MILITARY EXPENDITURES AND INCOME INEQUALITY EVIDENCE FROM A PANEL OF TRANSITION COUNTRIES (1990-2015)

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MILITARY EXPENDITURES AND INCOME INEQUALITY EVIDENCE FROM A PANEL OF TRANSITION COUNTRIES (1990-2015)

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Abstract: *This paper contributes to the literature on military spending by analyzing 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 income inequality. Due to military spending public financial resources are diverted from other items of public spending which could 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. Findings highlight a positive relationship between military spending and income inequality.*

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

Jel Codes: J24, I24, H56

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. The relationship between military spending and income inequality is a topic rather unexplored in literature. In fact, when analyzing military expenditure, a substantial number of previous studies analyze in depth its determinants whereas another substantial strand of 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 the relationship between military spending and public debt [see among others Caruso and Di Domizio, 2016; Paleologou (2013), Smyth and Narayan, (2009), Dunne et al. (2004)].

In brief, the relationship between military spending and income inequality have only been covered in a few studies. Therefore, this study aims to contribute to the existing literature. The main novelty to be claimed is that we analyze the relationship between military expenditure and income inequality in a panel of twenty-six transition European countries.

All the countries involved in our analysis are transition post-communist economies, most of them have undergone a considerable increase in inequality income and poverty.

After the end of the socialist regime, Central and Southern Eastern Europe, the Baltic Republics and the Commonwealth of Independent States (CIS) started their economic transition from a centrally planned to a market economy, and political transition from an authoritarian system to a democratic one. In fact, after an initial period of recession, until mid-Nineties, characterized by a fall of output, a massive reduction of employment and substantial under-utilization of labour in general and a rise of inflation rate, these countries introduced a series of reforms with the

aim to transform the economic system from socialist planning to market regulation. Despite the differences between countries caused by the heterogeneity of paths of reforms, in terms of speed (Gomulka, 1994) and conditions (Svejnar, 2002), one of the most significant consequences of transition was the growth of income inequality. Three are the factors that contributed to an increase of income inequality: privatization, the establishment of new markets in sectors that were previously controlled by the state and changes observed in the returns associated with a different level of skills (Ferreira, 1999). In addition, the shift of workers from the state sector being dismantled to the rich private sector one or unemployment led to a growing disparity in wage between the different sectors (Milanovic, 1999, 2011).

Moreover, in most countries military conscription has been compulsory even after the end of the socialist system. In 2003, Slovakia was the first country to remove compulsory military service. During the period from 2003 to 2010, about half of the countries considered in our analysis have abolished mandatory military service. Currently, the obligatory military service still exists in half of these countries. Therefore, it is likely that compulsory national military service could generate some effect of military expenditure on income inequality.

The paper is organized as follows: Section 2 of the paper presents the literature review and conceptual background on the relationship between military spending and income inequality; Section 3 introduces the methodology and the data used, while Section 4 presents and discusses the empirical evidences. Finally, Section 5 summarizes and concludes.

I. LITERATURE AND CONCEPTUAL BACKGROUND

In recent years the attention paid by the institutions to the issue of income inequality has increased even if it is very difficult to fully know the factors that can lead to a growth of this problem (Milanovic, 2011). In fact, a

considerable number of factors such as education, trade, growth of per capita income has been considered as the most important determinants of the increase in income inequality. Anyway, despite the growth of income inequality within most countries and the increase of military spending, the role of the latter as a factor of income inequality has received little attention from the theoretical and empirical point of view.

Hereafter we survey the little existing literature on the causality between military spending and income inequality. In particular, following Lin and Ali (2009), Elveren (2012) and Wolde Rufael (2016) we take in to account three main hypotheses: (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 particular, if the military industries are labour-intensive and if military production is domestic, military spending can be a driver of economic growth so producing benefits also for the poor population. Yet, this effect would be enlarged if a large share of military spending is allocated to wages and salaries of military personnel. Therefore, this would lead 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), which focuses on Middle East and North African (MENA) countries over the period 1987–2005. The Theil index is the measure of income inequality adopted, while the military expenditure is measured as percentage of GDP. The author finds that military expenditure has an important and negative effect on income inequality. In other words, in these countries an increase of military expense has led to a reduction of income inequality.

Shahbaz et al. (2015) investigated such relationship between military spending and income inequality in Iran considering the data from 1969 to 2011 by means of a cointegration analysis. Their findings confirm a negative relationship between military spending and income inequality, even

suggesting that military expenditure Granger produces income inequality in Iran.

The inequality-widening hypothesis is based on the idea that the military industry hires more productive workers who have higher salaries than the less-skilled workers in the civil sectors. In this way, the military expenditure can increase the inter-sectorial 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, if the interest groups related to the military complex lobby for higher spending perceive that the government wants to reallocate the military spending in favor of other sectors, the military sector can lead to an increase of military spending. Therefore, the additional resources used for the military complex reduce those provided for the welfare state that could redistribute the income through transfer payment programs (Elveren, 2012). The inequality-widening hypothesis also finds some evidence and draw insights from the Nazi Germany. The objective of Nazi economic policy was to build up a powerful army. To carry out the rearmament, the government carried a large-scale privatization policy which on the one hand increased the support of industrialists for NSDAP and on the other hand such policy turned out to be beneficial for top-income earners: as reported by Dell (2005), between 1933 and 1938 the share of earnings for top-incomes grew amazingly: more than 50 percent growth for the top percentile and more than 150 percent for the top 0.01 percent.

There could be another long-run driver of inequality-widening hypothesis. That is, since the veterans have lower productivity and wages than non-veterans [see on this point Griliches and Mason (1972), Rosen and Taubman (1982) and Angrist (1990)] this would worsen income inequality in favor of civilian employees. In fact, Abell (1994) investigates the relationship between military spending and income inequality in the United States for the period 1972-1992 by means of a OLS regression model. The

findings suggest that military spending increases income inequality because of the gap in wages between military and civilian employees. Vadlammanati et al. (2008) analyzed four South Asian economies i.e. India, Pakistan, Sri Lanka and Bangladesh through a panel regression fixed effect analysis for the period 1975-2005 finding a positive effect of military spending on income inequality. Interestingly, the authors found a direct relationship between wartime military spending and income inequality and an opposite linkage between peacetime military expenditure and income inequality. In fact, when they introduce in the equation number of war years, they find a significant and positive relationship with military expense. On the contrary, when they replaced with number of peace years, the findings are negative and statistically significant at one percent confidence level. However, the coefficient values are different since the peace years are slightly higher than the years of war, suggesting that peace brings to a reduction of excess military spending, which could be used for the implementation of social programs.

Ali (2007) analyzed a panel data of more than 150 countries for the period 1987-1997. He notes that the military expenditure and the inequality variables are both endogenous, therefore, these two variables may run both ways. As for the economic inequality measure, the author focuses on the Theil index while with reference to the military expenditures he introduces the two most important indicators of military institutions: per capita military spending and the size of armed forces. The empirical results of a two-stage least squares regression, indicate a positive relationship between military spending and income inequality.

Elveren (2012), explores the long run causality between military spending and the income inequality in Turkey by employing Engle and Granger cointegration and VECM causality tests by using the data for the period 1963-2007. Results show that military expenditure and income inequality are cointegrated and that exists an unidirectional causality

between said variables establishing that military spending exacerbates the income inequality.

Also the analysis carried out by Meng et al. (2015) by using the data of Chinese economy for the period 1989-2012 indicates cointegration and unidirectional causality between military spending and income inequality.

Additionally, Kentor et al. (2012) examined the relationship between military spending and income inequality by using the panel data of 82 developed and less developed countries from 1970-2000. Their starting assumption was that high-tech weaponry defined as "new" military cannot be considered the means through which to create employment for uneducated, unskilled and unemployed people so generating effects for the whole society. They found that "new" military worsens income distribution.

Wolde Rufael (2014) examined the long run relationship of military expenditure and income inequality in Tawain over the period of 1976-2011 by using the bounds testing cointegration causality tests to observe the cointegration and the causality relationships. The empirical evidences indicate a positive and significant effect of defense spending on income inequality in Taiwan and the unidirectional causal relationship is shown running from military spending to income distribution. The same results are obtained by Wolde Rufael (2016) analyzing the case of the South Korea for the period 1965-2011.

In a recent analysis, Tongur and Elveren (2015) employed the Generalized Method of Moment (GMM) in order to explore the relationship between defense expense and income inequality considering a panel data of 37 countries from 1988 to 2003 and reveal a positive and significant effect of military spending on income disparity.

Finally, the neutrality hypothesis argued that the effect of military expenditure on income inequality has not to be significant for two main reasons: (i) the defense spending represents only a small portion of the total government spending 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 allocate the resources to the welfare system and not to the defense sector, the effect of military expenditure on income inequality would be negligible. Empirically the effect would be statistically insignificant. Hirnissa et al (2009) used the bounds testing approach to cointegration in order to examine the linkage between the military spending and income inequality in the ASEAN countries. They applied this approach to observe the direction of causal relation by using the data for the period 1970-2005. Their findings show that the variables are cointegrated for long run relationship. Furthermore, defense spending Granger generates income inequality in Malaysia but the rest of the countries (Indonesia, Singapore, Indonesia Philippines, India and South Korea) are characterized by no meaningful relation between military expenditure and income distribution.

Lin and Ali (2009) applied the panel Granger non causality tests developed by Hurlin (2004) and also found no substantial findings to confirm any causal relationship between the defense expenditure and income inequality in both directions. The latter study is particularly robust since it analyzes the relationship between military spending and income inequality across 58 countries from 1987 to 1999 by using different measures of inequality as well as alternative sources of military spending.

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 and regions. In fact, the relationship between these two variables depends on the cultural, historical, political and institutional context of a country and, finally, by different stages of economic development.

All the countries considered in this study are transition post-communist economies that, with a few exceptions, have experienced a considerable increase in inequality income. It's obvious that the situation

differs from country to country, depending on the institutional heritages as well as the transition policies chosen.

The main reason of the increase in income inequality in the countries of the former Soviet Union was the privatization process (Milanovic, 1999, 2011).

The privatization process provided benefits to those linked with the political class, thus creating a sharp distinction within state employees. By the late 1990s and onwards, in Russia the growth in inequality ended, even if it is still higher than recorded in the other post-communist countries. In the above mentioned countries, inequality rose compared to the the growth of Gini coefficient recorded in Russia.

In addition, in many Central European countries (Slovenia, Czech Republic, Slovak Republic) the level of income inequality is relatively low since they have introduced a large number of reforms that have also aimed to the improvement of income distributions, and even significant increase has not ranked them below the levels that are considered normal for continental Europe.

Moreover, most countries have kept compulsory military conscription even after the end of the communism. In 2003, Slovakia was the first country to abolish compulsory military service. Eventually between 2003 and 2010 about half of the countries considered in this analysis have removed mandatory military service. At the moment obligatory military service still exists in half of these countries. It is possible that existence of compulsory national military service could be considered as a channel through which the effect of military expenditure on income inequality can be spread.

II. DATA AND METHODOLOGY

The data used in this paper is derived from several sources. Data on Gini coefficient, a commonly used measure of the income distribution that in this study represents the dependent variable, are taken from the Global

Income Dataset (GID)[1]. This data set provides the estimates of monthly real consumption and income for various quintiles of the population. Data are available for most countries in the world covering the period that goes from 1960 to 2015. The Gini index ranges between 0 and 1, where 0 means perfectly egalitarian distribution and 1 would denote perfect concentration. After 2007, the majority of the countries in our panel the Gini coefficient is greater than 0.40, which is higher than the average value, equal to 0.33, registered in EU. Data on military spending are drawn from the Stockholm International Peace Research Institute (SIPRI 2015)[2].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[3] estimates around the world (Psacharopoulos, 1994). After the end of communist regime, all the eastern transition economies have experienced significant improvements in human capital although, compared to some advanced economic countries, the gap still exists. Interestingly is the case of Albania, in 2014 its human capital index was equal to the one observed in Germany had in seventies. 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.

Trade represents a valuable alternative to foreign investment as an indicator of the level of globalization. Data regarding trade volume are taken from the World Bank World Development Indicator. Our measure of economic openness is equal to exports and imports divided by GDP. The

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

[2] Trend of Gini coefficient and military expenditure are in the Table 3 in the Appendix.

[3] Mincer (1974) modelled the natural logarithm of earnings as a function of years of education and years of potential labour market experience. In the most used version of Mincer equation human capital earnings function," log earnings are the sum of a linear function of years of education and a quadratic function of year of the potential experience.

index of ethnic fractionalization is based on the Herfindahl index 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. This variable is extracted from the QOG Standard TS Dataset 2017 carried out by the Quality of Government Institute (QoG).

The democracy scores are taken from the Polity IV data set (Marshall et al, 2017). This variable ranges from 10 (the most democratic regime) to -10 (the most autocratic regime). Due to the distributional impact of inflation (Ivaschenko, 2002; Ferreira,1999) and considering that the first years of transition were characterized by high level of inflation we included this indicator into the model. The data about the inflation rate, the real GDP per employee (as a proxy for labour productivity), the unemployment rate, the percentage of urban population to the total are all available from the World Bank's World Development Indicator. Furthermore, we include four dummy variables: the UE dummy is equal to 1 for countries belonging to European Union otherwise 0 and three dummies about the political system. These last extracted from the Database of Political Institution 2015 provided by Inter-America Development Bank (IDB). Table 1 summarizes data description and shows summary statistics (see appendix 1 for the list of countries), whereas Table 2 displays correlation matrix.

Table 1-Descriptive statistics

Names	Description	Number of observations	Min	max	Mean	Std. Dev
Inequality	**Log Gini index**	**646**	**-1.703**	**-0.549**	**-1.026**	**0.232**
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
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

Table 2 - Correlation Matrix

	Inequality	Milex	Human Capital	Labour Productivity	Democracy	Inflation	Unemployment	Presidential	Parliamentary	AEP	Urban Population	Openness	Ethnic Fractionalisation	EU	Time Trend
Inequality	1														
Milex	0.0786	1													
Human Capital	-0.2019	0.2096	1												
Labour Productivity	-0.4893	0.1855	0.5361	1											
Democracy	-0.189	0.062	0.0658	0.2879	1										
Inflation	0.0604	0.0873	-0.01	0.0673	0.0626	1									
Unemployment	0.0076	0.1087	0.1999	0.123	0.2553	0.1344	1								
Presidential	0.2801	0.0961	-0.0905	-0.1835	-0.4671	0.0019	-0.1034	1							
Parliamentary	-0.2963	-0.0265	0.2014	0.2844	0.324	0.0196	0.1721	-0.7232	1						
AEP	0.0723	0.0674	-0.0544	-0.1126	0.2239	-0.0232	-0.0943	-0.3171	-0.3293	1					
Urban Population	0.0977	0.1296	0.2166	0.0339	-0.0489	-0.0462	-0.0143	-0.1375	0.1045	0.084	1				
Openness	-0.0648	0.1769	0.5852	0.355	0.0169	0.004	0.1146	-0.0532	0.0552	0.1398	-0.0608	1			
Ethnic Fractionalisation	-0.0432	-0.1282	0.0661	-0.0339	-0.3012	0.0153	0.0261	-0.0225	-0.1636	0.1582	-0.0274	0.2712	1		
EU	-0.2865	0.164	0.4999	0.5688	0.1519	-0.0933	0.0454	-0.1143	0.1787	-0.0382	0.0048	0.469	-0.0034	1	
Time Trend	0.1647	0.1642	0.6211	0.4366	0.0966	0.0124	0.1509	-0.0422	0.1411	-0.0777	0.0441	0.6054	0.0118	0.5608	1

III. THE EMPIRICAL MODEL AND THE RESULTS

The relationship between the military expenditure and income inequality is analyzed by relying on a panel data model. In particular, we use the following specification:

$$lninequality_{it} = \beta_0 + \beta_1 lnmilex_{it-1} + \beta_2 X_{it} + \beta_3 W_{it} + \mu_i + \lambda_t + v_{it}$$

The dependent variable is *lninequality$_{it}$* representing the level of income inequality in country *i* at time *t*; *lnmilex$_{it-1}$* is the one-year lagged military expenditure, the vector $\mathbf{X}_{it}$ includes the economic variables such as economic globalization, unemployment rate, inflation rate, human capital and labour productivity, the vector $\mathbf{W}_{it}$ includes political variables as ethnic fractionalization, democracy, level of urbanization, dummies variables for political system and European membership. Finally, μ_i is the country fixed effect, λ_t is the year fixed effect and v_{it} represents the error term. Most of independent variable are one-year lagged. The period covered in our analysis goes from 1990 to 2015 and the empirical estimation includes a number of control variables. In order to find a punctual elasticity, most variables are logged (to minimize the skewness) and all the explanatory variables have been one-year lagged in order to mitigate the issue of endogeneity.

In fact, we used the Hausman test to verify whether the GLS was consistent and more efficient than the fixed effect model. Hausman's specification test indicates that a fixed-effects model is superior to an analysis with random effects. It also is superior on theoretical grounds because we do not have a random sample of cases (Hsiao 1986, 43). There is, however, little difference in the results produced by the two methods. This model eliminates the possibility of time invariant unobserved effects.

Table 3 shows the results..

Table 3 –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***	0.0097**	0.0072*
	[0.0033]	[0.00379]	[0.00379]	[0.0039]	[0.0039]	[0.0040]	[0.0041]
lnLabour Productivity$_{it-1}$		-0.121***	-0.119***	-0.1116***	-0.1033***	-0.0941***	-0.1187***
		[0.0249]	[0.0251]	[0.02500]	[0.0254]	[0.0258]	[0.0273]
lnHuman Capital $_{it-1}$		0.599**	0.625**	0.6228**	0.5843**	0.5949**	0.3989
		[0.2532]	[0.2531]	[0.2482]	[0.2493]	[0.2506]	[0.2636]
lnInflation $_{it-1}$				0.0205***	0.0185***	0.0174***	0.0178***
				[0.0056]	[0.0058]	[0.0058]	[0.0058]
lnDemocracy$_{it-1}$			-0.0144	-0.0217	-0.0253	-0.0362	0.0311
			[0.0206]	[0.0202]	[0.0205]	[0.0227]	[0.0219]
lnOpenness $_{it-1}$				0.05878***	0.0589***	0.0639***	0.0506***
			[0.02199]	[0.0219]	[0.0224]	[0.0248]	
lnUnemployment $_{it-1}$					0.0099*	0.0064	0.0117*
					[0.0055]	[0.0062]	[0.0066]
lnUrban Population $_{it-1}$							-0.1593
							[0.1612]
Ethnic fractionalization							-0.3946***
							[0.0988]
Presidential						0.0352	
						[0.0485]	
Parliamentary						0.0920*	
						[0.0495]	
AEP						0.0457	
						[0.0489]	
UE					-0.0067	-0.0097	-0.0015
					[0.0199]	[0.0201]	[0.0209]
Time Trend	0.00575***	0.00475**	0.00464**	0.0019	0.0018	0.0009	0.0037
	[0.0008]	[0.0023]	[0.0023]	[0.0023]	[0.0024]	[0.0024]	[0.0025]
Constant	-1.205***	-0.611*	-0.625*	-0.9811***	-1.0488***	-1.1641***	-0.4875
	[0.0149]	[0.3641]	[0.3646]	[0.3657]	[0.3677]	[-0.377]	[0.7383]
Observations	619	471	471	471	471	471	448
Number of countries	25	19	19	19	19	19	19
R-squared	0.245	0.217	0.218	0.253	0.259	0.266	0.217

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

First of all, we can clearly see that lagged values of military expenditure turns out to be highly significant and positively associated with current values of income inequality. The magnitude of the effect of military

spending on income inequality is quite substantial. Looking at the estimated coefficient on military expenditure in equation five, shows that a one-point percent change in military expenditure in the previous year leads to a change equal to 0.010% in the income inequality in the present year while all the other variables in the model are held constant. Such result holds for a large panel of transition economies in the period between 1990 and 2015. Therefore, this result fully confirms the inequality-widening hypothesis.

Control variables exhibit the expected signs. Greater openness can impact domestic inequality between and within countries, in fact a positive and highly significant role of economic globalization has emerged in all regressions. This finding might suggest that an increase in the openness equal to 1% would translate in a worsening of income distribution of about 0.06%. This result is in contradiction with neo-classical theory: free trade should reduce inequality in countries that have a comparative advantage in unskilled labor and thus trade should lead to an increase in income of production factors used intensively by exporters. In addition, this finding is inconsistent with White and Anderson (2001), Dollar and Kray (2002), Edwards (1997b) Higgins and Williamson (1999) and Jaumotte, et at. (2013).

The lagged GDP per employee, as proxy of labour productivity, exhibits a negative effect on current value of inequality level. In other words, 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 10% 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. So, one percentage change in human capital in the previous year would lead to a change of about 0.60% in the income inequality in the present year. In other words, 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. Furthermore, 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. In fact, if everyone has access to the same investment opportunities, then incomes and levels of human capital will be converged. Anyway, the human capital loses significance if we add in our regression, the percentage of urban population and the ethnic fractionalization index.

What is more, it is interesting to underline the result about inflation. We found a positive and significant coefficient for lagged inflation in all regressions. That means, the inflation of the previous year has a positive impact on current inequality. An increase in inflation rate generates an erosion of purchasing power of the national currency, particularly, the general increase in price level impoverishes especially 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 presented in Maussner (2004), Sun (2011) and Coibion et al., (2012) which found that inflation decreases the income inequality.

Moreover, the ethnic fractionalization presents a negative impact on income inequality, this result is in contrast with Dincer and Hotard (2011) that find a positive relationship between ethnic and religious polarization and income inequality.

The coefficient of unemployment rate is positive and statistically significant at 1% percent level, therefore, the growth of 1% of unemployment level in the previous year, produces an increase equal to 0.01% of dependent variable in the current period. An important consequence of an increase of unemployment rate is the reduction of earnings that leads to a growth of disparity in income distribution. Another effect of a high level of unemployment on inequality is the destruction of the bargaining power of workers, even those who are employed. Introducing in

the regression the dummy about the political system, the unemployment rate loses significance.

It is important to point out that, the democracy level, the EU membership and the political system, except for parliamentary, are not statistically significant. Finally, the time variable shows a significant impact on income inequality in the countries analyzed in the first three regressions, suggesting that during the years, there is a change in income inequality.

V. ALTERNATIVE ESTIMATION AND ROBUSTNESS CHECK

As robustness check, we eventually examined the relationship between military expenditure and income inequality in sub-samples. Table 4 reports the findings obtained excluding alternatively the countries with a population below the 40% (in model 1 and 2), 60% (in models 3 and 4) and 80% (in models 5 and 6) of median of population and finally, excluding Russia[4] (in models 7 and 8).

In fact, the main results do not change. The impact of lagged military spending on current inequality is always positive and significant so confirming the baseline results.

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[4] Hausman's test was conducted to verify whether the GLS estimate is preferable to the fixed effect model. The p-value is less than 0.05, so the fixed effect model is consistent and thus preferred.

Table 4 – Military Spending and Income Inequality: Robustness check

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$lnMilex_{it-1}$	0.0097**	0.0072*	0.0147***	0.0133**	0.0149***	0.0137**	0.0086**	0.0071*
	[0.0040]	[0.0041]	[0.0050]	[-0.00481]	[0.0053]	[0.0056]	[0.0040]	[0.0040]
$lnLabour\ Productivity_{it-1}$	-0.0942***	-0.1187***	-0.0690**	-0.0968**	-0.0568*	-0.0838**	-0.1150***	-0.1332***
	[0.0258]	[0.0273]	[0.0294]	[0.0308]	[0.0325]	[0.0341]	[0.0262]	[0.0272]
$lnHuman\ Capital_{it-1}$	0.5949**	0.3989	0.3361	0.2658	0.4106	0.3438	0.7098***	0.5187**
	[0.2506]	[0.2636]	[0.3187]	[0.3384]	[0.3481]	[0.3763]	[0.2468]	[0.2579]
$lnInflation_{it-1}$	0.0174***	0.0178***	0.0201***	0.020***	0.0233***	0.0232***	0.0199***	0.0197***
	[0.0058]	[0.0058]	[0.0072]	[0.0070]	[0.0082]	[0.0080]	[0.0057]	[0.0056]
$lnDemocracy_{it-1}$	-0.0362	-0.0313	-0.0041	-0.011	-0.0043	-0.0135	-0.0372*	-0.0392*
	[0.0227]	[0.0219]	[0.0278]	[0.0281]	[0.0301]	[0.0308]	[0.0308]	[0.0211]
$lnOpenness_{it-1}$	0.0639***	0.0506**	0.0863***	0.0721**	0.0905***	0.0689**	0.0623***	0.0444*
	[0.0224]	[0.0248]	[0.0261]	[0.0281]	[0.0285]	[0.0321]	[0.0219]	[0.0238]
$lnUnemployment_{it-1}$	0.0064	0.0107*	0.0127*	0.0233***	0.0121	0.0238***	0.007	0.0115*
	[0.0062]	[0.0066]	[0.0071]	[0.0078]	[0.0075]	[0.0083]	[0.0061]	[0.0065]
$lnUrban\ Population_{it-1}$		-0.1593		0.1833		0.2558		-0.1988
		[0.1612]		[0.3207]		[0.3467]		[0.1544]
Ethnic fractionalization		-0.3946***		-0.421***		-0.415***		-0.3859***
		[0.0988]		[0.0981]		[0.1025]		[0.0945]
Presidential	0.0352		0.0467		0.0695		0.0188	
	[0.0485]		[0.0617]		[0.085]		[0.0469]	
Parliamentary	0.092*		0.0523		0.0427		0.0534	
	[0.0495]		[0.0628]		[0.0902]		[0.0484]	
AEP	0.0457		0.0479		0.0336		0.0171	
	[0.0489]		[0.0630]		[0.0983]		[0.0475]	
EU	-0.0097	-0.0015	0.0381	0.0535**	0.0373	0.0569**	-0.0287	-0.0236
	[0.0201]	[0.0209]	[0.0255]	[0.0247]	[0.0269]	[0.0271]	[0.0197]	[0.0205]
Time Trend	0.0009	0.0037	0.0012	0.0026	0.0001	0.0015	0.0028	0.0056**
	[0.0024]	[0.0025]	[0.0029]	[0.0030]	[0.0031]	[0.033]	[0.0023]	[0.0025]
Constant	-1.1641***	-0.4875	-1.4074***	-2.2364	-1.6529***	-2.7656*	-1.0922***	-0.3045
	[0.3774]	[0.7383]	[0.4490]	[1.4844]	[0.5016]	[1.6210]	[0.3632]	[0.7055]
Observations	471	448	298	279	273	255	446	424
Number of countries	19	19	12	12	11	11	18	18
R-squared	0.266	0.217	0.388	0.377	0.365	0.361	0.316	0.27

Standard errors in brackets: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

The coefficient of military expenditure increases when the number of countries observed is reduced, in particular, if we consider populations above 80% of the median of population, the coefficient is one and a half higher the one observed in the main estimate.

Control variables also present expected signs, the ethnic fractionalization shows a negative impact of the Gini index, in other words, an increase of 1% of the ethnic fractionalization leads to a significant improvement of income distribution about 0.40%. The impact of ethnic fractionalization on income inequality presents an opposite trend to that found for military spending and its effect does not decrease if the number of countries excluded increases. The lagged value of inflation rate and openness index have always positive and significant effect on current Gini coefficient.

These results are consistent with those of the the baseline estimation. On the contrary, the labour productivity appears to be positive and significant and it is significant even when reducing the number of countries.

Turning to urbanization, despite knowing that it is considered a way to alleviate the income inequality because (i) it leads to a growth in occupation level leading to an increase in the income for individuals moving from rural to urban areas; and (ii) the benefits caused by the migrations, like remittances, can be improve the living condition of the families who receive them, generating a decrease of rural inequality, does not seem to have a considerable impact on income inequality, in fact, it is far from statistical significance.

Surprisingly is the EU dummy variable coefficient, in fact, being member of EU appears to be detrimental for income inequality. In two of the equations that it appears, EU dummy is positive and significant at the five percent level of significance or better.

The other variables such as the democracy level and the political system are not statistically significant and, expect for the unemployment rate, are consistent with results obtained in the initial estimate.

Columns (7) and (8) show the empirical evidence obtained excluding Russia from the regressions. The effect of the military spending on income inequality, albeit lower than the one found in the previous estimates, is positive and statistically significant. One percent increase of defense spending could lead to a deterioration of income inequality of 0.008% while holding all other variables constant.

The control variables present the same results shown in the previous estimation even though it deserves attention the human capital coefficient, a growth of human capital level of the previous year generates a greatly increase of current Gini coefficient equal to 0.70%. In other words, a change of 0.70% means that the final value of Gini coefficient is 1.7 times the initial value.

Eventually, we re-estimate the baseline model by considering interactions between some variables (see Table 5).

Table 5 - Military Spending and Income Inequality: Robustness check

	(1)	(2)	(3)	(4)
$lnMilex_{it-1}$	0.0205	0.110***	0.0687***	0.0763***
	[0.0159]	[0.0371]	[0.0171]	[0.0172]
$lnLabour Productivity_{it-1}$	0.00370	0.00467	0.0622***	0.00276
	[0.00612]	[0.00608]	[0.0174]	[0.00601]
$lnHuman Capital_{it-1}$	0.218	0.232	0.244	0.141
	[0.189]	[0.187]	[0.186]	[0.186]
$lnInflation_{it-1}$	0.0180***	0.0158***	0.0171***	0.0144**
	[0.00600]	[0.00599]	[0.00591]	[0.00594]
$lnDemocracy_{it-1}$	-0.0367	-0.0647***	-0.0686***	-0.0604**
	[0.0420]	[0.0248]	[0.0247]	[0.0245]
$lnOpenness_{it-1}$	0.0689***	0.175***	0.0573**	0.0623**
	[0.0255]	[0.0469]	[0.0252]	[0.0250]
$lnUnemployment_{it-1}$	0.0131*	0.0136*	0.0102	0.0142*
	[0.00740]	[0.00733]	[0.00733]	[0.00726]
$lnUrban Population_{it-1}$	-0.362**	-0.329*	-0.335*	-0.260
	[0.177]	[0.176]	[0.174]	[0.175]
Ethnic Fractionalization	-0.283***	-0.232**	-0.276***	-0.276***
	[0.101]	[0.102]	[0.0990]	[0.0986]
Presidential	-0.0164	-0.0104	-0.0276	-0.0179
	[0.132]	[0.131]	[0.130]	[0.129]
Parlamentary	0.0891	0.0987	0.0827	0.0605
	[0.124]	[0.122]	[0.122]	[0.122]

AEP	0.0208	0.0304	0.0148	0.0192
	[0.130]	[0.129]	[0.128]	[0.128]
UE	-0.0233	-0.0150	-0.0157	-0.00507
	[0.0217]	[0.0217]	[0.0214]	[0.0217]
milex*democracy	-0.00456			
	[0.00653]			
milex*openness		-0.0236***		
		[0.00869]		
milex*productivity			-0.0113***	
			[0.00313]	
milex_2				-0.00984***
				[0.00245]
Constant	-0.614	-1.082	-0.891	-0.886
	[0.717]	[0.732]	[0.707]	[0.703]
Observations	436	436	436	436
Number of countries	19	19	19	19
R-squared	0.165	0.179	0.189	0.196

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

General results are confirmed. Military expenditure is not only positively related to Gini coefficient but also highly significant in three out of four all estimations.

Interestingly the interaction between military spending and the degree of economic openness is negative and significant. This would mean that the effect of military spending on income inequality also depends on openness index. In fact, the countries that are characterized by higher openness index are those countries where the effect of military spending on income distribution is less accentuated than those countries whose economic globalization degree is low.

Yet, the interaction term between military spending and labour productivity is also negative and significant, an important level of labour productivity determines a remarkable impact of military expenditure on income inequality. Therefore, in simpler words the effect of military expenditure on income inequality is less intense in the countries where the labour productivity is high.

Then, we include military expenditure squared. Its coefficient is significantly negative and suggests that the military expenditure has a positive effect on income inequality until a turning point is reached, beyond that value the impact of defense spending has a negative impact on Gini coefficient. This result seems to confirm the inequality-narrowing hypothesis. The political system and the dummy EU do not seem to have a considerable impact on income inequality.

In conclusion, the main variables remain significant with similar effects on income inequality, therefore the main findings in this study can be considered to be robust to different model specifications.

CONCLUSION

This paper attempted to investigate the relationship between military spending and inequality in a panel of European transition countries in the period from 1990 to 2015. In order to observe the relationship between the military expenditure and income inequality, we have employed an OLS- fixed effects model.

Our findings show that higher military expenditure leads to a worsening of income distribution. This result can be interpreted in the light of the principles of the opportunity cost burden theory. It means that defense 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. One of the most important goal of the welfare state is to redistribute the resources to improve the social welfare of the population. It is obvious that government is putting into practice several welfare strategies that can improve the living standard and consequently reduce the income disparities within the country, but fewer financial resources represent a strict budget constraint. So, the amount of public budget creates a trade-off between different kind of expenditures. In other words, the military spending drains out the limited public resources for education, health and other social projects which improve the income distribution. 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

Table A1- 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	

Table A2- List of countries included in the first robustness check

> 40% of Median Population	> 60% of Median Population	> 80% of Median Population
Albania	Azerbaijan	Azerbaijan
Armenia	Belarus	Belarus
Azerbaijan	Bosnia and Herzegovina	Bulgaria
Belarus	Bulgaria	Czech Republic
Bosnia and Herzegovina	Czech Republic	Hungary
Bulgaria	Georgia	Kazakhstan
Czech Republic	Hungary	Poland
Georgia	Kazakhstan	Romania
Hungary	Moldova	Russia
Kazakhstan	Poland	Serbia
Lithuania	Romania	Slovakia
Moldova	Russia	Tajikistan
Poland	Serbia	Ukraine
Romania	Slovakia	Uzbekistan
Russia	Tajikistan	
Serbia	Ukraine	
Slovakia	Uzbekistan	
Tajikistan		
Ukraine		
Uzbekistan		

Table A3- Trend of Gini Coefficient and military expenditure as Averages

Country	1990-1995		1996-2000		2001-2005		2006-2010		2011-2015	
	Gini	Milex	Gini	Milex	Gini	Milex	Gini	Milex	Gini	Milex
Albania	0.448	144.8	0.455	79.95	0.442	199.5	0.458	205.5	0.454	177.75
Armenia	0.44	115.33	0.523	156.5	0.46	195.25	0.452	391.5	0.449	450.75
Azerbaijan	0.387	256.8	0.402	339	0.388	1044.5	0.402	2535.25	0.402	3564.5
Belarus	0.236	384.5	0.268	241.25	0.29	399.5	0.446	738	0.433	979.25
Bosnia and Herzegovina	0.301	.	0.282	.	0.419	311	0.429	230	0.435	195.25
Bulgaria	0.312	1273	0.326	858.25	0.329	1085	0.348	1070.5	0.358	837
Croatia	0.312	2882.25	0.391	2219.75	0.402	1122	0.39	1125.5	0.322	937.75
Czech Republic	0.234	2646.33	0.262	2731.75	0.269	3249.25	0.263	2726	0.263	2038.25
Estonia	0.349	79.87	0.42	150.5	0.42	324	0.324	481.5	0.332	499.75
Georgia	0.379	.	0.457	69.72	0.485	162.3	0.477	862.75	0.433	422.25
Hungary	0.275	1755.8	0.257	1500.5	0.273	2040.75	0.288	1586.75	0.304	1240.5
Kazakhstan	0.347	440.33	0.504	353.5	0.467	703	0.449	1543	0.447	2219.5
Latvia	0.271	107	0.319	108.4	0.374	361.5	0.378	455.5	0.358	297.75
Lithuania	0.321	123.43	0.335	263	0.364	399	0.352	472.25	0.346	422.75
Macedonia	.	.	.	131.75	.	179.75	.	168	.	126
Moldova	0.345	32	0.443	22.37	0.466	18.87	0.468	27.97	0.452	26
Montenegro	0.301	.	0.283	.	0.362	86.3	0.424	81.92	0.432	71.62
Poland	0.305	5300	0.334	6385.25	0.352	7020.5	0.342	8854	0.348	10408.8
Romania	0.269	3142	0.335	2448.5	0.354	2450.5	0.367	2570.5	0.348	2605.75
Russia	0.404	46751.8	0.473	25451.5	0.469	37896.75	0.43	57354.25	0.394	82543
Serbia	0.301	.	0.283	1292.75	0.425	1184.25	0.409	1046	0.357	907
Slovakia	0.202	1438.33	0.248	1296.75	0.295	1361.25	0.321	1399.75	0.261	1048.75
Slovenia	0.239	500.07	0.278	487.25	0.316	638.5	0.244	812.5	0.254	513.5
Tajikistan	0.339	73.9	0.425	24.2	0.462	54.8	0.447	58.1	0.457	92.8
Ukraine	0.321	1174.33	0.377	1707.25	0.439	2001	0.437	3166.75	0.437	3722.75
Uzbekistan	0.334	.	0.471	.	0.463	.	0.461	.	0.461	.