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MILITARIZATION AND INCOME INEQUALITY IN EUROPEAN COUNTRIES (2000-2017)

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Abstract: *This paper investigates the impact of militarization on income inequality. The analysis is performed on a panel of 40 European countries over the period 2000-2017. The degree of militarization of a country is measured by means of the Global Militarization Index (GMI) and we employ the Gini index as measure of inequality. The main findings show that militarization and inequality are positively associated. The findings appear to be robust. First, we undertake the same estimations on alternative samples of countries and results are confirmed. Eventually, to deal with the issue of endogeneity, we apply the Lewbel (2012) IV–GMM approach and results appear to be robust to endogeneity. We also consider control variables which are related to military commitment, namely (i) the conscription; (ii) the NATO membership; (iii) the involvement in an armed conflict. Interestingly conscription appears to be negatively associated with income inequality whereas an armed conflict and NATO membership show the opposite sign.*

Keywords: Militarization, Income Inequality, Global Militarization Index (GMI), Gini index.

Jel Codes: O15, H5, H56, C23

1. Introduction

Income inequality has always been a great concern especially for policy makers and it nowadays represents a major challenge for countries because of the large variety of associated factors (Alfani, 2021; Deller et al., 2021; Jaumotte and Osorio Buitron, 2020; de Haan and Sturm, 2017; Lakner and Milanovic, 2016; Piketty, 2015). This paper in particular focuses on the relationship between militarization and income inequality. The point of departure of this research is that the public resources allocated to military spending– and more in general the military commitment as a whole - could be expected to affect income distribution within a society. Secondly, there is a distinction to be made between wartimes and peacetimes. In this respect, recently it has been shown that in wartime the impact of military commitment of the government on inequality can be substantial but also short-lasting (Dalton and Shin, 2021; Bossie and Kuehn; Scheidel, 2017; Bircan et al. 2017).

Needless to say, studies on the impact of warfare on inequality are necessarily focused on a short-term shock and its consequences. Rather, this paper focuses on the overall impact of military commitment on income inequality. In fact, albeit crucial, the topic is not extensively treated[1]. Only a small set of studies analyzes punctually the relationship between inequality and military commitment. The empirical evidence is not fully conclusive even if most studies highlight a positive association between military commitment and inequality, i.e. military commitment increase income inequality. In fact, only Chletsos and Roupakias (2020) and Ali (2012) find that defense spending can reduce income inequality. According to this perspective, an increased military spending can be supposed to stimulate aggregate demand and therefore the level of employment. In particular, this impact is supposed to take shape if military industries are labour-intensive and military production is domestic.

Contrariwise, a larger number of empirical studies point to a worsening of income inequality due to military spending. Some studies are grounded on the idea that military industries hire more skilled and productive workers who have higher salaries than less-skilled workers in the civil sectors. The gap between skilled and unskilled labour can be further worsened if the military industry chooses to employ skilled workers rather than unskilled workers. Such idea necessarily could be tested only for economies which exhibit a military industry. Fitting to a larger variety of scenarios is the trade-off argument, namely the predicted reduction of welfare spending due to an increase in military spending. In such a case income inequality can increase when public resources are allocated to military spending so reducing those allocate to social welfare.

[1] In general, studies on military expenditure focus on: (i) the relationship between military spending and economic growth (Emmanouilidis and Karpetis, 2021; Lobont et al., 2019; Raju and Ahmed, 2019; Dunne and Nikolaidou, 2012; Dunne et al., 2004; Dunne et al., 2002), (ii) the convergence across countries in military spending (Clements et al., 2021; Yilanci et al., 2020), (iii) the determinants of military spending (Odehnal et al., 2020; Odehnal and Neubauer, 2018), (iv) the relationship defense spending and debt (Kollias et al. 2021; Dudzevičiūtė et al., 2021; Caruso and Di Domizio, 2017; Pollin, 2012; Smith and Narayan, 2009), (v) defense spending and unemployment (Kollias et al., 2020; Abell 1990), (vi) the impact of military expenditure on environmental pollution (Qayyum et al. 2021; Noubissi and Poumie, 2019; Sohag et al. 2019) and the interdependence of military spending among countries (Saba, 2021; Caruso and Di Domizio, 2016).

Then, there is a growing evidence on the association between military spending and income inequality. Elveren (2012) using the data for the period 1963-2007 on Turkey highlights that military spending also exacerbates the income inequality. Wolde-Rufael (2014) finds a positive and significant effect of defense spending on income inequality for Taiwan in the period 1976-2011 and Wolde-Rufael (2016) for South Korea for the period 1965–2011. Fewer studies are based on panel of countries: Kentor et al. (2012) highlights the same for a set of 82 developed and developing countries in the years 1970-2000 and Shahbaz et al. (2016) for Iran during the period 1969-2011. The same results are presented in Töngür and Elveren (2015) for a set of 37 countries during the period 1988-2003 and Meng et al. (2015) for the Chinese economy for the period 1989-2012. In a more recent analysis, Graham and Mueller (2019) reveal that military spending and income inequality are positively associated in a set of OECD countries in the period 1990–2007. Other few studies show a lack of relevance of military spending on inequality (Lin and Ali, 2009). In such a case, the proposed explanation is that military spending represents a small part of the total public expenditure and labor force employed.

This paper contributes to this strand of literature by focusing on the relationship between the degree of militarization and income inequality in a sample of 40 European countries over the period 2000-2017[2]. Because of the focus on European countries, the present research is associated with Biscione and Caruso (2021) that cover a panel of 26 Transition countries from 1990 to 2015. There the authors show that military expenditures increase inequality also pointing out empirically that there is a clear-cut trade-off between military and welfare spending.

In this paper the empirical approach differs from the prevailing models. In brief, we do not consider military expenditures only as explanatory variable. In fact, differently from the existing studies we point to militarization as a whole by employing the Global Militarization Index (hereafter GMI) which is a composite measure that provides information on the means and capabilities provided to state armed forces and compares spending on the military and military equipment with spending on other domains of society. Specifically, the GMI identifies the relative weight and relevance of military apparatus with respect to its society, as well as a process that records the increase or decrease in the degree level of militarization[3].

Our main findings show that militarization is associated with an increase in income inequality (proxied by means of the Gini index). Such main result appears to be robust. First, it is confirmed when we estimate an alternative sample of countries. Secondly, to deal with the issue of endogeneity, we employ an IV strategy employing the Lewbel model (2012) and the corresponding statistical tests that exclude any endogeneity problem also confirming the main results. In particular, the Lewbel approach is a 2SLS strategy that incorporates internally constructed heteroskedasticity-based instruments. Also in this case, the main results are confirmed.

[3] Elveren and Moghadam (2019) employs this index to examine empirically the impact of militarization on gender inequality in a sample of 133 countries for the period 1990-2017.

Although the focus is on the militarization proxied by GMI, we have included two controls which are related to military dimension of the countries, namely military conscription, the involvement in an armed conflict and the NATO membership. Interestingly, in most estimations military conscription appears to have a redistribution effect. Instead, inequality appears to increase if the country is involved in an armed conflict and if it is a NATO member.

The paper is organized as follows. Section 2 describes the data and the variables, while Section 3 outlines the econometric strategy and presents the findings of a baseline model. Alternative estimations and robustness check are presented is Section 4. Conclusions are in the last section.

2. Data collection and variables

We constructed a panel of 40 European countries[4] from 2000 to 2017. Our dependent variable is the income inequality captured by Gini index. The Gini index is bounded between 0 (perfect equality) and 100 (max inequality). Data on Gini index come from the Standardized World Income Inequality Database (SWIID, version 8.2). SWIID database allows maximum comparability for a broad number of countries and years (Zuazu, 2021 Berg et al., 2018; de Haan and Sturm; 2017; Acemoglu et al., 2015; Bergh and Nilson, 2010), standardized through the Bayesian approach information gathered from several data sources[5]. The main drawback related to the use of this dataset is that Gini coefficients are subject to measurement bias (Chletsos and Roupakias, 2020; Solt, 2020; Herzer, 2016). In our analysis we first employ the Gini index estimated before and after taxes and transfers. Then, in line with a growing literature we also employ the unbounded Gini index (see among others Chowdhury et al. 2018, Dizaji, 2017; Nikoloski, 2015; Reuveny and Li, 2003) by means of the following equation:

$$logGini = log\left[\frac{Gini}{100-Gini}\right].$$

The converted variable is equal to - ∞ if the original Gini score is 0 and to + ∞ when the Gini index takes the value of 100 (Pindyck and Rubenfeld, 1991). We employ the Gini index unbounded for two reasons: (i) as the Gini coefficient has a value between 0 and 100, the use of the OLS estimator could generate some problems since it supposes that the dependent variable is unbounded (Migliorati et al., 2018; Kieschnick and McCullough, 2003) and (ii) when using an OLS estimator, the Gini index unbounded provides a better fit to asymptotic normality assumption (Paolino, 2001)

As said above, the main explanatory variable is the Global Militarization Index (GMI) developed by the Bonn International Center for Conversion (BICC) that measures the level of militarization of 161 states since 1990. This index describes the relative weight and the role played by the military apparatus within a society. The BICC constructs this index exploiting information from several sources of data: (i) the

[4] Table A1 in Appendix contains the list of the countries.

[5] SWIID database combines information from: (i) Luxembourg Income Study data; (ii) OECD Income Distribution Database; (iii) the Socio-Economic Database for Latin America and the Caribbean; (iv) Eurostat; (v) the World Bank's PovcalNet, the UN Economic Commission for Latin America and the Caribbean and (iv) national statistical institutes.

Stockholm Peace Research Institute (SIPRI); (ii) the International Monetary Fund (IMF); (iii) the World Health Organization (WHO) and finally (iv) the International Institute for Strategic studies (IISS). To define the level of militarization of a country, the BICC considers the following three categories: (i) expenses; (ii) personnel and (iii) heavy weapons. The first provides information on the ratio of military expenditure on GDP and health spending. The degree of militarization is also determined by the ratio between military personnel and both total population and physicians. Finally, the third category provide information on the number of an armed force' heavy weapons[6] with respect to the total population. The GMI is computed considering the score of the three weighted categories, its final value is normalized on a scale from 0 to 1,000.

The GMI index is commonly quite stable. Most countries in our sample have not experienced significant fluctuations of such index in recent years. In fact, in countries, such as Austria, Belgium, France and Greece, military spending has even been almost stable for some year. Many NATO members in Eastern Europe show a disarmament propensity, with the exception of Estonia, Latvia and Lithuania. In 2000, three European countries were in the top twenty positions, while in 2017 there were 5. Russia, from 2001 to 2017 was in the top ten. This result is due to both the relatively high number of military personnel and the very highest number of heavy weapons. Although ranked among the top ten, in recent years Russia has recorded a slightly lower level of militarization. Differently from the Eastern Europe, most Western European countries have not experienced an increase in the degree of militarization. During the period 2000-2017, in some countries such as Germany, France, Great Britain, Italy and Spain, the GMI values even decreased.

Table 1. GMI Score and Rank-2017

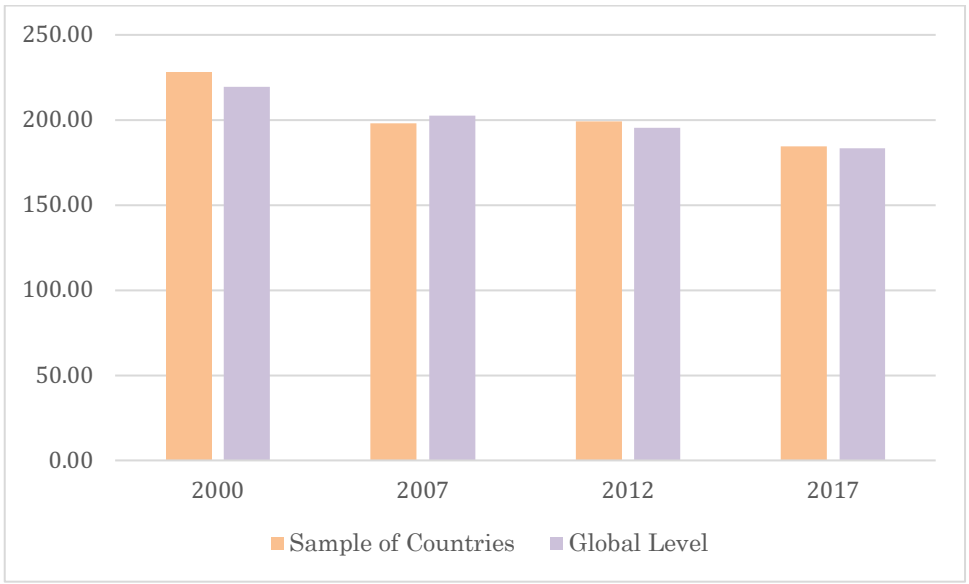
Country	GMI Score	GMI World Ranking
Top 5 European countries in the ranking		
Armenia	310	4
Russia	283	8
Cyprus	272	12
Greece	272	13
Belarus	230	17
Last 5 European countries in the ranking		
Luxembourg	116	103
Netherlands	115	104
Germany	115	105
Austria	111	106
Albania	79	129

In 2017 the European country with the highest level of militarization was Armenia followed by Russia, Cyprus, Greece and Belarus. To get an overview of the trend of the GMI, we calculate the average GMI for the set of countries under examination and on a global level. Graph 1 simply shows that the average GMI at global level is almost lower with respect to countries analyzed in our study.

[6] Heavy weapons are defined as all military equipment that fall into one of these four categories: (i) armored vehicles; (ii) artillery over 100mm caliber; (iii) combat aircraft, and (iv) major fighting ships.

The lower values of the global average GMI are due to the inclusion, in the calculation of the average value of countries with a negligible level of militarization which smooths out the final result.

Graph 1. Trend in Global Militarization Index (2000-2017)



Besides the GMI, the main explanatory variable, we also employ other variables which are broadly related to the degree of militarization of a society: (i) conscription; (ii) existence of a conflict; (iii) NATO membership. They are all dummy variables. First, to observe the effect of compulsory military service on income disparities, we create a dummy variable that assumes a value equal to 1 if the country has mandatory conscription during the time interval under analysis and 0 otherwise. Information on military conscription is taken from The World Factbook released annually by the U.S. Central Intelligence Agency (CIA). The 'conflict' dummy takes a value of 1 if the states are involved in an armed conflict and 0 otherwise. Conflict information is gathered from UCDP/PRIO Armed Conflict Dataset Codebook Version 20.1–2019. The NATO dummy is equal to 1 for NATO member countries, 0 if not.

Table 2. Correlation matrix

	Global Militarization Index	Conscription	Conflict	NATO
Global Militarization Index	1.000			
Conscription	0.495	1.000		
Conflict	-0.030	-0.189	1.000	
NATO	-0.271	-0.457	0.342	1

Other control variables are included to account for other factors that also potentially impact the income inequality. As an indicator of economic openness, we add the trade openness which is typically calculated as the ratio of the sum of imports and exports to the GDP. To capture the political regime of countries we exploit the scores taken from Polity IV dataset (Marshall et al., 2019). These scores range from −10 (most autocratic) to +10 (most democratic). We also include the Index of Economic Freedom released by the Heritage Foundation that assigns each country a ranking score a between 0 (no economic freedom) and 100 (total economic freedom). The index considers 10 different elements of economic freedom that are grouped in four categories: (i) rule of law: property rights, freedom from corruption; (ii) government size: fiscal freedom, government spending; (iii) regulatory efficiency: business freedom, labor freedom,

monetary freedom and (iv) market openness: trade freedom, investment freedom, financial freedom. Data on GDP per capita, age dependency (defined as the ratio of dependents -- people younger than 15 or older than 64 -- to the working-age population -- those aged 15-64), inflation level and unemployment rate are taken from the World Bank WDI dataset. Table 2 highlights the sources of variables, whereas the descriptive statistics of the variables used in the estimations are presented in Table 3.

Table 3. Definition and sources of variables

Variable	Definition	Source
Inequality	Gini Index	The Standardized World Income Inequality Database - SWIID
GMI	Global Militarization Index	Bonn International Center for Conversion -BICC
Conscription	Country with military conscription	The World Factbook CIA
Conflict	Country in an armed conflict	UCDP/PRIO
NATO	For non-NATO members NATO = 0 and for NATO members, NATO =1	Nato website
GDP per capita	GDP divided by Population	World Development Indicators-WDI
Trade Openness	Exports plus imports as percent of GDP	World Development Indicators-WDI
Inflation	Inflation Rate	World Development Indicators-WDI
Unemployment	Unemployment Rate	World Development Indicators-WDI
Dependency	Ratio of the number of dependents aged zero to 14 and over 65 to the total population aged 15 to 64.	World Development Indicators-WDI
Economic Freedom	Index of Economic Freedom	Heritage Foundation
Democracy	Polity index	Polity IV dataset

Table 4. Descriptive statistics

Variables	Number of Observations	Mean	Standard Deviation	Minimum Value	Maximum Value
Inequality					
Net Gini	703	3.419	0.153	3.109	3.777
Net Gini Unbounded	703	-0.142	0.251	-1.260	0.266
Gross Gini	703	3.415	0.154	3.109	3.777
Gross Gini Unbounded	703	-0.814	0.224	-1.243	-0.253
Global Militarization Index	708	6.534	0.132	6.001	6.762
Conscription	720	0.583	0.493	0	1
Conflict	720	0.633	0.482	0	1
NATO	720	0.538	0.499	0	1
GDP per capita	720	9.523	1.257	5.309	11.804
Openness	692	-0.081	0.393	-0.850	1.331
Inflation	668	0.976	1.172	-5.116	4.391
Unemployment	720	2.181	0.537	0.591	3.618
Dependency	720	3.880	0.114	3.548	4.450
Economic Freedom	700	4.173	0.127	3.802	4.414
Democracy	708	2.831	0.409	1.099	2.996

Note: All continuous variables are expressed in the natural logarithm form

3. Econometric specification and results

In what follows, we present our estimates. In particular, we employ a panel data model specified as follows:

$$lninequality_{it} = \beta_0 + \beta_1 lnGMI_{t-1} + \beta_2 Z_{it-1} + \beta_3 W_{it} + \mu_i + \nu_{it}$$

where, $lninequality_{it}$ is the dependent variable, namely the log of the Gini index (net and gross) that describes the level of income inequality in country i at time t and $lnGMI_{t-1}$ represents the one-year lagged index of militarization. The vector Z_{it-1} is a vector of the demographic, political and economic variables defined above, whereas the vector W_{it} includes a set of dummy variables (conflict, military conscription and NATO). To estimate the elasticity and mitigate the skewness, all continuous explanatory variables are converted into a natural log value. The explanatory variables have been also one-year lagged to minimize the endogeneity issue. Finally, μ_i refers to the country fixed effect, and ν_{it} is the error term capturing all other omitted factors. Table 5 collects the results of the regression estimates.

Table 5. Global Militarization Index and Inequality (2000-2017)- Main Results

VARIABLES	(1) Net Gini	(2) Net Gini (Unbounded)	(3) Gross Gini	(4) Gross Gini (Unbounded)
Ln Global Militarization Index *(t-1)*	**0.077****	**0.141****	0.058	0.078
	[0.037]	[0.067]	[0.061]	[0.088]
Conscription	**-0.021*****	**-0.036*****	**-0.025*****	**-0.036*****
	[0.006]	[0.012]	[0.007]	[0.011]
Conflict	**0.008****	**0.016****	**0.011****	**0.015****
	[0.004]	[0.007]	[0.004]	[0.006]
NATO	**0.022****	**0.035***	**0.028***	**0.040***
	[0.011]	[0.020]	[0.014]	[0.020]
Ln GDP per capita *(t-1)*	**-0.023*****	**-0.039*****	**-0.028****	**-0.038****
	[0.008]	[0.014]	[0.010]	[0.015]
Ln Openness *(t-1)*	-0.002	-0.007	0.02	0.031
	[0.021]	[0.036]	[0.028]	[0.040]
Ln inflation *(t-1)*	0.001	0.001	0.000	0.000
	[0.002]	[0.003]	[0.002]	[0.003]
Ln unemployment *(t-1)*	**0.031*****	**0.055*****	**0.033*****	**0.048*****
	[0.008]	[0.014]	[0.008]	[0.011]
Ln Dependency *(t-1)*	**0.148****	**0.260****	**0.170***	**0.238***
	[0.072]	[0.117]	[0.097]	[0.135]
Ln Economic Freedom Index *(t-1)*	0.049	0.100	**0.126****	**0.196****
	[0.049]	[0.076]	[0.057]	[0.080]
Ln Polity Index *(t-1)*	**0.104****	**0.177*****	0.065	0.097
	[0.040]	[0.065]	[0.049]	[0.069]
Constant	**2.368*****	**-2.799*****	**1.857*****	**-3.080*****
	[0.407]	[0.686]	[0.483]	[0.695]
Linear Time Trend	YES	YES	YES	YES
Observations	559	559	559	559
R-squared within	0.435	0.437	0.424	0.429
R-squared between	0.205	0.234	0.173	0.140
R-squared overall	0.210	0.238	0.175	0.145
Number of Countries	40	40	40	40

Notes: Clustered standard error at country level in brackets. Statistical significance *** p<0.01, ** p<0.05, * p<0.10

Findings in columns 1 and 2 refer to the baseline model with the Gini index estimated after taxes and transfers, and the same indices converted into unbounded variables. Column 3 and 4 present results with the Gini index estimated before taxes and transfers and the relative unbounded index.

Looking at the results, the main result we would claim is that the one-year lagged value of the global militarization index is significantly and positively associated with the current values of income inequality. In fact, militarization appears to be positively associated with income inequality. The magnitude of the effect of global militarization index on income inequality changes when changing the Gini score employed. Looking at the effect of the lagged militarization index on the Gini bounded coefficient, we find that it is statistically significant for net Gini indices. In fact, 1-point percent change in GMI in the previous year leads to a change in income inequality in the current year equal to 0.077%.

The impact is greater when the unbounded net Gini index is considered. In particular, when we use the unbounded Gini index after taxes and transfers, the estimated coefficient on military expenditure highlights that a 1-point percent change in militarization index in the previous year leads to a change equal to 0.141% in the income inequality in the current year. In any case we could argue that a 1-point percent change in militarization index in the previous year is associated with an increase in inequality that is slightly larger than 0.1%.

There are several additional findings that deserve to be highlighted. It emerges that inequality appears to increase if the country is involved in an armed conflict. This result seems to point out that armed conflict may have disproportionate effects especially for the poorest population. In fact, an armed conflict may also induce a reduction in current social spending as governments lose access to revenue due to both poor economic performance and poor tax collection. Interestingly, military conscription seems to be negatively related to income inequality. This means that, in the countries

analyzed, military conscription has had a re-distributional effect. However, this result is not a novelty. It is in line with Biscione and Caruso (2021) and Card and Cardoso (2012). Yet, NATO membership appears to be positively associated with inequality.

Other control variables exhibit the expected signs. An increase in GDP per capita in the previous year reduces inequality in the current year. On the contrary, unemployment leads to a worsening of income distribution. In addition, countries with a more democratic political system appear to have a higher inequality level. This result is in line with a part of literature which shows that democratic rule increases income inequality (Bahamonde and Trasberg, 2021; Bonica et.al; 2013; Wong, 2016). Finally, changes in the population age structure also affect the income inequality, in fact, the increase in the old-age dependency ratio appears to worsen income distribution as well.

Table 6 reports the baseline estimation obtained with the inclusion of the one-year lagged Gini indexes as regressor in the model. We add past income inequality levels to capture the persistence considering of income inequality since it often exhibits negligible within-country variation during the sample period (Christopoulos and McAdam, 2017; Coady and Dizioli, 2017; Latif, 2015). Also in this regression, coefficients of GMI appear to be statistically significant when we employ the net Gini index (both bounded and unbounded) so confirming that higher scores of GMI are associated with higher inequality. In detail, the one-year lagged militarization index positively has statistically significant impact on both indices although the effect seems to be higher and almost double for the net Gini unbounded. In fact, a 1-point percent increase in GMI in the previous year generates a worsening in income distribution in the current year equal to 0.016% if using the net Gini bounded and 0.029% if using the net Gini unbounded, respectively. At the bottom of the table, we also report the long run effects of GMI on inequality calculated by means of the following formula: $long\ run\ effect = \frac{coefficient\ of\ GMI}{1-coefficient\ of\ lagged\ Gini}$. We compute such impact with statistically significant coefficients only, namely only with net measures of Gini. The long-run effect is 0.132 when employing the original Gini score and it is even larger when employing the unbounded measure. In fact, the long run elasticity of Gini with respect to GMI appears to be substantial. In brief the results show that militarization increases inequality both in the short run and in the long run.

Table 6. Global Militarization Index and Inequality (2000-2017)– Lagged Inequality

	(1) Net Gini	(2) Net Gini (Unbounded)	(3) Gross Gini	(4) Gross Gini (Unbounded)
Ln Global Militarization Index *(t-1)*	**0.016****	**0.029****	0.016	0.022
	[0.006]	[0.011]	[0.012]	[0.016]
One year lagged dep. Variable	**0.879*****	**0.887*****	**0.849*****	**0.853*****
	[0.044]	[0.041]	[0.044]	[0.045]
Conscription	-0.002	-0.003	-0.003	-0.004
	[0.002]	[0.003]	[0.003]	[0.004]
Conflict	**0.003****	**0.005****	**0.004****	**0.006****
	[0.001]	[0.002]	[0.002]	[0.002]
NATO	0.002	0.003	**0.006***	**0.009***
	[0.002]	[0.004]	[0.003]	[0.005]
Constant	**0.245***	**-0.423****	**0.259***	**-0.485****
	[0.131]	[0.186]	[0.137]	[0.203]
Control Variables	YES	YES	YES	YES
Linear Time Trend	YES	YES	YES	YES
Long-run effects	**0.132**	**0.257**	-	-
Observations	559	559	559	559
R-squared within	0.895	0.898	0.865	0.869
R-squared between	0.991	0.991	0.993	0.993
R-squared overall	0.988	0.988	0.987	0.987
Number of Countries	40	40	40	40

Notes: Clustered standard error at country level in brackets. Statistical significance *** p<0.01, ** p<0.05, * p<0.10

4. Robustness check and alternative estimations

(i) Alternative samples of countries

As alternative estimations, we have re-run the analysis so highlighting the effect of militarization on income inequality in sub-samples of countries. Table 7 contains the empirical findings obtained excluding: (i) Russia that could be considered an outlier and (ii) the countries with a median population which is over the 90th percentile of the total population[7]. The main results are confirmed. For the sake of clarity, coefficients of control variables are not reported since all control variables confirm the expected signs.

Table 7. Military spending and income inequality (2000-2017) - Different Samples

	7.1 Excluding Russia			
	(1)	(2)	(3)	(4)
VARIABLES	Net Gini	Net Gini (Unbounded)	Gross Gini	Gross Gini (Unbounded)
Ln Global Militarization Index *(t-1)*	**0.078****	**0.141****	0.059	0.079
	[0.037]	[0.067]	[0.061]	[0.087]
Conscription	**-0.020*****	**-0.035*****	**-0.025*****	**-0.035*****
	[0.006]	[0.012]	[0.008]	[0.011]
Conflict	**0.009****	**0.016****	**0.012****	**0.016****
	[0.004]	[0.007]	[0.004]	[0.006]
NATO	**0.022****	**0.036***	**0.029****	**0.041****
	[0.011]	[0.020]	[0.014]	[0.020]
Constant	**2.326*****	**-2.856*****	**1.795*****	**-3.160*****
	[0.415]	[0.694]	[0.486]	[0.699]
Control Variables	YES	YES	YES	YES
Linear Time Trend	YES	YES	YES	YES
Observations	543	543	543	543
R-squared within	0.441	0.443	0.432	0.436
R-squared between	0.202	0.228	0.263	0.232
R-squared overall	0.209	0.234	0.261	0.234
Number of Countries	39	39	39	39
	7.2 Excluding countries with a median population over the 90th percentile of the total population			
	(1)	(2)	(3)	(4)
VARIABLES	Net Gini	Net Gini (Unbounded)	Gross Gini	Gross Gini (Unbounded)
Ln Global Militarization Index *(t-1)*	**0.072***	**0.131***	0.055	0.074
	[0.042]	[0.075]	[0.067]	[0.096]
Conscription	**-0.022*****	**-0.038*****	**-0.028*****	**-0.039*****
	[0.007]	[0.014]	[0.009]	[0.012]
Conflict	**0.009****	**0.016****	**0.011****	**0.015****
	[0.004]	[0.007]	[0.005]	[0.006]
NATO	**0.025****	**0.040***	**0.033****	**0.047****
	[0.011]	[0.020]	[0.014]	[0.021]
Constant	**2.452*****	**-2.599*****	**1.946*****	**-2.940*****
	[0.436]	[0.722]	[0.499]	[0.722]
Control Variables	YES	YES	YES	YES
Linear Time Trend	YES	YES	YES	YES
Observations	516	516	516	516
R-squared within	0.427	0.426	0.427	0.432
R-squared between	0.227	0.252	0.159	0.140
R-squared overall	0.229	0.253	0.174	0.156
Number of Countries	36	36	36	36

Notes: Clustered standard error at country level in brackets. Statistical significance *** p<0.01, ** p<0.05, * p<0.10

When we exclude these countries from our sample, the statistical results do not change with respect to the findings obtained by the baseline model, since these countries are not in the extreme positions but close to the mean. Finally, we also add the one-year lagged value of Gini index as dependent variable in the estimates performed for these sub-set of countries to control for the persistent effects of inequality, Table 8 contains the results.

Table 8. Global Militarization Index and Inequality (2000-2017)-Lagged Inequality

	8.1 Excluding Russia			
	(1)	(2)	(3)	(4)
VARIABLES	Net Gini	Net Gini (Unbounded)	Gross Gini	Gross Gini (Unbounded)
Ln Global Militarization Index *(t-1)*	**0.012****	**0.024****	0.015	0.022
	[0.005]	[0.010]	[0.010]	[0.015]
One year lagged dep. Variable	**0.919*****	**0.919*****	**0.891*****	**0.893*****
	[0.027]	[0.028]	[0.025]	[0.024]
Conscription	-0.000	-0.001	-0.002	0.002
	[0.002]	[0.003]	[0.003]	[0.002]
Conflict	**0.002***	**0.003***	**0.003***	0.002
	[0.001]	[0.002]	[0.002]	[0.002]
NATO	0.000	0.001	0.004	0.003

[7] The countries excluded are the following: France, Germany, Russia and the United Kingdom.

	[0.002]	[0.004]	[0.003]	[0.002]
Constant	0.118	**-0.408***	0.231	-0.287
	[0.120]	[0.236]	[0.146]	[0.200]
Control Variables	YES	YES	YES	YES
Linear Time Trend	YES	YES	YES	YES
Long-run effects	**0.148**	**0.296**	-	-
Observations	497	497	497	497
R-squared within	0.927	0.921	0.897	0.901
R-squared between	0.996	0.995	0.996	0.996
R-squared overall	0.994	0.993	0.993	0.993
Number of Countries	35	35	35	35
8.2 Excluding countries with a median population over the 90th percentile of the total population				
	(1)	(2)	(3)	(4)
VARIABLES	Net Gini	Net Gini (Unbounded)	Gross Gini	Gross Gini (Unbounded)
Ln Global Militarization Index *(t-1)*	**0.013****	**0.024****	0.016	0.023
	[0.005]	[0.030]	[0.010]	[0.015]
One year lagged dep. Variable	**0.920*****	**0.919*****	**0.891*****	**0.894*****
	[0.029]	[0.030]	[0.027]	[0.027]
Conscription	-0.000	-0.000	-0.002	0.002
	[0.002]	[0.003]	[0.003]	[0.002]
Conflict	**0.002***	**0.003***	**0.003***	0.002
	[0.001]	0.002]	[0.002]	[0.002]
NATO	0.001	0.001	0.004	0.003
	[0.002]	[0.004]	[0.003]	[0.003]
Constant	0.107	**-0.429***	0.221	-0.297
	[0.127]	[0.250]	[0.150]	[0.203]
Control Variables	YES	YES	YES	YES
Linear Time Trend	YES	YES	YES	YES
Long- run effects	0.163	0.296	0.147	0.217
Observations	433	433	433	433
R-squared within	0.928	0.923	0.896	0.901
R-squared between	0.996	0.996	0.995	0.995
R-squared overall	0.994	0.993	0.992	0.992
Number of Countries	31	31	31	31

Notes: Clustered standard error at country level in brackets. Statistical significance *** p<0.01, ** p<0.05, * p<0.10

Regression results validate that the level of militarization appears to have a strong influence on inequality as measured by the net Gini index. The magnitude of the effect of GMI on income inequality is nearly the same as that obtained using the full sample data, in fact, the effect is higher on net Gini unbounded than net Gini bounded. To sum up, with respect to the main estimation reported in previous section, the main results do not change. The militarization has a strong impact on inequality both in the short run and in particular in the long run thus confirming the baseline findings.

(ii) The issue of Endogeneity

To rule out the endogeneity issues, we estimate IV regressions based on the approach suggested by Lewbel (2012) which is based on the use of a 2SLS (two-stage-least squares) strategy that incorporates internally constructed heteroskedasticity-based instruments. This approach is preferred when no external instruments are readily available, in fact, employing the Lewbel's technique the internal instruments can be built from the residuals of the auxiliary equations and these residuals are multiplied by each included exogenous variable in mean-centering form. Specifically, this approach uses the conditional second moment of the focal regressors that in our study is the level of militarization. This approach works under two conditions: (i) the residuals derived from the first-stage regression must be heteroscedastic; and (ii) the vector of regressors used must be correlated with the variance of these residuals and, at the same time, these regressors must be independent of the covariance between these first-stage residuals and the residuals derived from the second-stage regression. If these assumptions are satisfied, the product of first-stage regression and mean-centering regressors gives instruments. Therefore, since it is useful to check for the heteroscedasticity of the first-stage residuals, we employ the Breusch-Pagan test, the null hypothesis is that errors are homoscedastic (Baum and Lewbel, 2019). Thus, in the first stage, we estimate our dependent variables on the other regressors, and we compute the residuals. Then, we perform the Breusch-Pagan statistic to control the heteroscedasticity of residuals. We obtain the instruments by mean centering each

regressor and multiplying it with the first-stage residuals. In the second stage, we estimate the previous equation exploiting the instruments derived. The validity of our instrumentation procedure is tested applying the Kleibergen-Paap F statistic whereas the Hansen-J test is used to control the overidentifying restrictions. Finally, we also test for the exogeneity of our inequality output performing the Sargan test. The null hypothesis, namely the level of militarization is exogenous, is checked using a statistical test distributed as a chi-squared with a number of degrees of freedom corresponding to the number of endogenous variables (Courtemanche et al., 2021). Table 9 contains the results obtained through the IV-GMM technique developed by Lewbel (2012). Specifically, columns 1-4 show the estimations considering the total sample of countries, columns 5-8 present the findings obtained excluding Russia and finally columns 5-8 display empirical evidence when excluding those countries with a median population over the 90th percentile of the total population.

Table 9. Global Militarization Index and Inequality (2000-2017)- Lewbel's Estimates

	Total Sample of Countries				Excluding Russia				Excluding countries with a median population over the 90th percentile of the total population			
	(1) Net Gini	(2) Net Gini (Unbounded)	(3) Gross Gini	(4) Gross Gini (Unbounded)	(5) Net Gini	(6) Net Gini (Unbounded)	(7) Gross Gini	(8) Gross Gini (Unbounded)	(9) Net Gini	(10) Net Gini (Unbounded)	(11) Gross Gini	(12) Gross Gini (Unbounded)
Δ Ln Global Militarization Index	**0.012****	**0.023****	**0.014****	**0.013***	**0.011****	**0.022****	**0.015****	**0.014****	**0.010****	**0.020****	**0.016*****	**0.013***
	[0.005]	[0.009]	[0.006]	[0.007]	[0.005]	[0.009]	[0.006]	[0.007]	[0.005]	[0.008]	[0.005]	[0.007]
Conscription	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.002]
Conflict	**0.001***	**0.003***	**0.002***	0.000	**0.002****	**0.004****	**0.003****	0.000	**0.002****	**0.004*****	**0.003****	0.000
	[0.001]	[0.001]	[0.001]	[0.002]	[0.001]	[0.002]	[0.001]	[0.002]	[0.001]	[0.002]	[0.001]	[0.002]
NATO	**0.002*****	**0.004****	**0.003*****	0.000	**0.002****	**0.003***	**0.003*****	0.000	**0.002***	0.002	0.003**	0
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.002]	[0.001]	[0.002]	[0.001]	[0.002]
Δ Ln GDP per capita	-0.004	-0.007	0.001	**0.026****	-0.007	-0.012	-0.003	**0.022***	-0.005	-0.01	0.004	**0.023***
	[0.005]	[0.010]	[0.007]	[0.012]	[0.006]	[0.011]	[0.008]	[0.013]	[0.006]	[0.010]	[0.008]	[0.012]
ΔLn Openness	-0.002	-0.002	0.002	-0.008	-0.002	-0.003	0.002	-0.009	-0.002	-0.004	0.005	-0.005
	[0.005]	[0.009]	[0.007]	[0.008]	[0.005]	[0.009]	[0.007]	[0.008]	[0.005]	[0.009]	[0.007]	[0.008]
Δ Ln inflation	0.000	0.000	0.000	**0.002*****	0.000	0.000	0.000	**0.002*****	0.000	0.000	0.000	**0.002*****
	[0.000]	[0.001]	[0.001]	[0.001]	[0.000]	[0.001]	[0.001]	[0.001]	[0.000]	[0.001]	[0.001]	[0.001]
Δ Ln unemployment	**0.014*****	**0.026*****	**0.016*****	**0.018*****	**0.013*****	**0.025*****	**0.016*****	**0.016****	**0.015*****	**0.026*****	**0.019*****	**0.017****
	[0.003]	[0.006]	[0.004]	[0.007]	[0.004]	[0.007]	[0.005]	[0.007]	[0.004]	[0.007]	[0.005]	[0.007]
Δ Ln Economic Freedom Index	-0.009	-0.019	0.020	-0.044	-0.012	-0.025	0.018	-0.040	-0.023	-0.039	0.002	-0.040
	[0.013]	[0.024]	[0.018]	[0.028]	[0.015]	[0.026]	[0.020]	[0.030]	[0.014]	[0.025]	[0.020]	[0.028]
Δ Ln Polity Index	0.000	-0.002	-0.013	-0.01	-0.003	-0.007	-0.015	-0.014	0.002	0.003	-0.013	-0.008
	[0.008]	[0.015]	[0.011]	[0.011]	[0.008]	[0.014]	[0.011]	[0.013]	[0.007]	[0.013]	[0.011]	[0.014]
Δ Ln Dependency	0.045	0.097	0.002	0.081	0.042	0.094	0.010	0.050	0.056	0.101	0.036	0.068
	[0.039]	[0.071]	[0.052]	[0.073]	[0.044]	[0.077]	[0.058]	[0.083]	[0.044]	[0.077]	[0.058]	[0.083]
Observations	556	556	556	524	539	539	539	508	488	488	488	460
R-squared	0.141	0.158	0.091	0.051	0.208	0.161	0.091	0.049	0.156	0.170	0.110	0.050
YEAR DUMMIES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Hansen Test (p-value)	0.655	0.775	0.760	0.769	0.460	0.590	0.609	0.647	0.485	0.617	0.599	0.475
Endogeneity test (p-value)	0.534	0.467	0.049	0.782	0.762	0.646	0.080	0.653	0.694	0.565	0.187	0.5970
Kleibergen-Paap rk Wald F statistic	44.680	44.680	44.680	50.400	55.468	55.468	55.470	62.241	61.998	61.998	61.998	66.584
First stage: Breusch-Pagan test (p-value)												
Dep Var: Ln Global Militarization Index	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10

With respect to the main estimation presented in the previous section, the main results do not change. The impact of the level of militarization on inequality preserves its statistical significance and passes endogeneity tests in all specifications. Specifically, the impact of the militarization degree on income inequality ranges from 0.012 to 0.023 when we consider the total sample of countries. Instead, excluding Russia and the countries with a population over 90th percentile, the effect of GMI on income disparities appears to between 0.011% and 0.022%. Thus, when we perform the Lewbel's approach on the sub-sample countries, the effect of the militarization degree on the income distribution presents coefficient nearly equal compared to those found when we examine the total set of countries. In addition, armed conflict and the NATO variable continue to have effects on inequality, while differently from baseline results, the military conscription loses its significance. Finally, the Hansen test and the Wald statistics, presented in the last lines, confirm the validity of our instruments.

5. Conclusions

The aim of the paper was to investigate the relationship between the degree of militarization and income inequality in a panel of 40 European countries in the period 2000-2017. The measure of income inequality adopted is the Gini index. In particular, we have employed both net and gross Gini scores. In addition, we have computed and eventually employed unbounded values of Gini scores. To capture the militarization level, we have employed the Global Militarization Index (GMI) compiled by the Bonn International Center for Conversion (BICC).

The main findings highlight a positive effect of military spending on Gini scores. More specifically, among several specifications we find that a 1-point percent change in militarization index in the previous year leads to a change equal to 0.14% in the income inequality in the current year when we use the unbounded Gini index after taxes and transfers. That is, the magnitude effect of military spending on inequality appears to be relevant. This empirical result appears to be robust given that it resists several robustness checks. In particular, we have re-sized the panel by excluding several countries and outliers. The main results are confirmed when we exclude Russia and the countries with a population over 90th percentile. In addition, for the sake of robustness, we have applied the Lewbel (2012) IV–GMM approach to address potentially

endogeneity bias. The main result is confirmed when applying the Lewbel estimator. In particular, a 1% increase in the militarization degree corresponds to an average 0.023% increase in inequality. These results suggest that the militarization increases income inequality. Among controls, we find that military conscription is negative associated with income inequality. This means that in our set of countries, the compulsory military service has a re-distributional effect. Instead, inequality appears to increase if the country is involved in an armed conflict and if it is a NATO member.

In sum, this work presents some additional evidence on the sources of income inequality within societies. Militarization appears to increase inequality and therefore reducing military commitment as a whole may have an overall beneficial impact.

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References

Abell, John D. (1990). Defence Spending and Unemployment Rates: An Empirical Analysis Disaggregated by Race, *Cambridge Journal of Economics*, 14(4):405-419.

Acemoglu, D., Naidu, S., Restrepo, P. and Robinson, J.A. (2015). *Handbook of Income Distribution*. Ed. by Atkinson, A. and Bourguignon, F Vol. 2B. North Holland. Chap. Democracy, Redistribution, and Inequality.

Alfani, G. (2021). Economic Inequality in Preindustrial Times: Europe and Beyond. *Journal of Economic Literature*, 59 (1): 3-44.

Ali, H.E. (2012). Military Expenditures and Inequality in the Middle East and North Africa: Panel Analysis. *Defence and Peace Economics*, 23(6): 575–589.

Bahamonde, H. and Trasberg, M. (2021). Inclusive institutions, unequal outcomes: Democracy, state capacity, and income inequality**.** *European Journal of Political Economy*. https://doi.org/10.1016/j.ejpoleco.2021.102048

Baum, C.F. and Lewbel, A. (2019)**.** Advice on using heteroskedasticity-based identification. *The Stata Journal*, 19(4): 757–767.

Berg, A., Ostry, J.D., Tsangarides, C.G and Yakhshilikov, Y. (2018). Redistribution, inequality, and growth: new evidence. *Journal of Economic Growth,* 23:259–305.

Bircan, C., Brück, T. and Vothknecht, M. (2017). Violent Conflict and Inequality, *Oxford Development Studies*, 45(2): 125-144.

Biscione, A. and Caruso, R. (2021). Military Expenditures and Income Inequality Evidence from a Panel of Transition Countries (1990-2015). *Defence and Peace Economics*, 32 (1): 46-67.

Bonica, A., McCarty, N., Poole, K.T. and Rosenthal, H. (2013). Why Hasn't Democracy Slowed Rising Inequality? *Journal of Economic Perspectives*, 27(3):103-124.

Bossie, A. and Kuehn, D. (2021). WWII Contract Spending and Inequality. *Applied Economic Letters*, 28(8): 635-639.

Card, D. and Cardoso, A.R. (2012). Can Compulsory Military Service Raise Civilian Wages? Evidence from the Peacetime Draft in Portugal. *American Economic Journal: Applied Economics,* 4(4): 57-93.

Caruso, R. and Di Domizio, M. (2016). Interdependence between US and European Military Spending: A Panel Cointegration Analysis (1988–2013). *Applied Economics Letters,* 23 (4): 302–305.

Caruso, R. and Di Domizio, M. (2017). Military Spending and Budget Deficits: The Impact of US Military Spending on Public Debt in Europe (1988–2013). *Defence and Peace Economics,* 28 (5): 534–549.

Chletsos, M. and Roupakias, S. (2020). The effect of military spending on income inequality: evidence from NATO countries. *Empirical Economics*, 58(3): 1305-1337.

Chowdhury, F., Desai, S. and Audretsch, D.B. (2018). Corruption, Entrepreneurship, and Social Welfare. in *Corruption, Entrepreneurship, and Social Welfare*, Springer, https://doi.org/10.1007/978-3-319-64916-0_6

Christopoulos, D. and McAdam, P. (2017). On the Persistence of Cross-Country Inequality Measures. *Journal of Money, Credit and Banking*, 49(1): 255-266.

Clements, J.B., Gupta, S. and Khamidova, S. (2021). Is military spending converging to a low level across countries? *Economic Modelling,* 94: 433-441.

Coady, D. and Dizioli, A. (2017). Income Inequality and Education Revisited: Persistence, Endogeneity, and Heterogeneity. *Applied Economics*, 50(2): 1-15.

Courtemanche, C., Pinkston, J.C., and Stewart, J. (2021). Time spent exercising and obesity: an application of Lewbel's instrumental variables method. *Economics & Human Biology,* 41:100940.

Dalton, C.D. and Shin, A.J. (2021). War, Inequality, and Taxation. *Economics and Politics*, 33(2): 315-342.

de Haan, J. and Sturm, J.E. (2017). Finance and income inequality: a review and new evidence. *European Journal of Political Economy*, 50: 171-195.

Deller, S., Maher, C. and Stallmann, J. (2021). Do tax and expenditure limitations exacerbate rising income inequality? *Economics & Politics*, 33 (3): 611-643.

Dizaji, S.F. (2017). *Oil Rents, Political Institutions, and Income Inequality*. In: Farzanegan, M.R., Alaedini, P., editors. Economic Welfare and Inequality in Iran. New York: Palgrave Macmillan, Springer Nature, 85-109.

Dudzevičiūtė, G., Česnuitytė, V. and Prakapienė, D. (2021). Defence Expenditure–Government Debt Nexus in the Context of Sustainability in Selected Small European Union Countries. *Sustainability*,13(12): 6669.

Dunne, J.P., Nikolaidou, E. and Smith, R.P. (2002). Military Spending, Investment and Economic Growth in Small industrialized Economies. *South African Journal of Economics*, 70(5): 789-808.

Dunne, J.P., Smith, R.P. and Willenbockel, D. (2004). Models of Military Expenditure and Growth: A Critical Review, *Defence and Peace Economics*, 16(6):449-461.

Dunne, J.P. and Nikolaidou, E. (2012). Defence Spending and Economic Growth in EU15. *Defence and Peace Economics*, 23(6): 537: 548.

Elveren, A.Y. (2012). Military Spending and Income Inequality: Evidence on Cointegration and Causality for Turkey, 1963–2007. *Defence and Peace Economics*, 23 (3): 289–301

Elveren, A.Y. and Moghadam, V.M. (2019). *The impact of militarization on gender inequality and female labour force participation.* The Economic Research Forum Working Papers No,1307.

Emmanouilidis, K. and Karpetis, C. (2021). The Effects of Military Expenditures on Economic Growth and Inflation: Evidence from Turkey. *Peace Economics, Peace Science and Public Policy*, 27(3): 369-404.

Graham, J.C. and Mueller, D. (2019). Military Expenditures and Income Inequality among a Panel of OECD Countries in the Post-Cold War Era, 1990–2007. *Peace Economics, Peace Science and Public Policy*, 25(1): 24-39.

Herzer, D. (2016). Unions and Income Inequality: A Panel Cointegration and Causality Analysis for the United States. *Economic Development Quarterly*, 30(3): 267-274.

Jaumotte, F. and Osorio Buitron, C. (2020). Traditional Drivers and the Role of Union Power. *Oxford Economic Papers,* 72(1):25-58.

Kentor, J., Jorgenson, A. and Kick, E. (2012). The "new" Military and Income Inequality: A Cross National Analysis. *Social Science Research*, 41 (3): 514–526.

Kieschnick, R. and McCullough, B.D. (2003). Regression Analysis of variates observed on (0,1): percentages, proportions and fractions. *Statistical Modelling*, 3(3): 193-213.

Kollias, C., Paleologou, S.M. and Tzeremes, P. (2020). Defence Spending and Unemployment in the USA: Disaggregated Analysis by Gender and Age Groups. *Peace Economics, Peace Science and Public Policy*, 26(2): 20180052.

Kollias, C., Paleologou, S. and Zouboulakis, M. (2021). Defence Spending and Sovereign Debt in Greece: A Long-Term Historical Perspective. *Peace Economics, Peace Science and Public Policy*. https://doi.org/10.1515/peps-2021-0020.

Lakner, C. and Milanovic, B. (2016). Global Income Distribution: From the Fall of the Berlin wall to the Great Recession. *The World Bank Economic Review,* 30(2): 203-232.

Latif, E. (2015). Income Inequality and Health: Panel Data Evidence from Canada. *The BE Journal of Economic Analysis and Policy*, 15(2): 927-959.

Lewbel, A. (2012). Using heteroscedasticity to identify and estimate mismeasured and endogenous regressor models. *Journal of Business & Economic Statistics*, 30(1): 67-80.

Lin, E.S. and Ali, H.E. (2009). Military Spending and Inequality: Panel Granger Causality Test. *Journal of Peace Research,* 46(5): 671–685.

Lobont, O.R., Glont, O.R., Badea, L. and Vatavu, S. (2019). Correlation of military expenditures and economic growth: lessons for Romania. *Quality & Quantity*, 53:2957–2968

Marshall, M., Gurr, T.R. and Jaggers, K. (2019). *Polity IV project. Political Regime Characteristics and Transitions, 1800-2015.* Center of Systematic Peace.

Meng, B., Lucyshyn, W. and Li, X. (2015). Defense Expenditure and Income Inequality: Evidence on Co-Integration and Causality for China. *Defence and Peace Economics,* 26 (3): 327–339.

Migliorati, S., Di Brisco, A.M. and Ongaro, A. (2018). A New Regression Model for Bounded Responses. *Bayesian Analysis*, 13(3): 845-872.

Mutschler, M.M. and Bales, M. (2020). *Global Militarisation Index 2020.* Bonn: Bonn International Center for Conversion (BICC). https://nbnresolving.org/urn:nbn:de:0168-ssoar-71220-4

Nikoloski, Z. (2015). Democracy and Income Inequality: Revisiting the Long- and Short-Term Relationship. *Review of Economics and Institutions*, 6(2): 1-24.

Noubissi, D.E. and Poumie, B. (2019). *Economic growth military spending and environmental degradation in Africa.* MPRA Paper No. 97455

Odehnal, J. and Neubauer, J. (2018). Economic, Security, and Political Determinants of Military Spending in NATO Countries. *Defence and Peace Economics*, 31(5):1-15.

Odehnal, J., Neubauer, J., Dycka, L., and Ambler, T. (2020). Development of Military Spending Determinants in Baltic Countries-Empirical Analysis. *Economies*, 8(3): 1-18.

Paolino, P. (2001). Maximum Likelihood Estimation of Model with Beta-Distributed Dependent Variables. *Political Analysis*, 9(4): 325-346.

Piketty, T. (2015). Putting Distribution Back at the Center of Economics: Reflections on Capital in the Twenty-First Century. *Journal of Economic Perspectives*, 29 (1): 67-88.

Pindyck, R. and Rubenfeld, D. (1991). *Econometric models and economic forecasts.* New York: McGraw-Hill.

Pollin, R. (2012). US Government deficits and debt amid the great recession: what the evidence shows. *Cambridge Journal of Economics*, 36 (1): 161-187.

Qayyum, U., Anjum, S. and Sabir, S. (2021)**.** Armed conflict, militarization and ecological footprint: Empirical evidence from South Asia. *Journal of Cleaner Production,* 281: 125299.

Raju, M.H. and Ahmed, Z. (2019). Effect of military expenditure on economic growth: evidences from India Pakistan and China using cointegration and causality analysis. *Asian Journal of German European Studies*, 4 (3): 1–8.

Reuveny, R. and Li, Q. (2003). Economic Openness, Democracy, and Income Inequality: An Empirical Analysis. *Comparative and Political Studies*., 36(5): 575-601.

Saba, S.C. (2021) Convergence or Divergence Patterns in Global Defence Spending: Further Evidence from a Nonlinear Single Factor Model. *Peace Economics, Peace Science and Public Policy,* 27(1): 51-90.

Scheidel, W. (2017). *The Great Leveler*. Princeton: Princeton University Press.

Shahbaz, M., Sherafatian-Jahromi, R., Malik, M.N., Shahbaz Shabbir, M. and Jam, F.A. (2016). Linkages between defense spending and income inequality in Iran. *Quality and Quantity*, 50 (3):1317–1332.

Smith, R. and Narayan, P.K. (2009). A Panel Data Analysis of the Military Expenditure -External Debt Nexus: Evidence from Six Middle Eastern Countries. *Journal of Peace Research*, 46(2): 235-250.

Sohag, K, Taşkın, F.D. and Malik, M.N. (2019). Green economic growth, cleaner energy and militarization: Evidence from Turkey. *Resources Policy*, 63:101407

Solt, F. (2020). Measuring Income Inequality Across Countries and Over Time: The Standardized World Income Inequality Database. *Social Science Quarterly*, 101(3): 1183-1199.

Töngür, U. and Elveren, A.J. (2015). Military Expenditures, Inequality, and Welfare and Political Regimes: A Dynamic Panel Data Analysis. *Defence and Peace Economics*, 26 (1): 49–74.

Wolde-Rufael, Y. (2014). Defence Spending and Income Inequality in Taiwan. *Defence and Peace Economics*, 27 (6): 871-884. doi:10.1080/10242694.2014.886436

Wolde-Rufael, Y. (2016). Military Expenditure and Income Distribution in South Korea. *Defence and Peace Economics*, 27(4): 571–581.

Wong, M.Y.H. (2016). Democratic Persistence and Inequality: The Role of Foreign Direct Investments. *Studies in Comparative International Development*, 51:103-123.

Yilanci, V., Eryzlu, H. and Hopoglu, S. (2020). Convergence in Military Burdens in MENA Region. *Uluslararasi Iliskiler,* 17(66): 41-59.

Zuazu, I. (2021). Electoral systems and income inequality: a tale of political equality, *Empirical Economics*. https://doi.org/10.1007/s00181-021-02154-9.

Appendix

Table A1. List of countries include in the analysis

Albania	Estonia	Latvia	Romania
Armenia	Finland	Lithuania	Russia
Austria	France	Luxemburg	Serbia
Azerbaijan	Georgia	North Macedonia	Slovakia
Belgium	Germany	Moldova	Slovenia
Bulgaria	Greece	Montenegro	Spain
Croatia	Hungary	Netherlands	Sweden
Cyprus	Ireland	Norway	Tajikistan
Czech Republic	Italy	Poland,	Ukraine
Denmark	Kazakhstan	Portugal	United Kingdom