MILITARY SPENDING AND BUDGET DEFICITS: THE IMPACT OF US MILITARY SPENDING ON PUBLIC DEBT IN EUROPE (1988-2013).

Raul Caruso*, Catholic University of the Sacred Heart

Marco Di Domizio, University of Teramo

[preliminary version, APRIL 2015]

Abstract

The aim of this paper is to study the relationship between military spending and sovereign debt in a panel of thirteen European countries. In particular, under the assumption of the interdependence of military spending between US and European countries, we analyse whether US military spending affected European sovereign debt in the period 1988-2013. The empirical estimation is based on different steps: (i) a unit root tests (ii) an Arellano-Bond panel estimation and a linear fixed effect model; (iii) a FMOLS estimation to highlight the long run relationship between debt and relevant variables. General results highlight that debt burden of European countries is: (1) positively associated with US military burden and (2) negatively associated with average military burden of other European countries.

Keywords: Military Spending, Public Debt, Interdependence, Arellano Bond, Fixed Effect, Panel Cointegration, Fully Modified OLS.

Jel classification: H56; H63; F52;

* corresponding author, email: raul.caruso@unicatt.it; Catholic University of the Sacred Heart; Institute of Economic Policy and Center for Applied Economics (CSEA). Earlier version of this paper have been presented at the 2015 ASSA/AEA conference, at the workwhop 'Costs of Destructive Entrepreneurship and Economic Performance', Maison des Sciences Economiques, Paris, and in a seminar at the National Bank of Poland. Thanks to all participants in these events and in particular to Joanna Tyrowicz, Jan Hagemejer Julien Malizard, Solomon Polachek, Zbigniew Polanski, Stergios Skaperdas, Carlos Siegle and Merdhad Wahabi. The authors also warmly thank Ron Smith, Javier Gardeazabal and Vincenzo Bove for valuable comments.

INTRODUCTION

The aim of this paper is to study the relationship between US military spending and sovereign debt in a panel of thirteen European countries. In other words, under the assumption of the interdependence of military spending between US and European countries, we analyse whether US military spending affected European public debt in both short and long-run. In the end, the main concern of this work is the impact of increasing debt related to military spending. This may become a crucial issue in the future. In fact, the data provided by SIPRI shows an increasing trend in world military spending in the latest years: between 2001 and 2013 world military spending increased by 49% in constant terms. In this respect US, driven by the war on terror under the Bush Jr. administration (2001-2009), had recorded the crucial increase of 76.4% eventually followed by an overall decrease by 14% in the following years until 2013. Western European countries had increased military spending by 8.5% in the period 2001-2009, whereas in the following years until 2013 they decreased it by 11%.

Needless to say, military spending is financed through taxes or by issuing public debt. The larger is the military spending, the larger could be the expected negative impact on growth, via the increased governmental debt. In fact, military spending is detrimental for growth in the long-run (Dunne and Tian, 2013; Perotti, 2014) and the increased sovereign debt is likely to be a crucial channel of transmission of this impact. For example, Williamson (1984) estimates that in England between 1761 and 1820 the capital formation share would have been almost 5% higher in the absence of war and the national income would have grown by 0.6 per year faster. This evidence is notably surprising because that period is usually refereed as the 'first industrial revolution'. So, in spite of the famous labelling, growth figures were actually rather weak. In fact, Williamson argues that the enormous debt issued to finance the wars had finally crowded-out civilian accumulation. In general, in the past century, the fiscal burden descending from wars was by no means a neglected issue. Pigou (1919) Gottlieb (1919/1924), and Leland (1944), for example, in the aftermath of the WWI and

WWII respectively, discussed the war burden on the future economic growth because of the stock of debt. In very recent years, a growing number of studies on the impact of military spending on public debt has been published[1].

This paper is intended to contribute to this line of research which focuses on the macro-economic impact of military spending on national economies in the long-run. The novelty of this paper is the focus on the impact of US military spending on European fiscal imbalance. Needless to say, the idea behind is that military alliances and relationship between US and Europe constitute a necessary channel of transmission of changes in military expenditures and consequently of their impact. In the same vein, the second main novelty of this work is the relationship between the debt burden of countries and the military burden of other European countries.

The traditional model of demand for military expenditure developed in Smith (1980) pointed out the role of military alliances in determining the level of military expenditures. In simpler words, military expenditures of partners are associated, in particular, for European countries, military spending of the international superpower, the US, does have an impact on choices of military spending of partners. Such interdependence can be shaped in two ways: (i) leader/follower interaction; (ii) free riding. According to the first view, European allies may behave as followers of the United States so interpreting an increase in US military burden as a credible signal of increased threats. This would imply a consequent increase in military burden of European countries. Instead, the free-riding behaviour implies a decrease in military burden of European countries.

In the light of that, whenever European countries behave as followers of allied superpower, the United States, and increase their military spending because of necessary strategic considerations. Then they have an additional source of pressure on their fiscal sustainability. This is nowadays particularly relevant for some European countries that have been experiencing the sovereign debt crisis since the end of 2009 (Lane, 2012).

[1] See the next section for a brief survey.

To empirically investigate this, we construct a panel of thirteen European countries for the period 1988-2013. The empirical estimation is based on different steps: (i) a panel unit root tests (ii) a set of panel cointegration tests; (iii) an Arellano-Bond panel estimation and a linear panel fixed effect estimation ; (iv) a FMOLS estimation to highlight the long run relationship between debt burden and relevant variables.

General results highlight a significant impact of US military spending on European sovereign debt burden. In particular, we find a positive long-run relationship between US military burden and debt burden in Europe. Eventually we find a negative relationship between military burden of other European countries and sovereign debt.

This result contributes to shape a question. Consider international political orders characterized by the existence of superpowers. In addition consider a massive military spending of the superpower. Are these scenarios sustainable in the long-run? In fact, the ultimate concern behind this work is that the burden emerging because of military spending does affect the very fabric of societal orders, thus increasing the level of vulnerability and insecurity of polities and human beings. In this respect, the structure of international order is a relevant component of the motivation behind this work[2]. The massive military spending of the leader of the international order could depend on ongoing conflicts but it could be interpreted as the latent factor of a long-run process which ends in the economic distress and eventually in the systemic decline. By systemic decline we mean the scenario where the existing institutions are no longer legitimate and therefore they do not function properly anymore. Put differently, the fundamental pillars of the socio-economic system would weaken and eventually would collapse. In other words, the crucial research question is whether US military spending had turned to be into a strong determinant of sovereign debt in Europe so weakening the existing institutional scenario.

[2] Albeit indirectly, this could be considered also a test of the Hegemonic Stability theory which has been the paramount approach among political scientists.

In this respect, there are analogies that can be found in the history and precisely: (i) the crisis of the Third Century of the Roman Empire and (ii) the General Crisis of the 17th century. The Roman Empire (henceforth Empire for sake of brevity) reached its greatest extent under Emperor Trajan (98 to 117 CE). Since its very beginning, the main item of Empire budget was the army. Hopkins (1980) estimated that 54% of state revenue would go for the army. Duncan Jones (1994) estimates that in the mid second century, the army accounted for three-quarters of the Empire's budget. Eventually, under Septimius Severus (193-211 CE), the military burden had become unbearable. Lucius Septimius Severus, who was a military himself, took (and consolidated) the power with the support of military. Under his rule, the military spending increased considerably because of the personnel costs. In fact, Severus, increased (almost tripled) the number of troops in Italy and eventually increased their wages (Smith, 1972). Even Severus's successors embraced a similar strategy by raising the military burden. Caracalla increased the soldier's normal pay by a half in the midst of the crises of the third century Maximinus Thrax doubled the soldiers' pay (Speidel, 1992). Such a policy in the long run turned to be unsustainable. In fact, at the time of political crises the third century a tremendous monetary and financial crises took shape in 238 CE. At that time, the Crisis of the Third Century (235-284 CE) had already taken shape after the assassination of Emperor Alexander Severus.

A second analogy has to be found in the financial troubles of Spanish empire under the Habsburgs. In particular, since the reign of Philip II (1556-1598) until Philipp IV (1621-1665) the Spanish empire experienced severe budget deficits because of massive military spending. Kindleberger (1991) pointed out the Spain "*…experienced financial crises at the level of the monarchy in 1557, 1575, 1596, 1607, 1627, and 1647-though not, on this showing, in 1619 to 1623…*"[3]. The main reason of such financial imbalances has to be found into the military commitments of Habsburgs. Philip II had already inherited a massive debt from Charles V. But, in particular, he led Spain into a number of conflicts. Such a policy has been financed by issuing state bonds (*Juros* and *Asientos*) and by

[3] Kindleberger (1991), p. 152.

levying new taxes. This massively increased the public debt and depressed the economy. In spite of the severe economic crises, the relationship between military spending and fiscal imbalance of kingdom did not stop. It was the *leit motiv* of Spanish policy until the re-structuring of international order implemented after the Westphalia treaty.

The paper proceeds as follows: in the next section a brief survey of the related literature is presented; eventually the data and test for unit roots are presented; in the fourth section we propose an Arellano-Bond and linear Fixed Effect Panel estimation models and in the fifth section a Fully Modified OLS estimation. Conclusions summarize and discuss.

II. THE CONCEPTUAL FRAMEWOK: DETERMINANTS OF MILITARY SPENDING AND DEBT

The pioneering model of demand for military expenditure is developed in Smith (1980). The empirical model presents the demand of military expenditure of a country as function of civilian output and of the 'strategic environment' which in turn is a function of military expenditures of other countries. In particular, the illustrative focus there was on the relationship between a country like UK and superpower like US. Assuming that military expenditure of a superpower can be interpreted as a relevant indicator of threat, two behaviours could be envisioned: (i) free riding; (ii) leader/follower relationship. In the first case, the empirical association between military expenditures of a superpower and its ally turns to be negative because a country can 'free-ride' so reducing its contribution to the production of the public good of security. In the alternative case, a country is intended to 'follow' the leader so increasing the military expenditure. In fact, military expenditure of the superpower signals an increase in threat. Eventually several papers confirmed the interdependence between the military spending of countries within an alliance at regional level [see among others Murdoch and Sandler (1984), Smith (1989), Sandler and Murdoch (1990), Dunne and Freeman (2003)]. The literature on the nexus between military spending and debt has been rapidly increasing for recent years, thanks to a growing availability of data and

to the recent developments in estimation methodologies of panel data. In seminal papers of Brzoska (1983), Looney and Frederiksen (1986) and Looney (1989), the focus was on the Third World and low-income countries contexts. Eventually a superior attention has been paid to other regional areas: the Arab countries have been the focus in Alami (2002); South American countries in Dunne et al., (2004a); Middle Eastern countries in Smyth and Narayan, (2009), Far Eastern countries in Dunne et. al., (2004b) and Sub-Saharan African in countries Ahmed(2012). More recently, the analysis has been extended to high income economies, such as European and NATO countries [Paleologou (2013), Alexander (2013)]. The estimation strategies and methodological approaches differ depending on the nature of dataset employed: single country time series, cross country panels or both.

Focusing on panel data approaches, the aim of empirical evidence investigations was primarily focused on the relationship between national military spending and debt. Dunne et al. (2004b) found a positive and significant effect of military burden on external debt in eleven small industrialized economies; they used static and dynamic panel estimators, with fixed and random effects, including as control variables, the net international reserves and growth of GDP. Smith and Narayan (2009), analyse six Middle Eastern countries to highlight long and short run effect of military spending on external debt. After controlling for unit roots and cointegrating relationships, they used Fully Modified OLS (FMOLS), Dynamic OLS (DOLS) and Dynamic Fixed Effect (DFE) techniques and found a positive (and elastic) and significant effect of military expenditure on debt in the long run, and positive (but inelastic) effect in the short run. The same econometric approach has been used by Ahmed (2012) to analyse the effect of military expenditure on external debt burden for 25 Sub-Saharan countries. Results show that military expenditures exhibit a positive impact on external debt, both in the short and in the long run. With respect to large economies, Alexander (2013) investigated the empirical evidence from high-income members of NATO using a partial auto regressive distributed lag (ARDL) equation to evaluate the effect of national military spending and growth on debt.

After controlling for the stationarity of series, he employed the Arellano-Bond technique to estimate the short run relationships among them. He found a strong persistence over time of the dependent variable (the share of government debt on GDP), together with a positive effect of the variation of military spending (from 1.85 in larger sample to 2.72 in smaller sample) and a negative effect of the change in GDP per capita (from -0.79 in larger sample to -1.19 in smaller sample). The same techniques were used by Paleologou (2013) in the empirical investigation on 25 European countries for the period 1996-2009. The author obtained similar results: a positive and elastic (1.4) relationship between the first difference of military expenditure and first difference of government debt, and a negative (-0.5) effect of the first difference of GDP per capita growth on debt (first difference). All the mentioned studies, adopt a traditional approach studying the impact of national military spending on gross public debt. This paper is an attempt to go beyond this approach by considering the necessary interdependence of military spending between allies in the international community.

III. THE RELEVANT DATA AND THE UNIT ROOT TESTS

The empirical analysis is run exploiting a panel of thirteen European countries: Belgium, Finland, Denmark, France, Germany, Greece, Ireland, Italy, Norway, Portugal, Spain, Sweden and United Kingdom. The sample selection was driven by the quality of available data together with the economic and military association of the observed countries with United States. With the exception of Finland, Ireland and Sweden all countries are members of NATO.[4] The panel includes 26 yearly observations from 1988 to 2013. The main variables under study are: (i) the debt burden, namely the Government debt/GDP ratio; (ii) the US military burden, namely the US military spending/GDP ratio; (iii) the military burden of other European countries considered.

[4] Other NATO members not included in the panel are: Luxembourg, Netherlands and Turkey.

The Government debt of each country is the General Government Gross Debt expressed in US dollars at constant prices (2005)[5]. The data on Military Expenditure are drawn from the World Bank dataset and are based on SIPRI data. The United States military expenditure is labelled as *USmilex*. In addition we computed the average military expenditures of other European countries. That is, when considering a country *i*, we compute *EUmilexav* the average military spending of European countries other than *i*. In addition we consider the ratio between both *USmilexp* and *EUmilexav* and GDP. Then, to take into account the role of growth and of welfare state on debt burden, we include the unemployment. Hereafter, we first test for the presence of individual and common unit root. Breitung and Meyer (1994) proposed a unit root test valid for fixed T and for N→∞ (where N is the number of cross sections) imposing the restriction of equal parameter of the lag variable for all cross sectional units, while the lag order of the first differences terms may differ across them. The crucial hypothesis is the presence of cross sectional independence. The Breitung test was implemented by Levin et al. (2002) whose test (LLC) requires bias correction factors for cross-sectionally heterogeneous variance in order to estimate efficient pooled OLS parameters. Yet, Im, Pesaran and Shin (2003) proposed a test (hereafter IPS) for heterogeneous panels excluding that all countries have the same pace of convergences toward the equilibrium and, in addition, they reduce dramatically the problem of cross sectional dependence by demeaning the data. An important consequence of the IPS approach is that it allows for the possibility of rejection of non-stationarity even if a single cross section time series variable is not stationary. This is the same approach of Maddala and Wu (1999) that used ADF unit root tests on each single cross section time series variable to build a non-parametric test based on ADF *p-value*.

In our panel, the LLC test rejects the hypothesis of common unit roots for the dependent variable *Ln Debt Burden* for the hypothesis of individual intercept and trend specification in levels (at 10 % significance), and in all cases for its first

[5] For some countries [Denmark (1988-1992), Germany (1988-1991), Portugal (1988-1990), and Sweden (1988-1993)] data from IMF were supplemented by OECD information in order to have a balanced panel

difference. Among the other variables, the LLC test does not reject the hypothesis of common unit root only for *Ln unemployment rate* in the case of no individual intercept and trend. The Breitung test suggests that all variables have not common unit roots in levels, while they have common unit roots in first differences, while in the IPS test, for the case of individual intercept, the hypothesis of individual unit root of variables in levels is rejected at standard statistical significance (1%) for *Ln unemployment rate* and *Ln EU milex on average* , while it is rejected for all variables and intercept and trend specification for their first differences. If considering Maddala based Wu test the hypothesis of non-stationary series in levels (depending on intercept and trend specification) and stationary on their first differences is confirmed. The Augmented Dickey-Fuller test for US military expenditure, (burden and log levels), results suggest that the series are non-stationary in levels, and stationary in first differences if no intercept and linear trend is added in the model specification, . In this case the series show a pure stochastic trend without intercept. Results are in table 2.

TABLE 1 - Descriptive statistics of main variables. 1988-2013

	Obs.	**Mean**	**Median**	**Std. Dev.**	**Min**	**Max**
Debt Burden (Debt /GDP)	338	67.37	58.98	30.14	13.84	175.74
Unemployment rate	325	8.696	8.144	4.039	1.617	25.126
US Military Expenditure (bln$/2005)	26	445	428	105	320	635
US military burden (Military Expenditure / GDP ratio)	26	3.99	3.85	0.75	2.91	5.58
European Average Military Expenditure (bln$/2005)	338	16.3	16.7	1.68	12.5	19.2
European Average military burden (average military Expenditure / GDP ratio)	338	1.89	1.80	0.31	1.43	2.62
Vote	323	0.263	0	0.441	0	1
Rae Leg	325	70.603	71.468	10.272	52.802	88.976
Gov Party	324	2.818	3	1.607	1	5

Table 2: Panel Unit Roots Test: Schwarz Info Criterion (SIC) – Automatic selection – Max lags: 4. Spectral estimation: Bartlett. Bandwidth selection: Newey West . 325 obs.

Null hypothesis: Common unit root	**Individual intercept**	**Individual intercept and trend**	**None**

	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Levin, Lin and Chu						
Ln Debt Burden	-1.049	0.147	**-1.371***	0.085	2.893	0.998
Δ Ln Debt Burden	**-5.377*****	0.000	**-3.745*****	0.000	**-8.998*****	0.000
Ln Unemployment rate	**-3.608*****	0.000	**-2.052****	0.020	0.423	0.667
Δ Ln Unemployment rate	**-4.991*****	0.000	**-4.500*****	0.000	**-10.065*****	0.000
Ln EU milex Burden	**-4.437*****	0.000	**-1.586***	0.056	**-14.782*****	0.000
Δ Ln EU milex Burden	**-13.955*****	0.000	**10.478*****	0.000	**10.936*****	0.000
Ln EU milex	**-4.517*****	0.000	**-2.611*****	0.005	**-3.396*****	0.003
Δ Ln EU milex	**-4.346*****	0.000	**-2.743*****	0.003	**-9.296*****	0.000
Breitung						
Ln Debt Burden			-0.373	0.354		
Δ Ln Debt Burden			**-4.678*****	0.000		
Ln Unemployment rate			0.717	0.763		
Δ Ln Unemployment rate			**-3.700*****	0.000		
Ln EU milex Burden			-0.347	0.364		
Δ Ln EU milex Burden			**-9.323*****	0.000		
Ln EU milex avg			**-3.458*****	0.000		
Δ Ln EU milex avg			**-5.639*****	0.000		
Maddala and Wu[A]	λ statistic					
Ln Debt Burden	33.339		**37.601***		6.388	
Δ Ln Debt Burden	**76.775*****		**54.015*****		**119.796*****	
Ln Unemployment rate	**55.386*****		**43.750****		10.309	
Δ Ln Unemployment rate	**78.343*****		**69.657*****		**139.443*****	
Ln EU milex Burden	15.775		8.092		**224.794*****	
Δ Ln EU milex Burden	**154.979*****		**124.739*****		**149.276*****	
Ln EU milex	**56.703*****		29.287		32.236	
Δ Ln EU milex	**66.816*****		**38.695***		**119.007*****	
Augmented Dickey-Fuller						
Ln US milex Burden	-2.353	0.165	-2.284	0.426	-0.770	0.371
Δ Ln US milex Burden	-2.044	0.267	-1.893	0.627	**-1.996****	0.046
Ln US milex	-1.192	0.660	-2.264	0.436	0.221	0.742
Δ Ln US milex	-2.373	0.159	-2.264	0.436	**-2.430****	0.017
Null hypothesis: Individual Unit Root	**Statistic**	**Prob**	**Statistic**	**Prob**		

Im, Pesaran and Shin (IPS)				
Ln Debt Burden	-0.168	0.433	-1.256	0.105
Δ Ln Debt Burden	**-5.590*** **	0.000	**-3.722*** **	0.000
Ln Unemployment rate	**-2.991*** **	0.001	-1.267	0.103
Δ Ln Unemployment rate	**-5.524*** **	0.000	**-4.869*** **	0.000
Ln EU milex Burden	0.379	0.648	2.257	0.988
Δ Ln EU milex Burden	**-11.115*** **	0.000	**-9.373*** **	0.000
Ln EU milex	**-4.008*** **	0.000	-1.245	0.107
Δ Ln EU milex	**-4.988*** **	0.000	**-2.459*** **	0.007

[A] In the Maddala and Wu test the λ statistic is distributed as χ^2 with 26 degree of freedom. The null hypothesis of non-stationary panel is rejected if λ is on the right of the threshold values: 45.642 (1% level of significance: ***), 38.885 (5% level of significance: **), 35.563 (10% level of significance: *). The computation of statistics is available under request.

According to the results of Maddala and Wu test the variables are integrated of order one - I(1). We eventually test for the presence of cointegrating relationships among the series. We conduct the Pedroni and the Kao tests[6]. The Pedroni test rejects the null hypothesis of no cointegration for 5 and 4 out of the 11 statistics reported, if individual intercept and/or deterministic trend is modelled, respectively, while the null hypothesis is not rejected if no intercept and deterministic trend are assumed. The rejection of no cointegration hypothesis is supported, in particular, by the ADF test specification. The rejection of no cointegration hypothesis in the Kao test, suggests that cointegrated relationships exist among variables and a long run relationship may be estimated. Results of tests are shown in table 3.

TABLE 3. PANEL COINTEGRATION TEST

Variables: *Debt Burden, Ln Unemp, Ln USmilex Burden, Ln EU milex Burden on avg.*

[6] The first is a cointegration test based on residuals of a spurious regression carried out on I(1) variables, and it allows for heterogeneous intercepts and time trend among cross sectional units. Pedroni proposed several methods of constructing the statistics to test the null hypothesis of no cointegration; in particular he proposed two alternative hypothesis: the "within" and "between" dimension. In the within dimension, the coefficient of the first lag of the residual is imposed to be equal (and <1) for all cross sections, while in the between dimension the only restriction is that all the coefficients of the first lag of the residual are <1. The Kao Cointegration Test is based on the same approach as in Pedroni, but it considers countries specific intercepts and homogeneous coefficients on the first stage regressors.

Sample 1988-2013. Observations: 378 - Cross-sections included: 13. Automatic lag length selection based on Schwarz Info Criterion with a max lag of 4 - Newey-West automatic bandwidth selection and Bartlett kernel

Pedroni Residual Cointegration Test - Null Hypothesis: no cointegration

Alternative hypothesis: common AR coefs. (within-dimension)

Trend assumption	**No deterministic trend**		**Individual intercept and individual trend**		**None**	
	Stat	**Prob**	**Stat**	**Prob**	**Stat**	**Prob**
v-Stat	**2.436*** **	0.007	0.937	0.174	-2.511	0.994
rho-Stat	0.539	0.705	1.572	0.942	1.550	0.939
PP-Stat	-0.104	0.459	0.605	0.727	1.265	0.897
ADF-Stat	**-2.622****	0.004	**-2.723*****	0.003	-0.147	0.441
	Weighted stat	**Prob**	**Weighted stat**	**Prob**	**Weighted stat**	**Prob**
v-Stat	**2.295****	0.011	**1.903****	0.029	-2.736	0.997
rho-Stat	0.671	0.749	1.455	0.927	1.331	0.908
PP-Stat	0.001	0.500	0.369	0.644	0.987	0.838
ADF-Stat	**-1.596***	0.055	**-1.659****	0.049	-0.848	0.198

Alternative hypothesis: individual AR coeffs. (between-dimension)

	No deterministic trend		**Individual intercept and individual trend**		**None**	
	Stat	**Prob.**	**Stat**	**Prob.**	**Stat**	**Prob**
rho-Stat	2.092	0.982	2.587	0.995	3.251	0.999
PP-Stat	0.794	0.786	0.736	0.769	2.706	0.997
ADF-Stat	**-1.389***	0.082	**-2.069****	0.019	0.134	0.553

Kao Residual Cointegration Test - Null Hypothesis: no cointegration.

	t-Stat	Prob.
ADF	**-3.106*****	0.001

IV. ARELLANO BOND AND FIXED EFFECT PANEL ESTIMATION

In this section we estimate a panel regression to uncover first the short-run relationship between our measures of debt and military spending. In particular, we follow the Arellano-Bond (A-B) GMM method and a linear Fixed Effect model (FE). We employ the FE model because the Hausman test, (reported at the bottom of table 4) supports the idea of preferring FE specification against the alternative RE. The model to be estimated can be so expressed:

$$D_{it} = a_0 + \beta_1 D_{it-1} + \beta_2 M_{ust-1} + \beta_3 M_{eut-1} + \beta_4 X_{t-1} + e_{it}$$

Where D is the natural log of the debt burden. As noted above, main explanatory variables are the lagged US military expenditure (M_{ust-1}) and the lagged expenditure of other European countries (M_{eut-1}). The latter are expressed both in logs of levels and in ratios with respect to GDP. In other words we are taking into account the military burdens. In all estimations we also include the lagged value of the dependent variable so highlighting the first-order autoregressive process.

Then, we also consider a set of covariates (X_{t-1}). First, in order to proxy the impact of the current trend of the economy, we use the logged level of unemployment. Eventually, we employ also three controls to capture the political cycle and the political structures of the countries. First we consider a dummy denoting whether in the previous year there had been a general election (*vote-1*). This choice links with the idea of fiscal imbalance determined by incumbents in electoral years. Alesina and Perotti (1995) and Alesina and Drazen (1991), for example, explained the increases in public expenditure and the delay in the fiscal adjustment by the incumbent cabinet before elections. Then we include an index of legislative fractionalization, the RAE index, in order to verify whether higher fragmentation leads to higher debt burden in line with a pork-barrel hypothesis. Then, we also include an integer variable *Gov Party* bounded between 1 and 5 which captures the political attitude of the cabinet (where 1 stands for hegemony of right wing parties and 5 stands for leftist parties). The latter three controls have been drawn from Comparative Political Dataset[7] by Armingeon et al. (2014). Table 4 below reports the results.

Table 4 – AB and FE estimations

Dependent: Ln (Debt Burden)	**Arellano Bond Estimate**		**Fixed Effects**	
	All time	**All time**	**All time**	**All time**
Constant	**0.469***** (0.118)	**-4.745**** (2.076)	**0.274*** (0.073)	**-6.903**** (2.893)

[7] Drawn at the website http://www.ipw.unibe.ch/content/team/klaus_armingeon/comparative_political_data_sets/index_ger.html [last access december 2014],

Lagged	**0.738*** (0.021)	**0.754*** (0.022)	**0.821*** (0.024)	**0.833*** (0.024)
Ln Unemployment	**0.229*** (0.017)	**0.219*** (0.016)	**0.163*** (0.021)	**0.160*** (0.020)
Ln US Military Burden (-1)	**0.123*** (0.021)		**0.141*** (0.031)	
Ln avg european Military Burden (-1)	**-0.195*** (0.026)		**-0.171*** (0.039)	
Ln US Military Expenditure (-1)		**0.123*** (0.019)		**0.114*** (0.027)
Ln average european Military Expenditure (-1)		0.080 (0.095)		0.176 (0.134)
Vote (-1)	**0.020**** (0.008)	**0.020**** (0.008)	**0.022*** (0.012)	**0.022*** (0.019)
RAE Legislative fract (-1)	0.002 (0.001)	**0.002*** (0.001)	0.001 (0.001)	0.001 (0.002)
Gov Party (-1)	**-0.005*** (0.003)	-0.004 (0.003)	0.000 (0.004)	0.000 (0.004)
Hausman test against RE			**35.18***** 0.000	**42.81***** 0.000
Countries	13	13	13	13
Time lenght min/max	23/23	23/23	24/24	24/24
Observations	299	299	312	312
Long run effects				
Ln US Military Burden	0.469		0.788	
Ln average European Military Burden	-0.744		-0.955	
Ln US Military expenditure		0.5		0.682

The main results show that: (i) the one year-lagged values of US military burden and military expenditure appear to be positively associated with the logged value of debt burden of European countries; (ii) there is a negative association between the debt burden of a country *i* and the lagged value of average military burden of other European countries other than *i*. No statistical significance emerges from the relationships between European debt burden and log of average military expenditure of other European countries other than *i*. In brief, evidence suggests that the relation 'leader – follower ' between US and

European countries translated into a higher debt-burden for the latter. In addition, the results on the relationship between military burden of other European countries and national debt burden highlight that countries have benefited from military spending of other countries so suggesting that the production of a regional public good would be preferable (namely an European common defence).

Among controls, as expected, the unemployment rate is positively associated with debt burden. Among political variables, the debt burden appears to be always significantly and positively associated with the election cycle, but only once weakly significantly associated to the RAE, namely the index of legislative fractionalization. In the presence of significant coefficient, the higher is the past fragmentation of the cabinet, the higher is the current debt burden. At the bottom of the table we report the long-run effects of relevant variables calculated from the statistically significant estimates by means of the following formula: *long-run effect = coefficient of US or EU military burden/expenditure* (1-*coefficient Ln debt burden* $_{it-1}$).

In order to test the robustness of our results, eventually we have repeated the AB and Fixed Effects estimations splitting the time span into two sub-periods, namely 1992-2001 and 2002-2013. That is, we consider that 2001 could be considered as a turning point because of the boost in military spending undertaken by US administration in the aftermath of the September 11th, 2001. Please consider also that, in order to avoid biased estimates, we consider only the period 1992-2001 for the first period. In fact, this choice has been motivated by the likely bias emerging from the excessive burden of the Cold War in the early years of the series. Results of additional estimations are reported in table 5.

Dependent: Ln (Debt Burden)	**Arellano Bond**				**Fixed Effects**			
	1992-2001	**2002-2013**	**1992-2001**	**2002-2013**	**1992-2001**	**2002-2013**	**1992-2001**	**2002-2013**
Constant	**0.920*** ** (0.287)	**0.419*** (0.218)	**-11.458*** (5.090)	**-16.831**** (8.652)	0.379 (0.269)	0.403 (0.290)	**-21.479*** ** (5.728)	**-19.641*** (11.352)
Lagged	**0.606*** ** (0.051)	**0.819*** ** (0.035)	**0.574*** ** (0.054)	**0.828*** ** (0.036)	**0.699*** ** (0.047)	**0.798*** ** (0.048)	**0.694*** ** (0.044)	**0.810*** ** (0.049)

Ln Unemployment	**0.122*** ** (0.040)	**0.232*** ** (0.029)	**0.179*** ** (0.035)	**0.212*** ** (0.029)	**0.154*** ** (0.038)	**0.253*** ** (0.040)	**0.198*** ** (0.034)	**0.230*** ** (0.040)
Ln US Military Burden (-1)	**0.464*** ** (0.136)	-0.005 (0.062)			**0.512*** ** (0.164)	0.007 (0.083)		
Ln average European Military Burden (-1)	**-0.579** ** (0.279)	**-0.424** ** (0.167)			**-0.754** ** (0.326)	**-0.440** ** (0.222)		
Ln US Military Expenditure (-1)			0.186 (0.208)	0.029 (0.045)			-0.114 (0.235)	0.031 (0.061)
Ln average European Military Expenditure (-1)			0.335 (0.422)	**0.686*** (0.398)			**1.066** ** (0.473)	0.804 (0.524)
Vote (-1)	-0.004 (0.009)	**0.035*** ** (0.013)	-0.002 (0.009)	**0.038*** ** (0.013)	-0.004 (0.011)	**0.037** ** (0.017)	-0.004 (0.011)	**0.040** ** (0.017)
RAE Legislative fract (-1)	0.004 (0.003)	0.001 (0.002)	0.001 (0.003)	0.003 (0.002)	**0.006** ** (0.003)	0.002 (0.002)	**0.005*** (0.003)	0.003 (0.002)
Gov Party (-1)	**-0.010** ** (0.004)	0.000 (0.004)	**-0.010*** ** (0.004)	0.000 (0.005)	**-0.008*** (0.004)	-0.0002 (0.289)	**-0.008** ** (0.003)	0.000 (0.006)
Hausman test against RE					**28.07*** ** 0.000	3.23 0.863	**51.37*** ** 0.000	**24.83*** ** 0.000
Countries	13	13	13	13	13	13	13	13
Time lenght min/max	8/8	11/11	8/8	11/11	9/9	11/11	9/9	11/11
Observations	104	143	104	143	117	143	117	143

After the split of the time series, some results are confirmed whereas other get slightly puzzled and inconclusive. The most robust results are: (i) the positive association between debt burden of European countries and US military burden in the period 1992-2001; (ii) the negative association between the average European military burden in both periods. Yet, the association between European debt burden and US military burden is not confirmed for the period 2002-2013. In addition, when considering the absolute level of US military spending (in logs), no statistically significant association emerges with the dependent variable. Interestingly, if not confusing, the relationship between the debt burden and the logged level of the absolute value of average military expenditure of European countries other than *i*, appears to be positive in the period 2002-2013 in the FE estimation and (albeit only weakly significant) in the

period 1992-2001 in the AB estimates. In particular with regard to the result of the FE estimation in the period 2002-2013, so implying a unitary elasticity between the military spending of other European countries and the national debt burden. However, it must be noted that results are only apparently contradictory with previous evidence on association between military burdens.

V. FULLY MODIFIED OLS

In what follows we attempt to strengthen our analysis by highlighting the long-run relationships between debt and military spending. In order to do that we employ the **fully modified technique (FMOLS)** for cointegrating vectors in dynamic panel data[8]. The estimator proposed for single cross section time series firstly by Phillips and Hansen (1990) was refined for heterogeneous cointegrated panel by Pedroni (2000). For sake of parsimony, we only consider two specifications: linear and quadratic. Results are reported in table 6 below.

Table 6 – FMOLS estimation

Dependent variable: Ln (Debt Burden)	**Panel Fully Modified OLS**			
	linear trend	**quadratic trend**	**linear trend**	**quadratic trend**
	Pooled weigthed			
Constant	YES	YES	YES	YES
Ln Unemployment	**0.598***** (0.032)	**0.556***** (0.030)	**0.566***** (0.032)	**0.553***** (0.030)
Ln US Military Burden	0.032 (0.022)	**0.055***** (0.017)		
Ln average European Military Burden (t-1)	**-0.479***** (0.010)	**-0.481***** (0.010)		
Ln US Military Expenditure			**0.332***** (0.017)	**0.347***** (0.015)
Ln average European Military Expenditure (t-1)			**-1.372***** (0.026)	**-1.340***** (0.025)
Vote (-1)	-0.017 (0.038)	0.020 (0.035)	-0.093 (0.066)	**-0.150***** (0.054)
RAE Legislative fract (-1)	**-0.053****	**-0.074*****	-0.031	-0.006

[8] The estimation has been run by means of Eviews 8.

	(0.024)	(0.023)	(0.035)	(0.029)
Cabinet composition (-1)	**0.075***** (0.027)	**0.123***** (0.025)	0.038 (0.035)	**0.064**** (0.031)
Countries	13	13	13	13
Time lenght min/max	23	23	23	23
Observations	300	300	300	300
Adjusted R-squared	0.589258	0.357300	0.714940	0.713265
S.E. of regression	0.273514	0.342136	0.227857	0.228526
Durbin-Watson stat	0.364384	0.392842	0.416281	0.541649
Sum squared resid	21.02163	32.89311	14.58924	14.67496
Long-run variance	0.021707	0.030475	0.022895	0.029660
Jarque-Bera stat (* rejects null of normality distribution of residuals)	19.56***	16.94***	6.867**	1.717
Wald test on military spending coefficients Chi-square (* rejects the null of null related coefficients)	2118,29***	2333,38***	3811.63***	4196.48***

Since the variables are logged the estimated coefficients are to be interpreted as the punctual elasticities of dependent variable with respect to one point percentage change of independent variables. In table 6 it is shown that the coefficient on the association between US and EU military spending and the European debt burden, exhibit the same sign estimated in the previous Arellano-Bond and Fixed Effect models for the whole period.

That is, in the long run, according to our panel framework, the increase in the level of the US military expenditure had translated into an increase of debt burden in European countries. The impact is substantial. The growth of national debt burdens as a consequence of United States military engagement is ranged from a minimum of 0.33 and a maximum of 0.35. In brief, the results of long run relationships partially confirm the Arellano-Bond short run estimations of previous section. The military expenditures of other European countries, in particular, influence the level of *debt burden* negatively, and the long run effect is significant. Interestingly, the long-run coefficients from FMOLS can compared with those computed from AB and FE panel estimates. The coefficients of US

military burden differ whereas those of average military burden of other European countries for FMOLS and AB estimates.

CONCLUSIONS

The aim of this paper was to investigate the relationship between US military spending and public debt in a sample of European countries. In particular, we investigated the relationship between the US military burden and the debt burden of European countries. In addition, we also focused on the association between the debt burden and the military burden of other countries in Europe. Under the assumption that military spending is a substantial component of public spending and eventually of public debt, the baseline estimation is based upon the traditional model of military spending. That is, military spending of each country is a function of other countries' military spending. In particular, the impact of the superpower is disentangled from the impact of other European countries. Therefore, the empirical analysis has been run exploiting a panel of 13 European countries: Belgium, Finland, Denmark, France, Germany, Greece, Ireland, Italy, Norway, Portugal, Spain, Sweden and United Kingdom. With the exception of Finland, Ireland and Sweden, all countries are members of NATO. The empirical strategy consisted in different steps: (i) a unit root tests (ii) a set of panel cointegration tests; (iii) an Arellano-Bond and Fixed Effect panel estimation; (iv) a FMOLS estimation to highlight the long run relationship between debt burden and relevant variables;

The AB and FE panel estimates show that that: (i) the one year-lagged US military burden appears to be positively associated with the debt burden of European countries; (ii) there is a negative association between the debt burden of a country *i* and the average military burden of other European countries other than *i*. In brief, evidence suggests that the relation 'leader – follower' between US and European countries translated into a higher debt-burden for the latter. In addition, the results on the relationship between military burden of other

European countries and national debt burden highlight that countries have benefited from military spending of other countries.

In addition, the control variables show the expected signs. As expected, the unemployment rate is positively associated with debt burden. Among political variables, the debt burden appears to be positively associated with the RAE, index of legislative fractionalization. That is, the higher is the fragmentation of the cabinet, the higher is the current debt burden. This is in line with standard pork-barrel hypothesis. Yet, the political cycle also appears to be positively associated with the debt burden. This is by no means a trivial aspect because choices of public spending are generally sensitive to political cycle. Needless to say, this may hold also for military spending and especially in democratic countries. For sake of robustness, we have tested our models for sub-periods 1992-2001 and 2002-2013. After the split of the time series, some results are confirmed whereas other turn to be slightly puzzled and inconclusive. Robustness of results is confirmed for (i) the positive association between debt burden of European countries and US military burden in the period 1992-2001; (ii) the negative association between the average European military burden in both periods. Put differently, in the first period after the Cold War the leader-follower scheme translated into a higher debt burden for European countries whereas the same does not seem to hold after the 2001. Rather the results for the European negative association between debt burden and military burdens appear to be strong.

The results from the FMOLS confirm the main results. That is, in the long run, according to our panel framework, the increase in the level of the US military expenditure translates into an increase of stock of gross public debt in European countries. In sum, the empirical results confirm in most cases the main hypothesis of this work, namely that European sovereign debt is also associated in the long run with US military expenditures. This empirical evidence confirms that the interdependence between US and European countries on security issues contributed to a higher fiscal imbalance for the latter. Yet, in particular, European countries actually behave as 'followers' of the United States so

interpreting an increase in US military burden as a credible signal of increased threats. This implied a consequent increase in military burden of European countries. And eventually an increase in the debt burden.

Moreover, the findings of this paper pose an additional explanation on the determinants of 2009 sovereign debt crisis in Europe. In fact, in the light of the results one can maintain that previous US military spending had played a role to generate the current stock of European debt. Needless to say, security and strategic consideration lead the policy choices on military expenditure but the detrimental impact on the whole economy is often disregarded or underestimated. So in general, this paper contributes to this line of research. In particular, this paper focuses on the fiscal impact of the hegemon country's choices on smaller or weaker countries. This is the main novelty we would claim for this work. This represents a relevant departure from the existing literature that have analyzed traditionally the impact of national military spending on national economic performance (either debt or economic growth). Yet, this matters significantly if considering that threats to security are by no means the sole reason to increase military spending. In fact, apart from security issues, military spending is determined because of internal political economy considerations.

Another point deserves attention. In several estimations we found that the debt burden of a country is negatively associated military burden of other European countries. Interestingly, this indirectly confirms that a common defense policy is desirable for EU countries. In fact, the fiscal imbalance of countries is mitigated when the average military burden of other countries is higher. This is the actual evidence on the benefits of financing a regional public good. In other words, further integration of European security policy appears to be desirable.

In the end, as noted above in the introduction, the ultimate concern of this paper is that periods of massive military spending can have a substantial impact on economies and eventually on stability of polities. This is nothing but a modest point of departure. Needless to say, further research is needed in order to unpack

the relationships and the dynamics between military spending and the economic performances of states within the international community.

REFERENCES

Ahmed A.D., (2012), Debt Burden, Military Spending and Growth in Sub-Saharan Africa: A Dynamic Panel Data Analysis, *Defence and Peace Economics*, 23(5): 485-506.

Alami R., (2002), Military Debt: Perspectives from the Experience of Arab Countries, *Defence and Peace Economics*, 13(1): 13-30.

Alesina, A. and Drazen, A. (1991) Why are stabilizations delayed? *American Economic Review*, 81(5): 1170–1188.

Alesina, A. and Perotti, R. (1995) The political economy of budget deficits. *IMF Staff Papers*, 42(1): 1–31.

Alexander W.R.J., (2013), The Defence-Debt Nexus: Evidence from the High-Income Members of Nato, *Defence and Peace Economics*, 24(3): 133-145.

Amara J., (2008), Nato defense expenditures: Common goals or diverging Interests? A Structural Analysis, *Defence and Peace Economics*, 19(6): 449-469.

Anderson T.W., Hsiao, C., (1981), Estimation of Dynamic Model with Error Components, *Journal of the American Statistical Association*, 76: 598-606.

Arellano M., Bond S., (1991), Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations, *Review of Economic Studies*, 58: 277-294.

Armingeon K., Knöpfel L., Weisstanner D., Engler S., (2014). *Comparative Political Data Set I 1960-2012.* Bern: Institute of Political Science, University of Berne.

Baltagi B.H., Kao C., (2000), Nonstationary Panels, Cointegration in Panels and Dynamic Panels: A Survey, Center for Policy Research, Syracuse University, paper 136.

Blackburne E.F., Frank M.W., (2007), Estimation of Nonstationary Heterogeneous Panels, *The Stata Journal*, 7(2): 197-208.

Breytung J. (2000), The Local Power of Some Unit Root Test for Panel Data, Advances in Econometrics, 15(2): 161-177.

Breytung J., Meyer W., (1994) Testing for Unit Roots in Panel Data: Are Wages on Differencet Bargaining Levels Cointegrated?, *Applied Economics*, 26: 353-361.

Brzoska M., (1983), The Military Related External Debt of Third World Countries, *Journal of Peace Research*, 20(3): 271-277.

Caruso R., Addesa F., (2012), Country survey: Military expenditures and its impact on productivity in Italy 1988-2008, *Defence and Peace Economics*, 23(5), 471-484.

Chinn M.D., Hiro Ito (2006)**,** What Matters for Financial Development? Capital Controls, Institutions and Interactions, *Journal of Development Economics*, 81(1): 163-192.

Drelichman M., Voth H.J. (2011) Lending to the Borrower from Hell: Debt and Default in the Age of Philip II, *The Economic Journal* 121 (557): 1205-1227.

Drelichman M., Voth H.J. (2011), Serial Defaults, Serial Profits: Returns to Sovereign Lending in Habsburg Spain, 1566-1600, *Explorations in Economic History* 48 (1): 1-19.

Drelichman M., Voth H.J. (2011), The Sustainable Debts of Philip II: A Reconstrcution of Spain's Fiscal Position, 1560-1598, *The Journal of Economic History* 70 (4): 813-842.

Duncan Jones R., (1994), *Money and Government***,** Cambridge.

Dunne J.P., Tian N., (2013), Military Expenditure and Economic Growth: A Survey. *The Economics of Peace and Security Journal*, **8**, 1.

Dunne P., (1996), Economic effect of Military Spending in LDC: A Survey, in Gleditsch N.P., Cappelen A., Bjerkolt O., Smith R., Dunne P. (eds.), The Peace Dividend, Chapter 23, North Holland.

Dunne J.P, Perlo-Freeman S., Soydan A., (2004a), Military Expenditure and Debt in South America, *Defence and Peace Economics*, 15(2): 173-187.

Dunne J.P, Perlo-Freeman S., Soydan A., (2004b), Military Expenditure and Debt in Small Industrialized Countries: A Panel Analysis, *Defence and Peace Economics*, 15(2): 125-132.

Engel R.F., Grenger C.W.J. (1987), Cointegration and Error Correction: Representation, Estimation and Testing, *Econometrica*, 55: 251-276.

Gottlieb L.R., (1924), Post-war Local Burdens, *Journal of Political Economy*, 32(2): 226-235.

Gottlieb L.R., (1919), Indebtedness of the Principal Belligerents, *Quarterly Journal of Economics*, 33(3): 504-530

Hopkins K., (1980), Taxes and Trade in the Roman Empire (220BC-AD400), *The Journal of Roman Studies*, pp. 101-125.

Im K., Pesaran M.H, Shin Y., (2003), Testing for Unit Roots in Heterogeneous Panels, Econometrics, vol.115, pp.29-52.

International Monetary Fund, 2013, World Economic Outlook

Johansen S., (1991), Estimation and Hypothesis Testing of Cointegrating Vectors in Gaussian Vector Autoregressive Models, Econometrica, vol.59, pp. 1551-1580.

Kao C., (1999), Spurious Regression and Residual-Based Test for Cointegration in Panel Data, *Journal of Econometrics*, 90(1): 1-44.

Karagol E., (2005) Defence Expenditures and External Debt in Turkey, *Defence and Peace Economics*, 16(2): 117-125.

Kindleberger C.P., (1991), The Economic Crisis of 1619 to 1623, *The Journal of Economic History*, 51(1): 149-175.

Lane P.R., (2012), The European Sovereign Debt Crisis, *Journal of Economic Perspectives*, 26(3): 49-68.

Leland S.E., (1944), Management of the Public debt after the war, *The American Economic Review*, 34(2): 89-132

Levin A., Lin C., (1993), Unit Roots Test in Panel Data: New Results, UCSD Discussion Paper, n.23.

Looney R. (1989), The Influence of Arms Imports on Third World Debts, *The Journal of Developing Areas*, 23(2): 221-232.

Looney R., **Frederiksen P.C.,** (1986), Defence Expenditures, External Debt and Growth in Developing Countries, *Journal of Peace Research*, 23(4): 329-337.

Maddala G.S., Kim I.M., (1998), Unit Roots, Cointegration, and Structural Change, Cambridge University Press, Cambridge.

Maddala G.S., Wu S., (1999), A Comparative Study of Unit Roots Tests with Panel Data ans a New Simple Test, *Oxford Bulletin of Economics and Statistics*, 61: 631-652.

Murdoch J.C., Sandler T., (1984), Complementarity, Free Riding, and the Military Expenditures of NATO Allies, Journal of Public Economics, 25(1): 83-101.

Murdoch J.C., Sandler T., (1982), A Theoretical and Empirical Analysis of NATO, *The Journal of Conflict Resolution*, vol. 26, n.2, pp. 237-263.

Paleologlou S.M., (2013), A Dynamic Panel Data Model for Analyzing the Relationship Between Military Expenditure and Government Debt in the EU, *Defence and Peace Economics*, vol.25, n.5, pp.419-428.

Pedroni P., (2004), Panel Cointegration: Asymptotic and Finite Sample Properties of Pooled Time Series Tests with an Application to PPP Hypothesis, Econometric Theory, 20(3): 597-625.

Perotti R., (2014), Defense Government Spending is Contractionary, Civilian Government Spending is Expansionary, NBER Working Paper Series, n.20179, pp. 1-46.

Pesaran M.H., Smith R., (1995), Estimating the Long Run Relationships from Dynamic Heterogeneous Panels, *Journal of Econometrics*, 68: 79-113.

Phillips P.C.B, Moon H.R., (1999), Linear Regression Limit Theory for Nonstationary Panel Data, *Econometrica*, 67, 1057-1111.

Pigou A.C., (1919), The Burden of War and Future Generations, *The Quarterly Journal of Economics*, 33(2): 242-255

Robertson D., Symons J., (1992), Some Strange Properties of Panel Data Estimators, *Journal of Applied Econometrics*, 7(2): 175-189.

Sandler T., Murdoch J.C., (1990), Nash-Cournot or Lindahl Behavior?: An empirical Test for the Nato Allies, *The Quarterly Journal of Economics*, vol. 105, n.4, pp. 875-894.

Smith R.E., (1972), The Army Reform of Septimius Severus, *Historia: Zeitschrift für Alte Geschichte*, vol. 21, n.3, pp.481-500.

Smith R., Nayaran 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.

Smith R.P., 2001**.** Estimation and inference with non-stationary panel time-series data**,** paper prepared for the RC33 Conference, Cologne October, 2000

Smith, R.P. (1980) The demand for military expenditure. *Economic Journal*, 90(360) 811–820.

Speidel M.A., (1992), Roman Army Pay Scales, *The Journal of Roman Studies*, vol. 82, n.1, pp. 87-106

Trevor-Roper H.R., (1959), The General Crisis of the 17th century, *Past & Present*, n.16, pp.31-64.

Verbeek M., (2004), A Guide to Modern Econometrics, Wiley & Sons.

Wooldridge J., (2003), Introductory Econometrics – A Modern Approach (2nd Edition), Thomson South Western.