tang & Wolde-Rufael, 2015). Accordingly, the pivotal hypotheses of the paper read as follows:

H1: There are a long-run dynamic link and the causal nexus between defense burden and unemployment throughout the above-mentioned mechanisms.

H2: Increases in defense burden tend to accelerate unemployment either in the short- or in the long run.

The fact that this empirical study differs from previous ones in various aspects and that it aims to fill the gap in the empirical literature by employing a relatively novel approach is also worth noting. Initially, this empirical endeavor would be the first to investigate the interplay between defense burden and unemployment for the post-Soviet Union countries never analyzed in empirical analyses to date. The majority of the empirical studies in the field of defense economics have focused on the countries involved in proliferation, namely Greece, Turkey, India, and Pakistan. Moreover, with the developments in cross-sectional and panel data analysis, empirical studies have also focused on some military, political, or economic blocs, such as the NATO, the EU, and the OECD. Moreover, the economic effects of militarization have been discussed empirically in the context of conflicted regions, namely the Middle East and Africa.

Secondly, the present paper differs from the previous in the methodological aspect. To this end, the long-term dynamic link between defense expenditures and unemployment will be estimated using the Cross-Sectional Autoregressive Distributed Lag (CS-ARDL) method introduced by A. Chudik, K. Mohaddes, M.

H. Pesaran and M. Raissi (2016). In the case of the cointegration relationship, the main advantages of this method originate from it capturing the effects of cross-sectional dependence (CD) both in the short- and in the long run even though the series are integrated at different orders. Furthermore, this paper also aims to bring a novel approach in terms of causality analysis, in which context the methodology having recently been introduced by A. Juodis, Y. Karavias and V. Sarafidis (2021) will be used to determine the causal interplay among the variables of interest in this paper. Beside the presence of CD, the methodology allows for the examination of the causal nexus between the variables. There is either homogeneity or heterogeneity in the panel data. Yet, it has the size and power advantages over its counterparts depending on whether the time dimension is bigger or smaller than the cross-sectional dimension. To the best of the authors' knowledge, neither technique has been implemented so far in identifying the nexus between military spending and unemployment specifically.

Given the aforementioned issues, the rest of the study is organized as follows: in the following section, some figures regarding the trends in unemployment and defense burden over the sampled period in which countries tend to increase their military outlays due to the tensions between them despite the recent outbreak of COVID-19 are presented; in the third section, the theoretical and empirical literature is reviewed, whereas the section four discusses the issues pertaining to the data, model, and empirical strategy to be implemented. Section five is devoted to the results and discussions derived by conducting empirical analysis. Finally, in the section six, some concluding remarks and policy recommendations are reported through the results obtained from the econometric analysis.

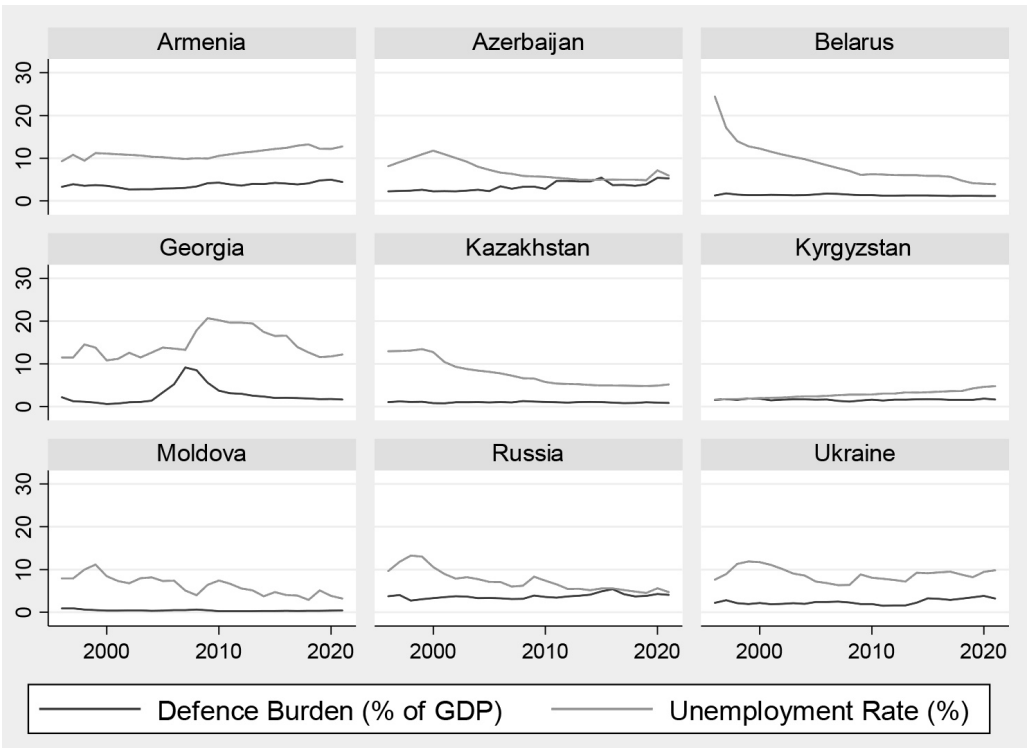

Figure 1 The trends in defense burden and the unemployment rate (in percentage)

Source: Authors

TRENDS AND FACTS

Despite the outbreak of COVID-19 and its ongoing detrimental economic effects in a global context, the increasing tendency in favor of militarization is still continuing. As reported by the Stockholm International Peace Research Institute (SIPRI, 2023), global military expenditures have recorded a historical peak of US $2240 and have been rising for eight consecutive years. According to SIPRI (2023), governments all around the world allocate 6.2% of their budgets to their military requirements, which also corresponds to $282 *per capita*. One of the main reasons for the recent rising tendency in military expenditure is the ongoing warfare between Russia and Ukraine. In particular, the neighboring countries and Europe as a whole have adversely been influenced since the outbreak of the war.

Apart from those global trends in militarization, the present study specifically focuses on the selected post-Soviet countries. Accordingly, Figure 1 presents some striking trends in defense burden and the unemployment rates despite the nonexistence of a uniform tendency between these variables.

Due to ongoing operations in the Southern Caucasus, Syria, and Libya, warfare in Ukraine has forced the Russian Federation to expand its military outlays almost twofold. Similar trends are observed in the Russian Federation's neighboring countries. In this respect, Belarus and Ukraine have experienced military expansion in the recent decade. The ongoing dispute over Nagorno-Karabakh since the end of the First Nagorno-Karabakh War induced the breakout of the Second Nagorno-Karabakh War between Armenia and Azerbaijan, both countries continuously increasing their military expenditure during the last two decades. Thus, the share of the defense expenditure in the GDP for both countries is at higher levels. One of the highest records was observed for Georgia, which suffered an invasion by the Russian forces due to the severe territorial issues over Southern Ossetia. To this end, with the outbreak of invasion in 2008, the share of the defense expenditure in the GDP has reached approximately 10%.

On the other hand, unemployment rates exhibit various tendencies for each country. It should be highlighted that the unemployment rates reach high levels mostly in Armenia and Georgia. With the outbreak of the Second Nagorno-Karabakh War in 2020, the unemployment rate tends to increase in Azerbaijan as well. In the earlier transition period, the unemployment rate was the highest in Belarus as compared with the countries included in the study's sample and managed to be alleviated by the earlier periods of the 2000s. Similar tendencies are also observed in Kazakhstan, where defense burden tended to increase between 2000 and 2010, whereas the unemployment rate tended to decline in that same period. It should be noted that the sampled period also coincides with the global financial turmoil that emerged as a subprime mortgage crisis in the USA and severely influenced the real sector worldwide. In this respect, some countries included in the sample are severely influenced by the outbreak of the subprime mortgage crisis. For instance, the unemployment rate in Armenia, Georgia, Moldova, Russia, and Ukraine increased more when compared to the rest of the countries included in the sample.

LITERATURE REVIEW

Differing from the studies examining the nexus between defense expenditures and economic growth, the literature in the field of defense economics also includes the studies that aim to examine the interplay between defense expenditures and unemployment, which are relatively scanty. It should also be noted that the empirical literature has not revealed a clear-cut relationship between defense expenditures and unemployment yet, so that the mechanisms which connect the nexus between the two variables might potentially vary. Nonetheless, the majority of the empirical studies have focused on the advanced economies or regional blocs to address the interconnectedness between defense expenditures and unemployment. In this respect, M. A. Hooker and M. M. Knetter (1994, 1997) examined the effects of curtails in military procurement spending on the unemployment rate for the USA utilizing the

panel data for the USA in each study. Nonetheless, in their earlier studies, the effect of reduction in military procurement spending on unemployment had been analyzed, whereas the latter study aimed to explain the effects of cuts in military procurement spending on employment growth across the states. In their previous study, M. A. Hooker and M. M. Knetter (1994) had concluded that a reduction in military procurement spending not only explained the variations in unemployment across the USA but also swelled up to the overall unemployment level by 0.15%. By conducting standard panel regressions and instrumental variable (IV) analysis, M. A. Hooker and M. M. Knetter (1997) highlighted the fact that variations in employment growth mainly stemmed from a reduction in military procurement spending as well. For the case of France, J. Malizard (2014) aimed to examine the long-term interplay between defense spending and unemployment. It is documented that both defense and nondefense expenditures have adverse long-term effects on unemployment, whereas the effects of the former are more dominant than those of the latter. In a more recent study, C. Michael and R. Stelios (2017) investigated the long-term relationship between defense spending and unemployment for Greece, Italy, Portugal, and Spain over the period from 1960 to 2015. The results of the empirical analyses confirmed the fact that increasing defense spending had reduced unemployment in Portugal and Greece, whereas the result was different in the case of Spain.

Advanced economies aside, numerous studies also focus on developing countries in the context of defense expenditures and the employment/unemployment nexus, to which end P. J. Dunne and D. Watson (2000) added to debate by considering the sectoral approach. In this context, employing the bounds test approach to cointegration, their findings indicate the fact that employment growth in the manufacturing sector of South Africa is negatively influenced by rising military expenditure in the long run. J. Yıldırım and S. Sezgin (2003) constructed the constant elasticity of the substitution (CES) type production function in examining the effects of military expenditure on employment in Turkey in the long run by incorporating the annual timeseries data spanning from 1950 to 1997. The results revealed the fact that military expenditures tended to have detrimental effects on employment either in the short- or in the long run so that the military budget was allocated more on imported cutting-edge arms. In contrast to the results reported by J. Yıldırım and S. Sezgin (2003), Jr.-T. Huang and A.-P. Kao (2005) reported the positive long-term interconnectedness between the military outlays and employment for Taiwan. L. Qiong and H. Junhua (2015) estimated the long-term relationship between military expenditure and unemployment for China by performing the Autoregressive Distributed Lag (ARDL) Approach to Cointegration, which was also employed in the studies carried out by J. Yıldırım and S. Sezgin (2003) and Jr.-T. Huang and A.-P. Kao (2005). The results demonstrated the fact that rising military expenditure upswung the overall unemployment rate while the nonmilitary components of government expenditure alleviated the overall unemployment rate. In their more recent paper, M. Azam, F. Khan, K. Zaman and A. M. Rasli (2016) focus on the four South Asian Association for Regional Cooperation (SAARC) countries to reveal the presence of the long-term relationship between military expenditure and unemployment by incorporating the annual panel dataset covering the period between 1980 and 2013. Although the results of the Panel Vector Error Correction Mechanism (VECM) test indicated the nonexistence of the short-term relationship, the long-term inverse relationship tended to exist between the military outlays and the overall unemployment rate. In a more recent study, I. A. Raifu and J. A. Afolabi (2023) considered the effect of structural breaks in dealing with the nexus between military spending and unemployment for South Africa by incorporating the quarterly timeseries data spanning from 1994 to 2019. Implementing the linear and nonlinear ARDL cointegration approaches, the authors came to the findings asserting that rising military spending is detrimental to unemployment in the long run.

With the developments in timeseries and panel data analyses, some empirical studies have also addressed the causality nexus between defense expenditures and employment/unemployment. To that end, S. Paul (1996) utilized a large data set of the OECD countries for the period between 1962 and 1988 in order to

investigate the presence of the causality relationship between defense spending and unemployment. The results showed that no significant causal interplay between defense spending and unemployment tended to exist overall. However, defense spending has substantial effects on the unemployment rate for Germany and Australia. For a large panel data set of 46 countries, J.- H. Tang *et al* (2009) find little or no evidence regarding the causality nexus from unemployment to military expenditure. Moreover, the selection of the proxy variables for militarization significantly influences the results, in which context they concluded that, for the non-OECD countries, unidirectional causality existed running from military expenditure to unemployment to the extent that military spending was expressed as a percentage of the GDP. Employing the panel bootstrap causality test, M. Zhong *et al* (2015) report the presence of unidirectional causality running from military spending to unemployment for Canada, Japan and the USA, whereas there it tends to be the opposite form of causality for France and Germany. In addition, the results reveal the existence of bidirectionality in Italy and the UK. Analogous to M. Zhong *et al* (2015), M. Sanso-Navarro and M. Vera-Cabello (2015) employed the panel bootstrap causality test to examine the causality nexus between military expenditure and unemployment for the EU-15 countries. It was documented that there was little evidence regarding the causality nexus between military expenditure and the unemployment rate. Nevertheless, a causal relationship was observed for some countries where personnel expenditure from the military budget was more dominant, or conscription was in force. Since most of the macroeconomic variables and interaction among them potentially exhibit asymmetric relationships, E. Anoruo, U. Akpom and Y. D. Nwoye (2018) investigated the nexus between military spending and unemployment for eight African countries by utilizing the Panel Smooth Transition Regression (PSTR) approach to account for the nonlinear association between the former and the latter. In the last instance, it was accentuated that military expenditures had a positive effect on unemployment during the low inflation periods, whereas the opposite applied during the high inflation periods. Therefore, it is recommended that military spending should be increased during the period of low inflation periods so as to mitigate the unemployment problem in those countries.

More recently, J. Becker (2021) has examined the effect of unemployment on defense burden disaggregating the latter into personnel expenses and equipment modernization. By employing the panel-corrected standard errors and the Two-Stage Least Squares (2SLS) approaches on the annual panel data set of 34 countries from NATO and the EU over the period from 1991 to 2019, it was determined that defense burden strongly hinged on the developments in the labor markets. Moreover, the results revealed that the countries with high unemployment rates tended to spend less on defense and shift the resources from equipment modernization to personnel expenses. Apart from the aforementioned studies, G. Dudzevičiūtė and A. Šimelytė (2022) discussed the impact of military personnel and some major macroeconomic indicators on defense burden for Greece, Turkey, and the USA, which are the NATO members with the highest military expenditures. By incorporating the annual time series data and conducting the ARDL analysis, the results revealed that defense burden negatively interacted with the output changes in the cases of Turkey and Greece. On the other hand, inflation and the number of military personnel tended to have positive effects on defense burden in all the three countries in the long run.

In accordance with the intricate nature of the nexus between defense spending and unemployment, the current empirical literature exposes a sporadic situation as well. Beneath the veneer of this intricacy in the empirical literature, the next section aims to establish the model and empirical strategy in line with theoretical discussions and pivotal hypotheses of the paper.

DATA, MODEL AND ESTIMATION STRATEGY

Data

The primary objective of the present study is to investigate the long-term dynamic effects of defense burden on unemployment by paying special attention to the post-Soviet countries, most of which are also the members of the Commonwealth of Independent States (CIS)[1]. Moreover, the outbreak of the war between Russia and Ukraine, the disputes over the Caucasus region between Russia and Georgia, the conflict between Armenia and Azerbaijan over the issue of Nagorno-Karabakh, and the internal political tensions in Kazakhstan and Kyrgyzstan are the pivotal factors in the selection of the sample countries. On the other hand, three Baltic countries (Estonia, Latvia and Lithuania) were excluded since they are currently the members of the EU and the NATO. Hence, due to the data limitations, the empirical analysis was limited to the nine post-Soviet countries by utilizing the annual balanced panel data set that spanned over the period from 1996 to 2021[2]. Throughout the theoretical discussions and the main hypotheses of this present paper, empirical analysis was carried out incorporating the three variables in accordance with the studies by J.- H. Tang *et al* (2009), J. Malizard (2014), M. Zhong *et al* (2015), M. Sanso-Navarro and M. Vera- Cabello (2015), L. Qiong and H. Junhua (2015), Azam *et al* (2016) and Anoruo *et al* (2018). Apart from the main variables of interest, namely the unemployment rate (the dependent variable) and the defense burden measured by military expenditure as a percentage of the GDP, the GDP *per capita* was also included as a proxy variable in identifying whether an inverse relationship between the output growth and unemployment is perceived, which is well-known macroeconomic phenomena pioneered by Okun's Law. Except for the data on defense burden, the data on unemployment and the GDP *per capita* were compiled from the World Development Indicators (WDI) Database of the World Bank. The data pertaining to defense burden were gathered from the Military Expenditure Database of the Stockholm International Peace and Research Institute (SIPRI), which generates data on military outlays, arms production and trade in a global context. It should also be noted that all the variables were converted into a natural logarithmic form. The abbreviations, definitions, and sources of data regarding the variables are presented in Table 1.

On the other hand, Table 2 displays the descriptive statistics regarding the variables incorporated in the empirical analysis. Since the difference between the maximum and minimum values is higher for defense burden (LD) and the unemployment rate (LU) is lower, which is the main interest of the variables, the values of the standard deviation are relatively lower indicating a lesser volatility across the countries and the time periods. However, the standard deviation of the GDP *per capita* (LY) is strikingly higher, so that the difference between the maximum and minimum values is significantly higher.

Model and estimation strategy

In order to reveal the dynamic link between defense burden and unemployment, the following baseline specification will be incorporated by including the GDP *per capita* as the output growth proxy:

Table 1 The definitions and sources of the variables

Variables	Unit	Abbreviation	Data Source
Unemployment Rate	As percentage	LU	World Bank
Defense Burden	Military expenditure as a percentage of the GDP	LD	SIPRI
Real GDP *per capita*	Constant 2015 US $	LY	World Bank

Note: The capital L denotes the natural logarithm of the corresponding variable.

Source: SIPRI and the World Bank.

Table 2 The descriptive statistics

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
LU	234	0.5818	0.7414	-1.3360	2.2147
LD	234	1.9868	0.5283	0.4842	3.1945
LY	234	24.1888	1.7227	21.7769	28.0299

Note: The descriptive statistics of all the variables are computed in their natural logarithms.

Source: Authors.

$$LU_{it} = f(LD_{it}, LY_{it}) \quad (1)$$

where LU_{it}, LD_{it}, and LY_{it} denote the natural logarithms of unemployment, defense burden, and the GDP *per capita*, respectively, whereas the subscripts i and t denote the cross-sectional unit and the time dimensions, respectively.

In the case of the cross-sectional dependence (CD) with different integrations of the series, the long-term link across the variables will be examined using the CS-ARDL approach, which was introduced by A. Chudik *et al* (2016). It should be noted that the CS-ARDL approach has some superior traits over its counterparts. First, it considers the presence of cross-sectional dependence and slope heterogeneity in panel data. To that end, it facilitates the CD both in the short and in the long run. In addition, this approach captures the long-term effects, which are estimated by controlling the unobservable factors associated with the baseline specification. Second, it is a dynamic approach in which the lagged-dependent variable enters as the weak exogenous regressor under the error-correction mechanism (Sohag, Chukavina & Samargandi, 2021). Accordingly, the CS-ARDL representation of the baseline specification reads as follows:

$$\begin{aligned}\Delta LU_{it} = {} & \mu_i + \varphi_i\left(LU_{it-1} - \beta_i X_{it-1} - \gamma_{1i}\overline{LU_{t-1}} - \gamma_{2i}\overline{X_{t-1}}\right) + \\ & \sum_{j=1}^{p-1}\theta_{ij}\Delta LU_{it-j} + \sum_{j=0}^{q-1}\vartheta_{ij}\Delta X_{it-j} + \\ & \sigma_{1i}\Delta\overline{LU_t} + \sigma_{2i}\Delta\overline{X}_t + \varepsilon_{it}\end{aligned} \quad (2)$$

where ΔLU_{it} is the dependent variable, whereas X_{it} represents the vector of the independent variables in which LD and LY are involved. The long-term expected values of both the dependent and the independent variables are denoted by $\overline{LU_{t-1}}$ and $\overline{X_{t-1}}$, whereas the short-term value for the dependent variable and the set of the independent variables are denoted by ΔLU_{it-j} and ΔX_{it-j}, respectively. $\Delta\overline{LU_t}$ and $\Delta\overline{X}_t$ represent the expected values in the short run; β_i represents the estimated coefficient of the independent variables, θ_{ij} represents the short-term coefficient of the dependent variable; ϑ_{ij} denotes the short-term coefficients of the independent variables. Finally, σ_{1i} and σ_{2i} denote the coefficients of the expected values and ε_{it} denotes the conventional error term.

The empirical analysis in the present study will be augmented by performing the recently developed panel Granger noncausality approach. A. Juodis *et al* (2021) tailored a new method in testing for Granger noncausality not only in the presence of cross-sectional dependence, but also in the presence of either homogeneity or heterogeneity. Moreover, the test cannot suffer size distortions even if the time dimension (T) is smaller than the cross-sectional dimensions (N). In other words, it has the powerful advantage in the presence of the large N and the small T, and can produce the results that are more efficient when compared to the counterparts, namely to E. L. Dumitrescu and C. Hurlin (2012) (Xiao, Karavias, Juodis, Sarafidis & Ditzen, 2023). By setting linear restriction on the Granger causation parameters, A. Juodis *et al* (2021) assumed the following linear dynamic panel data model:

$$y_{i,t} = z'_{i,t}\theta_i + x'_{i,t}\beta_i + \varepsilon_{i,t} \quad (3)$$

where $z_{i,t} = (1, y_{i,t-1},\ldots,y_{i,t-p})'$, $x_{i,t} = (x_{i,t-1},\ldots,x_{i,t-p})'$, $\theta_{i,t} = (\theta_{i,t-1},\ldots,\theta_{i,t-p})'$ and $\beta_i = (\beta_{1,i},\ldots,\beta_{p,i})'$.

In addition, i=1,…,N denotes the cross-sectional unit, t=1,…, T denotes the time dimension, whereas p=1,…, P denotes the lag length for the heterogeneous autoregressive coefficient. The null hypothesis of $x_{i,t}$ does not Granger-cause of $y_{i,t}$ by the pooled least squares estimator of β, which A. Juodis *et al* (2021) develop in the following form:

$$\hat{\beta}=\left(\sum_{i=1}^{N} X_i^{'} M_{Zi} X_i\right)^{-1}\left(\sum_{i=1}^{N} X_i^{'} M_{Zi} y_i\right) \quad (4)$$

where $M_{Zi} = I_T - Z_i (Z'_i Z_i)^{-1} Z'_i$. According to A. Juodis *et al* (2021) the pooled least squares estimator of β suffers a Nickell bias, so A. Juodis *et al* (2021) suggest the half-panel jackknife (HPJ) method pioneered by G. Dhaene and K. Jochmans (2015) to eliminate the bias. Thus, A. Juodis *et al* (2021) derived the following bias-corrected version of the Wald test for Granger noncausality in the following form (Xiao *et al*, 2023):

$$\widehat{W}_{HPJ}=NT\tilde{\beta}^{'}\left(\hat{J}^{-1}\widehat{V}\hat{J}^{-1}\right)^{-1}\tilde{\beta} \quad (5)$$

where $\hat{J}=\frac{1}{NT}\sum_{i=1}^{N} X_i^{'} M_{Zi} X_i$ and $\tilde{\beta}$ is the HPJ estimator that removes the bias associated with the pooled estimator under homogeneity restriction. Accordingly, the discussion on the empirical results will be documented in Section 5 below through the above-mentioned methodological arguments.

EMPIRICAL RESULTS AND DISCUSSION

The first step of this empirical investigation commences with checking the presence of cross-country dependence and slope homogeneity. Since the countries in the present sample have almost analogous economic and political structures, any shocks (economic, commercial, financial, political, etc.) that arise in one country may potentially influence the rest of the countries in the sample. Thus, it is crucial to check for the presence of cross-country dependency in order to conduct efficient analyses in further steps. Pioneered by M. H. Pesaran (2004), the left-hand segment of Table 3 reports the results of the CD and CD_{LM} tests with respect to each specification. The null hypothesis of cross-sectional independence is firmly rejected by each test since the computed test statistics are significant at the 1% significance level. On the other hand, the homogeneity of slope parameters in a linear model is examined by the homogeneity tests introduced by M. H. Pesaran and T. Yamagata (2008). In this respect, the right-hand segment of Table 3 reports the results of the homogeneity tests, which on their part clearly highlight the rejection of the null hypothesis of slope homogeneity to the extent that the corresponding test statistics exceed the critical values at the 1% significance level.

Before investigating the presence of the long-term interplay across the variables, it is crucial to check for the integration order of the variables so that, in the presence of the unit root, further analyses may produce spurious results. In this respect, various types of panel unit root tests were performed so as to check for the integration order of the considered variables. Depending on the existence of cross-sectional dependence and homogeneity/heterogeneity conditions, those tests are classified as the first-generation and second-generation panel unit root tests. Table 4 reports the results of the panel unit root tests. It should be noted that the underlying

Table 3 CD tests and slope homogeneity

Cross-Sectional Dependency Tests			Homogeneity Tests		
	Test statistics	p-value		Test statistics	p-value
CD Test	21.705	0.000*	$\tilde{\Delta}$Test	20.691	0.000*
CD_{LM} Test	54.218	0.000*	$\tilde{\Delta}$adj Test	22.493	0.000*

Note: *denotes the significance level at 1%.

Source: Authors

assumptions and the test statistics of each test might differ as well. The test pioneered by A. Levin, F.-C. Lin and C. J. Chu (hereinafter referred to as the LLC) (2002) is appropriate under the homogeneity of conditions, whereas the tests suggested by G. S. Maddala and S. Wu (1999) and K. S. Im, M. H. Pesaran & Y. Shin (hereinafter referred to as the IPS) (2003) are more appropriate in the case of heterogeneity in panel data. Moreover, the LLC test is based on t-statistics, whereas the IPS and Fisher-type tests (the ADF and PP tests, respectively) are based on the W-statistics and Fisher χ^2-statistics (Chakraborty, 2023). To this end, the results of the first-generation tests produce consistent results. Except for the series of LD, the series of LU and LY become stationary by the first differencing.

Due to the aforementioned shortcomings associated with the issues of cross-sectional dependence and slope heterogeneity, the first-generation tests might produce spurious inferences, in which context, the stationarity of the variables is also checked by employing the so-called second-generation test pioneered by M. H. Pesaran (2007). Differently from the first-generation tests, the consideration of the cross-sectional dependence and heterogeneity issues is the basic characteristic of the second-generation-type tests. In line with the IPS test, M. H. Pesaran (2007) developed the unit root test suitable in the presence of cross-sectional dependence and heterogeneity. In order to wipe out cross-sectional dependence, M. H. Pesaran (2007) derived the cross-sectional augmented version of the IPS (CIPS) test, in which the common factor approach was used to eliminate CD. Accordingly, the results of the CIPS test are presented in the last column of Table 4. The results of the CIPS test endorse the results obtained by the implementation of the first-generation unit root tests, in which context, the series of defense burden is integrated at the level, whereas the series of the unemployment rate and the GDP *per capita* become stationary after the first differencing. In other words, I (1). Thus, the mixed order of the integration of the variables in the presence of CD and heterogeneity makes it feasible to apply the CS-ARDL technique to investigate the long-term relationship.

In the case of CD and heterogeneity, on the one hand, and the mix order of integration among the variables, the cointegration relationship is examined employing the CS-ARDL approach. Developed by A. Chudik *et al* (2016), this approach can eliminate the CD bias for different time horizons. Throughout the baseline specification, the CD bias is eliminated in the short run (Model 1), in the long run (Model 2), and jointly (in the short and long run) in Model 3. In other words, Model 1 eliminates the CD bias in the short-term estimators, whereas Model 2 eliminates the CD bias in the long-term estimators. Furthermore, Model 3 eliminates the CD bias in either estimator with respect to each time horizon. The sign of the error-correction term (EC_{t-1}) is negative and statistically significant in each model. Thus, the long-term interplay tends to exist between unemployment, defense burden, and the GDP *per capita*. However, the speed of adjustment to the long-term equilibrium path is 12.4% per year to

Table 4 The panel unit root tests

Variables	LLC	IPS	ADF	PP	CIPS	Outcome
LU	0.6869	0.3220	0.8516	-0.4035	-1.395	
ΔLU	-8.9237*	-8.8599*	8.8645*	31.1553*	-4.746*	I (1)
LD	-3.9234*	-3.2985*	2.8519*	2.0382**	-1.687***	
ΔLD	-7.8566*	-9.1250*	11.2760*	33.8880*	-4.614*	I (0)
LY	0.0259	2.4402	-1.5807	0.2783	-1.365	
ΔLY	-6.6948*	-6.7413*	7.8646*	14.9250*	-3.557*	I (1)

Note: *** denotes the significance level at 1%. The critical values for the CIPS test at 1%, 5% and 10% significance levels are -2.93, -2.76, and -2.66, respectively.

Source: Authors

the extent that is relatively lower with respect to the other models. After the elimination of the CD bias, the speed of adjustment to the long-term equilibrium is 22.8% in Model 2, and 22.6% in Model 3.

The detection of the long-term interplay across the variables leads to checking for potential causality relationships as well. Differently from the standard M. H. Pesaran (1969) causality test, in which the CD and heterogeneity issues are ignored, the A. Juodis *et al* (2021) panel Granger noncausality test was used, the results of the test being accounted for in Table 6 and showing the presence of unidirectional causality from defense burden to unemployment, with respect to which, the null hypothesis reading that LD does not Granger-cause LU is rejected at the 10% significance level. Moreover, there is also unidirectional causality from the GDP *per capita* to unemployment to the extent validating the presence of Okun's Law. Thus, the null hypothesis reading that LY does not Granger-cause LU is clearly rejected at the 5% significance level. Unidirectional causality is also perceived between the GDP *per capita* and unemployment, in which context, the null hypothesis reading that LY does not Granger-cause LU is rejected at the 5% significance level.

Overall, the results support those documented by P. J. Dunne and D. Watson (2000), J. Yıldırım and S. Sezgin (2003) and L. Qiong and H. Junhua (2015). Furthermore, in the sense that the presence of the causality relationship between defense burden and the unemployment rate, the results of the present study also tend to support the results reported by J.- H. Tang *et al* (2009), M. Zhong *et al* (2015), and Anoruo *et al* (2018). As argued by M. Sanso-Navarra and M. Vera-Cabello (2015), a possible explanation

Table 5 The CS-ARDL model results

	CD in SR (Model 1)	CD in LR (Model 2)	CD in SR & LR (Model 3)
EC_{t-1}	-0.1242 (0.0630)**	-0.2289 (0.0963)**	-0.2263 (0.1133)**
Long-term coefficients			
LD_{t-1}	0.3624 (0.1042)*	0.3986 (0.0733)*	0.4620 (0.0474)*
LY_{t-1}	-0.0430 (0.0611)	-0.5773 (0.1109)*	-0.1195 (0.1135)
Short-term coefficients			
ΔLD	-0.0844 (0.0796)	0.0111 (0.0456)	-0.0253 (0.0698)
ΔLY	-0.5180 (0.2170)**	-0.8051 (0.2700)*	-0.4919 (0.2647)***
Constant	0.3876 (0.1807)**	-0.8992 (0.3797)**	-2.1973 (1.1228)**

Note: *** denotes the significance level at 1%. The standard errors are given in parentheses.

Source: Authors

Table 6 The panel Granger noncausality test results

Direction of causality	HPJ Wald Test	Outcome
LD ⟶ LU	3.4108 (0.0648)***	H_0 is rejected
LU ⟶ LD	0.4915 (0.4833)	H_0 is not rejected
LY ⟶ LU	4.4175 (0.0356)**	H_0 is rejected
LU ⟶ LY	2.4955 (0.1142)	H_0 is not rejected
LD ⟶ LY	2.0278 (0.1544)	H_0 is not rejected

Note: ** and *** denote the significance levels at 5% and 10%. The corresponding p-values are given in parentheses.

Source: Authors

could be that, rather than being made on capital-intensive, defense expenditures in those countries are inclined more on labor-intensive to the extent that forced conscription or mandatory military service is in force even though the duration of those services depends on respective legislations and the situation those countries are being faced with.[3] Thus, except for Russia, which is one of the major arms producers and exporters in the world, the allocation of the budgetary sources could be channelized more to a personnel expenditure rather than the provision of arms products with cutting-edge technologies. Therefore, the anticipated outcome regarding the diffusion of technology to the civilian sector and the associated increase in labor productivity and employment may not be realized.

CONCLUSION

The present study focuses on the long-term dynamic link between defense burden and unemployment for the selected CIS countries where intensive conflicts have broadly been observed in recent years under the shadow of the warfare between Russia and Ukraine. Furthermore, the interplay between defense burden and unemployment were investigated in a novel empirical approach. In this respect, the long-term dynamic link was examined using the CS-ARDL approach that has never been implemented before in the empirical analyses specifically addressing the nexus between defense expenditures and employment/unemployment. The results obtained from all the three versions of the CS-ARDL model have confirmed the existence of the positive dynamic link between defense burden and unemployment, meaning that increasing defense spending tends to accelerate the unemployment rate in those countries. The panel Granger noncausality test by A. Juodis *et al* (2021) has also verified these results.

In line with the results, the characteristics of defense expenditures in those countries could be prone to more labor-intensive rather than capital-intensive, except for Russia, which is one of the leading arms producers and exporters in the global context and with the potential to invest more in cutting-edge technologies in arms production. Therefore, anticipated productivity gains may not be realized without the diffusion of military technology to the civilian sectors. Since forced conscription is in force in all the countries included in the sample, it is quite plausible that the countries tend to channel their budgetary sources to a personnel expenditure. In order to generate additional employment opportunities associated with productivity rises, governments should allocate defense expenditures in a capital-intensive manner so as to enable the production of cutting-edge technology arms in the country. Moreover, governments should also reinforce cooperation with civil or private sector companies for the provision of defense goods. Beside the diffusion of technology in the country, the provision of those goods would also strain the external dependence of the military sector in general. Thus, the pressure on governments' budgets and the balance of payments would be mitigated as well. Beyond the characteristics of defense expenditures in those countries, governments should channel the budgetary sources to the productive fields that trigger private investments, which are likely crowded out by the defense expenditures of the governments. In line with the results highlighted in the present study, the governments in those countries should gradually constrain defense expenditure in the long run in order to channel the budgetary sources to productive fields.

Despite those major findings and policy implications, this paper has some limitations that are worth mentioning in conducting future studies in this field. The basic limitation of this empirical endeavor hinges on the sample countries. Due to the limitations of the available data for some countries (i.e. for Tajikistan and Uzbekistan), the empirical analysis was limited to those nine post-Soviet countries. Moreover, the three Baltic countries (Estonia, Latvia and Lithuania) were excluded from the sample since they are involved in different economic and political blocs by having integrated with the EU and NATO. Therefore, further empirical analyses could be strengthened by including those countries as well. In addition, the outbreak of the war between the Russian Federation and Ukraine has not only influenced both countries, but their

neighboring countries and European countries as well. In this respect, the majority of the European countries have allocated more budgetary resources to their respective national defense since the outbreak of said war. Thus, future empirical studies could be extended involving those European countries, too. Furthermore, with the availability of proper data for empirical analysis, future studies could be carried out taking into consideration the presence of structural breaks in unveiling the dynamic interplay between militarization and unemployment, together with the other macroeconomic indicators thought to be influenced by changes in defense expenditures.

ENDNOTES

1 Currently, the CIS consist of nine states and one associated state, namely Turkmenistan. Due to the data availability issue, Tajikistan and Uzbekistan have not been included in the empirical analyses. Even though Moldova and Ukraine have been ceased the CIS protocol as the founding members, they were included in the empirical analyses instead of Tajikistan and Uzbekistan. For the current discussion on the membership status of the countries, see: https://en.wikipedia.org/wiki/Commonwealth_of_Independent_States.

2 Since Estonia, Latvia and Lithuania are the current members of the EU and NATO, they are excluded from the empirical analyses because they are involved in a different political and military bloc.

3 To learn where conscription is currently in force with respect to the sex and duration for the countries included in the sample, go to https://worldpopulationreview.com/country-rankings/countries-with-mandatory-military-service.

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APPENDIX

A. 1. The list of the post-Soviet Union countries

Azerbaijan	Georgia	Moldova
Armenia	Kazakhstan	Russian Federation
Belarus	Kyrgyzstan	Ukraine