MILITARY EXPENDITURES AND INCOME INEQUALITY EVIDENCE FROM A PANEL OF EUROPEAN COUNTRIES

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Raul Caruso*

Institute of Economic Policy, Catholic University of the Sacred Heart

Antonella Biscione

Catholic University "Our Lady of Good Counsel"

Abstract: *This paper contributes to the literature on military spending by analysing the relationship between military spending and income inequality in a panel of transition economies over the period 1990-2015. In fact, there is a strong conceptual argument that would explain how an increase of military spending is linked to a growth of income inequality. Due to military spending public financial resources are diverted from other items of public spending which are supposed to reduce inequality. Empirically, the effect of military spending on income inequality is examined by using a panel regression with European countries level observations over the period 1990–2015 by considering also a wide range of control variables. Preliminary estimates highlight a positive relationship between military spending and income inequality.*

Keywords: military expenditures, inequality income, human capital, political regime

Jel Codes: J24, I24, H56

* corresponding author, email: raul.caruso@unicatt.it; Catholic University of the Sacred heart; Institute of Economic Policy and Center for Applied Economics (CSEA) and CESPIC, Catholic University 'Our Lady of Good Counsel'. This paper is very preliminary. Please do not cite without permission. The authors thank Marco Sanfilippo for his valuable comments on this work in progress.

INTRODUCTION

This paper is focused on the relationship between military spending and income inequality in a panel of eastern and transition countries over the period 1990-2015. This topic is rather unexplored in literature. In fact, a substantial number of previous studies analyse in depth the determinants of defence spending. Yet, another substantial literature focuses on the impact of military spending on economic growth and development highlighting in most cases a negative relationship [see the survey presented in Dunne and Tian (2013) and among others Kollias et al. (2017); Kollias C., Paleologou S. (2015); Kollias et al. (2007)]. A minor literature focuses on other macroeconomic variables as public debt [see among others Caruso and Di Domizio, 2016; Paleologou (2013), Smyth and Narayan, (2009), Dunne et al. (2004)].

In other words, the impact of military expenditure on the other macro economic variables have also been analysed in the literature, but the relationship between defence spending and income inequality have been subject only of a very limited number of studies. In the past, the works with reference to the military expenditure, tried to explore this issue in relation to the economic growth, income, education, inflation and other sectors. In sum, this study contributes heavily to the existing literature. In fact, it analyses the link between military expenditure and income inequality in a panel of twenty-six transition European countries. Since all countries considered are transition post-communist economies, we are likely to narrow the results to this class of countries.

In sum, the aims of this paper are: (i) analysing the relation between military expenditure and income inequality and (ii) quantifying the impact of defence spending on income inequality.

The paper is organized as follows: Section 2 of the paper presents the literature review and conceptual background; section 3 introduces the methodology and the data used, while section 4 presents and discusses the

empirical results. Finally, section 5 summarizes and concludes.

I. LITERATURE AND CONCEPTUAL BACKGROUND

The role of defence spending as a factor of income inequality has found scarce attention from the theoretical and empirical point of view. Despite the few studies carried out to understand the causality between military spending and income inequality, it is possible to identify three main hypotheses (Lin and Ali 2009, Elveren 2012, Rufael 2016) that try to explain this association: (i) the inequality-narrowing, (ii) the inequality-widening and (iii) the neutrality hypothesis.

According to the inequality-narrowing hypothesis, higher military expenditure can generate higher aggregate demand and therefore an increase of employment level in the whole economy. In fact, if the military industries are labour intensive and if the defence production is indigenous, the economic growth produces benefits for the poor population so leading to an improvement of income distribution (Hirnissa et al 2009; Lin and Ali 2009; Elveren 2012). Empirical findings that corroborates this hypothesis come from Ali (2012), in his study carried out on Middle East and North African (MENA) countries, he unveiled that military expenditure has an important and negative effect on income inequality, in other words, in these countries an increase of military expense leads to a reduction of income inequality.

The inequality-widening hypothesis is based upon the idea that the military industries prefer more productive workers who have higher salaries than the less-skilled workers in the civil sectors. In such a way the military expenditure can increase the intersectoral wage gaps (Ali, 2007). Moreover, the disparity between skilled and unskilled labour can be exacerbated if the military industry decides to produce by employing skilled labour rather than unskilled workers. In addition, the military sector can lead to an increase of income inequality if the interest groups related to the military

complex lobby for higher spending when they perceive that the government wants to reallocate the defence spending in favour of other sectors. Therefore, the additional resources in favour of the military complex reduce those provided for the welfare state that could be used to redistribute the income through transfer payment programs (Elveren, 2012). The empirical findings that confirm this hypothesis come from Abell (1994), Ali (2007, 2012) Tongur and Elveren (2012), Kentor et al. (2012) Meng et al. (2013), Lucyshyn et al. (2013) Rufael (2016).

Finally, the neutrality hypothesis argued that the effect of military expenditure on income inequality is not significant for two main reasons: (i) the defence spending represents only a small portion of total government expenditure and (ii) the labour force employed in the military industrial sector is only a negligible part of the overall labour force. Therefore, if the government chooses to address the resources to the welfare instead of the defence sector, the effect of military expenditure on income inequality would be negligible. Empirically the effect would be statistically insignificant. In their analysis, Hirnissa et al (2009) unveiled no significant relation between military expenditure on income distribution for Indonesia Philippines, India and South Korea, also Lin and Ali (2009) found no substantial findings to confirm any causal relationship between the defence expenditure and income inequality in both directions.

The hypothesis previously described underline three different predictions with relation to the effects of military expenditure on income inequality. However, it could be argued that the impact of military spending on income inequality is likely to differ across countries because they are characterised by different stages of economic development. The aim of this paper is to analyse the relation of military spending and income inequality in a large group of European countries to evaluate whether defence expenditure lead to an improvement or worsening of income inequality. The countries included in the sample are transition economies.

II. DATA AND METHODOLOGY

The table 1 show the variables considered to estimate the effect of military spending on income inequality by using a panel regression with transition countries level observations over the period 1990–2015 (see appendix 1 for the list of countries).

Table 1- Descriptive statistics

Names	Description	Number of observations	min	max	mean	Std. Dev
Milex	Log military expenditure	648	0	6.242	4.365	2.133
Labour productivity	Log GDP per person employee	650	-3.108	11.226	10.040	0.844
Human Capital	Log human capital index based on year of schooling and return of education	475	0.896	1.312	1.114	0.083
Inflation	Log inflation rate	650	0	6.232	4.886	1.130
Democracy	Log polity index	650	0	3.045	2.606	0.516
Openness	Log ratio of total trade on GDP	650	2.460	5.294	4.410	0.452
Unemployment	Log unemployment rate	650	0.693	6.413	5.247	1.286
Inequality	Log Gini index	646	-1.703	-0.549	-1.026	0.232
Ethnic fractionalization	Ethnic fractionalization index	616	0.047	68.460	0.820	5.587
urban population	Log ratio of urban population on total	676	3.273	4.334	4.027	0.234
UE	Dummy for countries EU	676	0	1	0.173	0.379
Presidential	Dummy for countries with presidential political system	676	0	1	0.425	0.495
Parliamentary	Dummy for countries with parliamentary political system	676	0.000	1.000	0.345	0.476
AEP	Dummy for countries with Assembly Elected President political system	676	0	1	0.090	0.287
Time trend	Time variable	676	1	26	13.5	7.506

The data on income inequality used in this paper is taken from the Global Income Dataset (GID)[1]. The dataset presents estimates of monthly real consumption and income of various quintiles of the population for the majority of countries in the world between 1960 and 2015. Data on military

[1] See http://gcip.info/about

spending are drawn from the Stockholm International Peace Research Institute (SIPRI 2015). The human capital index is taken from Penn World Tables (PWT 8.1) and it is based on the average years of schooling from Barro and Lee (2013) and also on a rate of return to education, based on Mincer equation estimates around the world (Psacharopoulos, 1994). In order to remove the inconsistencies in classification systems between sources or censuses, the data on the average years of schooling in the population is to combine information from population censuses with information on school enrolment.

The openness index is the ratio between the total trade of a country (the sum of the amount of the exports and the imports) and its GDP. The index of ethnic fractionalization is extracted from the QOG Standard TS Dataset 2017 carried out by the Quality of Government Institute (QoG) of Gotheborg. The index of fractionalization, based on the Herfindahl index of market power, allows to quantify the degree of ethnic diversity in a jurisdiction and it measures the probability that two randomly selected individuals from a country/region belong to two different groups. The level of democracy is captured by means of the Polity IV database, carried out by the Center for Systemic Peace, which rates each country on a democracy-autocracy scale.

The data about the real GDP per person employee (as a proxy for labour productivity), the inflation rate, the unemployment rate, the ratio of the manufacturing to the GDP, the percentage of urban population to the total are drawn from the World Development Indicator, World Bank. Furthermore, we use four dummy variables, the UE indicates the dummy variable for countries belonging to European Union and three dummies represent the political system, these last extracted from the Database of Political Institution 2015 produced by Inter-America Development Bank (IDB).

III. THE EMPIRICAL MODEL

In order to observe the relationship between the military expenditure and income inequality, in this study we use the fixed effects model, it is able to correct for the problem of the heterogeneity bias. This model eliminates the possibility of time invariant unobserved effects. The fixed effects, in fact, allow to explore the relation between military spending and income inequality within each country. In the fixed effects model, the individual-specific effect is a random variable that is allowed to be correlated with the explanatory variables. Mainly variables considered, are logged (to minimize the skewness) so to present an elasticity: a change in the explanatory variable by one per cent leads to a change of income inequality equal to the coefficients per cent. Furthermore, the regression has been estimated using one-year lag. The empirical model will be estimated using the fixed effect method, that is specified as follows:

$$
\begin{aligned}
lninequality_{it} &= \beta_0 + \beta_1 lnmilex_{it-1} + \beta_2 lnunemployment_{it-1} \\
&+ \beta_3 lnlabourproductivity_{it-1} + \beta_4 lninflation_{it-1} \\
&+ \beta_5 lnhumancapital_{it-1} + \beta_6 lndemocracy_{it-1} + \beta_7 lnopenness_{it-1} \\
&+ \beta_8 lnhurbanpopulation_{it-1} + \beta_9 ethnicfractionalization_{it} \\
&+ \beta_{10} presindential_{it} + \beta_{11} parliamentary_{it} + \beta_{12} AEP_{it} + \beta_{13} ue_{it} \\
&+ \beta_{14} timetrend_{it} + \mu_i + \lambda_t + \upsilon_{it}
\end{aligned}
$$

The dependent variable $lninequality_{it}$ is the income inequality, $lnmilex_{it-1}$ is the one-year lagged military expenditure. $\mu_i$is the country fixed effect, λ_t is the year fixed effect and υ_{it}represents the error term. i represents the country of interest and t is the sample period which is from 1990 to 2015. Furthermore, we consider a number of control variables in order to analyse to what extent other factors, apart from defence spending, could be influence the income inequality.

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IV. RESULTS

This section presents the results of regression estimate in assessing the impact of military spending on income inequality in European countries, in fact, the finding for the panel analysis are contained in the following table.

Table 2 – Military spending and income inequality - Main results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
lnMilex$_{it-1}$	0.0250***	0.0159***	0.0158***	0.0110***	0.0101***	0.00971**	0.0102**
	[-0.00326]	[-0.00379]	[-0.00379]	[-0.00387]	[-0.00389]	[-0.00403]	[-0.00478]
lnLabour Productivity$_{it-1}$		-0.121***	-0.119***	-0.112***	-0.103***	-0.0942***	-0.0991***
		[-0.0249]	[-0.0251]	[-0.025]	[-0.0254]	[-0.0258]	[-0.0302]
lnHuman Capital $_{it-1}$		0.599**	0.625**	0.623**	0.584**	0.595**	0.189
		[-0.25]	[-0.253]	[-0.248]	[-0.249]	[-0.251]	[-0.29]
lnInflation $_{it-1}$				0.0205***	0.0185***	0.0174***	0.0205***
				[-0.00565]	[-0.00581]	[-0.00583]	[-0.00608]
lnDemocracy$_{it-1}$			-0.0144	-0.0217	-0.0253	-0.0362	-4.23E-05
			[-0.0206]	[-0.0202]	[-0.0205]	[-0.0227]	[-0.00369]
lnOpenness $_{it-1}$				0.0588***	0.0589***	0.0639***	0.0725***
				[-0.022]	[-0.022]	[-0.0224]	[-0.0263]
lnUnemployment $_{it-1}$					0.00993*	0.00642	0.0117*
					[-0.00547]	[-0.00617]	[-0.00687]
lnUrban Population $_{it-1}$							-0.203
							[-0.164]
Ethnic fractionalization							2.086*
							[-1.141]
Presidential						0.0352	
						[-0.0485]	
Parliamentary						0.0920*	
						[-0.0495]	
AEP						0.0457	
						[-0.0489]	
UE					-0.0067	-0.00976	-0.0123
					[-0.0199]	[-0.0201]	[-0.0212]

Time Trend	0.00575***	0.00475**	0.00464**	0.00194	0.00178	0.000927	0.00393
	[-0.000788]	[-0.00226]	[-0.00227]	[-0.00234]	[-0.0024]	[-0.00244]	[-0.00272]
Constant	-1.205***	-0.611*	-0.625*	-0.981***	-1.049***	-1.164***	-0.745
	[-0.0149]	[-0.364]	[-0.365]	[-0.366]	[-0.368]	[-0.377]	[-0.877]
Observations	619	471	471	471	471	471	408
Number of countries	25	19	19	19	19	19	18
R-squared	0.245	0.217	0.218	0.253	0.259	0.266	0.201

Standard errors in brackets: *** p < 0.01, ** p < 0.05, * p < 0.1

The main finding we would claim here is that lagged values of military expenditures do exhibit a significant and positive effect on current value of income inequality. Such result holds for a large panel of transition economies in the period between 1990 and 2015. Therefore, our hypothesis is confirmed. This result is in line with the opportunity cost theory which would argue that military spending drains out the resources from public spending on other items as social sector development, rural development spending, development of infrastructure and other social welfare programs that unarguably promotes social and human development and reduce income inequalities.

Control variables also exhibit the expected signs. It is interesting to observe that the openness index is positively related to Gini coefficient. This analysis supports a positive relationship between the openness and income inequality, suggesting that an increase in the openness would lead to a worsening of income distribution, a direct contradiction of the result obtained by White and Anderson (2001), Dollar and Kray (2002), Edwards (1997b) and Higgins and Williamson (1999).

The GDP per employees that could be considered as a proxy of labour productivity and it measures how efficiently labour input is combined with other factors of production and used in the production process. The lagged values of labour productivity have a negative effect on current value of inequality level. That is, when aggregate labour productivity increases

income inequality appears to decrease. The effect of a change of labour productivity on income inequality results always statistically significant at 1% confidence level.

The human capital, measured by a mincerian combination of years of schooling (from Barro and Lee, 2013) and returns to education, has a statistically significant effect on income inequality, in fact, an improvement of human capital leads to an increase of Gini coefficient. The interdependence between income and human capital represents the basis of theory of the distribution of income. In fact, only richer families are able to invest more in human capital, and thereby earn more in the future causing difference in average income. The persistence of inequalities in incomes and human capital also depends on imperfections in the capital market, if everyone has access to the same investment opportunities, then incomes and levels of human capital will converge. Anyway, the human capital loses significance if we consider in our regression the percentage of urban population and the ethnic fractionalization index.

Yet, interesting to note the result about inflation. We found a positive and significant coefficient for lagged inflation in all regressions. That is, inflation of previous year has positive impact on current inequality. In other words, an increase of inflation rate generates a loss of purchasing power of the national currency, particularly, the general increase of the price level impoverishes specially the population that is in the last part on the left of income distribution, thus increasing inequality. However, the results obtained are inconsistent with those present in the studies carried out by Maussner (2004), Sun (2011), Maestri and Roventini (2012), and Coibion et al., (2012), in fact, they found that inflation decreases the income inequality.

The ethnic fractionalization presents a positive impact on income inequality, this result corroborates what stated by Dincer and Hotard (2011), in fact, they found a positive relationship between ethnic and religious polarization and income inequality.

The coefficient of unemployment rate is positive and statistically

significant at 10% confidence level, therefore, the growth of 1% of unemployment level in the previous year, produce an equal increase of dependent variable. An important consequence of an increase of unemployment rate is the reduction of earnings that leads to a growth of disparity in income distribution. The other effect of a high level of unemployment on inequality is the destruction of the bargaining power of workers, even those who have a jobs. The unemployment rate loses significance if we introduce in the regression the dummy variable which concern the political system.

It is of important to note that, the democracy level, the dummy EU and the political system dummies, except parliamentary, are not statistically significant. Finally, the time variable shows a significant impact on income inequality in the countries analysed in the first three regressions, suggesting that as time pass by, there is a change on income inequality.

V. ALTERNATIVE ESTIMATION AND ROBUSTNESS CHECK

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(TO BE COMPLETED, WORK IN PROGRESS)

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CONCLUSION

This paper is focused on the relationship between military spending and inequality in a large group of European transition countries in the period from 1990 to 2015. In order to observe the relationship between the military expenditure and income inequality, in this study we have used the fixed effects model, obtaining novel findings that are robust and consistent with the literature. Our results show that there is a positive effect of military spending on income inequality. This result can be interpreted in the light of the principles of the opportunity cost theory. That is, defence

spending reduces the amount of resources which could be used for other channels of public spending and in particular for the social and welfare system which are expected to reduce income inequality. Therefore, as military spending increases the commitment of government to reduce inequality decreases. Among other possible explanations this appears to be meaningful.

This work contributes to a rather unexplored aspect of military spending. Yet it throws new light on the channels that generate a detrimental effect of military spending on economic growth. In fact, the analysis has been run only for transition economies. Whether such results have to be considered valid also for both developed and low income countries is a challenge of future research on this topic.

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Appendix 1- List of countries included in the analysis

Albania	Croatia	Latvia	Romania	Ukraine
Armenia	Czech Republic	Lithuania	Russia	Uzbekistan
Azerbaijan	Estonia	Macedonia	Serbia	
Belarus	Georgia	Moldova	Slovakia	
Bosnia and Herzegovina	Hungary	Montenegro	Slovenia	
Bulgaria	Kazakhstan	Poland	Tajikistan	