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Military Expenditures and Profit Rate: Evidence from OECD Countries

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Abstract

Adapting Foley (1982)'s Marxian model of the circuit of capital to specify the role of military expenditures on the rate of profits the paper provides evidence for 24 OECD countries for the period of 1963-2008 by employing a panel autoregressive distributed lag model for the first time. Findings show that while for the whole period there is a positive linkage between military expenditures and profit rates, in the post-1980 era, the impact of military expenditures is negative. Findings suggest no strong evidence to underscore the assertion that for arms-exporting countries there is positive linkage between military expenditures and profit rates, and negative for non-arms-exporter countries.

Key Words: Military expenditures, profit rate, underconsumptionist theory, panel ARDL

JEL Codes: C33, E11, H50

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Introduction

In this paper, we discuss the impact of military expenditures on profit rates, using Foley's (1982) Marxian model of the circuit of capital to specify the role of military expenditures on the rate of profits. We incorporate data from 24 OECD countries for the period of 1963-2008 by employing a panel autoregressive distributed lag (ARDL) model.

Marxist scholars have long discussed the tendency for the profit rate to decline in a capitalist system, as the amount of surplus value that can be obtained from workers falls over time. There exists a sound empirical literature on Marx's law of the tendency of the profit rate to fall (Dumenil and Levy 2011, and see Basu and Vasudevan 2013 for a concise summary). In this context, some Marxist scholars often view military spending as a means to counteract the threat of crisis of underconsumption, in which demand, and therefore economic growth, decline.

As a result of the end of the Cold War, world military expenditures and arms exports have fallen dramatically from their peak in the mid-1980s. This pattern has not remained uniform due to a variety of current geopolitical threats. Although there was a general pattern of a decline in military spending as a percentage of GDP between 1963 and 2008 in all countries in our sample --except for Chile, Japan and Spain, the magnitude and pattern of the decline varied considerably. While there was a dramatic decline in Canada, as well as in Scandinavian and Benelux countries, there was a relatively small decrease in Greece, Turkey, Israel and Italy. Therefore, it is crucial to investigate the existence and direction of the linkage between profit rates, a key indicator of the health of a capitalist economy, and military expenditures.

To the best of our knowledge, there are only three time series studies that have investigated this relationship. These have been performed for the U.S., the U.K., and West Germany (Georgiou 1992), for Greece (Kollias and Maniatis 2003), and for the U.S. (Dunne et al 2013). The main shortcoming of these studies is due to their coverage as they mainly focus on single countries. Although they provide some detailed analyses on the issue for single country or limited multi country cases, it is not possible to derive a general result.

Following these early studies, the article also aims at examining the effect of military spending on the rate of profit within a Marxist framework. This study is not an attempt to assess the conflicting views on the overall economic growth effect of military spending within the

Marxist literature, neither theoretically nor empirically. Rather, considering the conflicting explanations in the literature, the article aims at providing some evidence regarding the effect of military expenditures on the profit rate alone.

This paper differs substantially from the aforementioned studies. First, from a theoretical viewpoint, this paper specifies the role of military expenditures on the rate of profits through incorporating Foley's (1982) Marxian model of the circuit of capital. Second, rather than focusing on a single country case, this paper covers 24 OECD countries for a relatively long time period (1963-2008) by employing a panel autoregressive distributed lag (ARDL) model for the first time. This process yields some important findings as the results change with respect to time period, and also with respect to a country's arms exporting status to some extent.

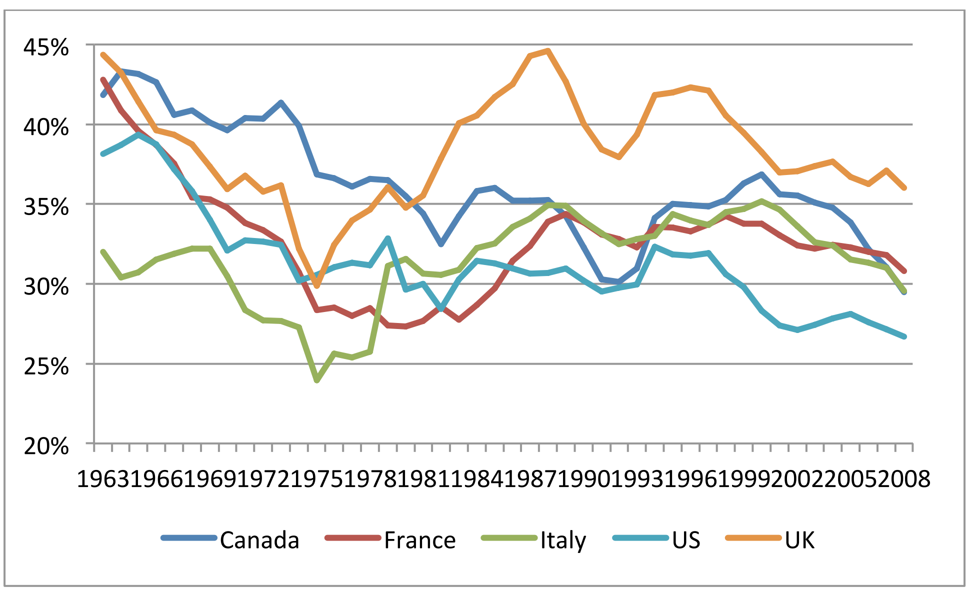
The next section provides a brief review of the debate about the effect of military expenditures on the profitability within the Marxist literature. Sections 3 and 4 introduce the theoretical model, as well as the data and empirical strategy, respectively. Section 5 presents the results and discussion. Finally, the last section is reserved to summarize the findings.

2. The Effect of Military Expenditures on Profitability in Marxist Theory

As the expansion of the capitalist economy is based on the general rate of profit, the rates of profit are at the focal point of the capitalist system. One of Marx's major claims in Volume III of *Capital* was that there is a tendency for the general rate of profit to fall. There has been an immense literature on the so called 'law of the tendential fall of the profit rates,' providing an inconclusive debate on the issue (Basu and Vasudevan 2013). While some scholars have argued in favor of the validity of the tendency of the profit rate to fall (Shaikh 1978, 1987, 1992, Kliman 2007, and Rosdolsky 1977) some others rejected the existence of such tendency (Roemer 1981 and Bowles 1985). Others argue that that there is no secular trend in the profit rate upwards or downwards resulting from capitalist development (Foley 1986, Michl 1988, Moseley 1991, Duménil and Lévy 1993, 2003, and Foley and Michl 1999, cited in Basu and Manolakos 2013). Several forces act upon the profit rate. Competition within the capitalist system forces firms to reduce their cost of production by increasing the degree of mechanization in production, leading to enhanced productivity of labor. Replacement of labor by machines leads to a rise in the organic composition of capital and, given no rise in the surplus value, this can lead to a potential decline in the rate of profit. However, there are some counter-tendencies, noted by Marx, that mitigate the tendency for the rate of profit to fall (Foley 1986). These include an increase in the rate of surplus value, a reduction in the prices of constant capital components, movement of the wage rate away from the value of labor power, increase in a surplus population, and reduction in prices of imported goods (i.e. the cheapening of constant capital).

Profit rates rose in the post-WWII era up until the mid-1960s, during what was referred to as the Golden Age, followed by a decline through 1982, when the profits rose again during the Neoliberal period, reaching a peak in 1997. From 1997 to 2001 there was a fall in profit rates, followed by a recovery in the credit boom up to 2005-6, for the US, and for other major economies to some extent (Dumenil and Levy 2011, Roberts 2012, Li et al 2007, Basu and Vasudevan 2013, Bakir 2014). A similar trend can be observed in our data (Figure 1, also see Table 1 in the appendix for descriptive statistics).

Figure 1: Profit Rates for Selected Major Countries



There are alternative explanations for the fall in profit rates (see Basu and Vasudevan 2013). Bellamy-Foster and Magdoff (2009) argue that monopoly capitalism reduces competition and innovation and increases wealth and income inequality, limiting consumption demand, and therefore increasing the disjuncture between economic surplus and profitable investment. What stimulates the demand and increases absorption of the economic surplus is the ballooning of the credit–debt system in the stage of so-called 'monopoly-finance capital.' In contrast to this explanation, Brenner (2010) argues that globalization and the intensification of competition have resulted in overinvestment, leading to decline in the rate of return of capital since the 1970s. Kotz (2009), on the other hand, states that overinvestment is caused by higher demand that reaches above its normal level as a result of asset price bubbles. Shaikh (1987, 1999) finds that profit rates fall as a result of a rise in capital intensive production that results in an increasing composition of capital. For Moseley (1991), on the other hand, the main reason behind the fall of profits was the growth in the ratio of unproductive to productive labor.

Basu and Vasudevan (2013) find that capital productivity increased during the 1946-1968 period, declined in 1968-1982, slowly increased in 1982-2000, and declined sharply after 2000. They state that the first period of a declining profit rate, from 1966 to 1982, resulted from 'Marx-biased technological change', resulting in increasing labor productivity and falling capital productivity (Foley and Michl 1999). During the second period, from 1982 to 2000, both labor and capital productivity increased, which is not in line with the 'Marx-biased technological change' theory. The period following 2000 again reverted back to the Marx-biased technological change pattern.

The profit rate may also be increased by a rise in real capital productivity and a decrease in the price of capital (what Marx called the 'cheapening of the elements of capital'). The former can be illustrated by the output-capital ratio. The interpretation of the capital-output ratio is a subject of disagreement, however. According to Rawthorn (2014), the rising capital-output ratio is caused by disproportionate increases in the market value of assets such as housing, and not by a large real rise in the capital-output ratio in contrast to what Piketty claims in *Capital*. This phenomenon is rather merely a valuation effect as Galbraith (2014) has underscored. Galbraith (2014) finds that Piketty's measure of the capital to output ratio is driven by the return on capital, citing the Leontief paradox that richer countries often use less physical capital rather than more (visible in higher quantities of labor in exports).

In this context, military expenditures may have an impact on the profit rate both in terms of capital productivity and the organic composition of capital. The conflicting role of military expenditures on the economy in the Marxian literature has been noted (see *inter alia* Kollias and Mantias 2003, Coulomb 2004, Yilmaz 2010, and Dunne et al 2013). While Marxist scholars have not provided a general Marxist theory of militarism, they have provided specific linkages between military expenditures and the profit rate. There are three mechanisms through which these are interrelated. First, military spending may include surplus that can be realized as profit, or it may remove capital from the non-military sector, reducing the increase in the organic composition of capital in that area while cheapening constant capital in the military sector. Military spending may also ideologically alter the class structure, allowing capitalists to exploit workers even more and increase their profit rates (Smith, 1977; 1983).

Friedrich Engels in *Anti-Duhring* (1877) stated that "[m]ilitarism dominates and is swallowing Europe. But this militarism also bears within itself the seed of its own destruction. Competition among the individual states forces them, on the one hand, to spend more money each year on the army and navy, artillery, etc., thus more and more hastening their financial collapse..." Later, Rosa Luxemburg discussed the role of military expenditures in the capitalist economy further (Luxemburg 1913). In her work, she asserts that depending on the method of financing, military spending may generally have a positive effect on the economy. While taxing workers or capitalists would have differing effects on the rate of profit, deficit financing would stimulate (aggregate) demand as long as the economy is below the full employment point. Luxemburg argued that in addition to ideological benefits, military spending enables economies to expand toward external markets. She argued that an expansion in the military would result in higher levels of surplus than in other sectors. On the other hand, in the long run, she contended that over time, fixed capital increases more than variable capital does, leading to the fall of the rate of profit in a capitalist economy.

Luxemburg's theory was interpreted in two different ways. While some view it as an 'underconsumptionist theory,' in which military expenditures allocate surplus without increasing productive capacity, others interpret it as stating that military expenditures boost capital accumulation by encouraging technological development and overcoming the internal contradictions of capitalist expansion (Rowthorn 1980, cited in Coulomb 2004).

The controversy on the economic effect of military spending within the Marxist literature continued through the post-1945 period. Some Marxists have argued for the positive impact of military expenditures on the capitalist system. From this has arisen the theory of 'the permanent arms economy,' in which militarism stabilizes the capitalist system. Accordingly, first, imperialist policies in neo-colonies expanding the boundaries of the market slow down the fall in the profit rate. Second, military research and development benefits the civil sector. Finally, military expenditure stimulates aggregate demand, which helps to prevent the realization of a surplus resulting from under-consumption.

A major theory of under-consumption is suggested by Baran and Sweezy (1966) in line with Mandel's (1967) argument[2] that the military sector allows capitalists to obtain higher rates of profit and lower levels of competition. Baran and Sweezy stated that military spending can absorb the economic surplus created by capitalism in the monopolistic stage. They argued that military expenditures are an integral part of the monopolistic nature of the post-war capitalist system, as they encourage aggregate demand and absorb surplus without raising wages or capital, thereby preventing realization crises.

Baran and Sweezy contend that excessive military expenditures in the 1940s and 1950s contributed to the preservation of monopolistic capitalism. Military expenditures helped to keep unemployment at lower levels while also preventing stagnation. Research and development in the defense sector encourages the development of new products and technologies in non-defense sectors and stimulates the competitiveness and profit margins of those firms. However, on the other hand, it is noted that as military expenditures require higher expenditures in research and development, engineering, control and maintenance, through time they require fewer employees with more skills, creating fewer jobs than they used to. Also, considering the argument by Dunne and Sköns (2011) that "as a result of a long-term rapid development in many civilian technologies, the relative positions of military and civilian technology have been reversed in several areas of sophisticated technology" (p. 4) it can be argued that there is no spin-off effect from the military to the civilian sector.

[2] Original French edition is dated 1962.

What is more, Baran and Sweezy note that as arms production becomes more capital intensive, military expenditures' capacity to prevent the fall in the profit rate declines. This is because maintaining high levels of military spending requires large amounts of taxation, which can harm economic activity. At the same time, a tax cut resulting from lower military spending can lead to a crisis of overproduction.

Expenditures on armaments are economically unproductive, as armaments are neither production nor consumption goods. Hence military spending can help prevent the decline in the rate of profit by eliminating unproductive capital, reducing excessive production. That is, military expenditures are used to address the issue of excess capital (Mandel[3], 1978). Also, the prices and profit margins are set up through a direct negotiation between the state and the industry, making it possible for firms in the defense sector to obtain a rate of profit much higher than that corresponding to similar activities of a firm situated in competitive markets. It is also noted that military expenditures are neither dependent on peoples' purchasing power nor on economic fluctuations (Mandel 1978).

Gottheil (1986) argued that military production is more capital intensive (due to rising organic composition of capital), in contrast to the monopoly capital/underconsumptionist approach taken by Baran and Sweezy (1966), Kalecki (1972), O'Connor (1973), and Weisskopf (1976). Cypher, in response to Gottheil (1986), emphasized that military sector R&D improves the technology of major constant capital such as computers, lowering the production cost in major non-military sectors. Also, R&D expenditures improve the productivity of labor. Therefore, military expenditures prevent the increase in the organic composition of capital and the fall in the rate of profit (Cypher, 1987a, 1987b). Further, Miller (1987) stated that military expenditures lead to capital accumulation because they are financed by wage taxation. However, since the military expenditures by their nature are neither "reproductive'' nor "productive" expenditures, they are detrimental to the long-run productivity and profitability potential of the economy, as Melman argues, in that diverting intellectual, financial, and material resources away from civilian industries, military expenditures are detrimental to industrial productivity (Melman 1965).

[3] Original French edition is dated 1972

To the best of our knowledge, there are only three empirical studies addressing this issue. The first study, by Georgiou (1992) on the UK, US and the former West Germany during the 1958-1987 period, employs an OLS methodology to investigate the effect of military expenditures on profit rates with respect to Luxemburg's and Mandel's views. Overall, Georgiou found a significant positive effect of military expenditures on profitability for the US, and insignificant effects for the other two countries.

In the second work, Kollias and Maniatis (2003) show that while military expenditures have a positive short-run effect on the profit rate, they have an inverse relationship in the long-run in the case of Greece for the period of 1962-1994. The authors employ the autoregressive distributed lag approach to cointegration (ARDL) to reach this conclusion. Finally, a recent study by Dunne et al (2013) examines the case of the US for the period of 1959 to 2010. Using OLS and ARDL methods, the authors provide some evidence on the positive long-run relationship between the military burden and the profit rate.

In short, overall, the Marxist literature on the effect of military expenditures on the economy presents different linkages based on different crisis theories with different underlying assumptions. Regarding the very limited empirical literature on the issue and conflicting results, our article contributes to the literature by employing panel data within the autoregressive distributed lag (ARDL) model to provide evidence for 24 OECD countries over the 1963-2008 period.

In the following section, our goal is to present the linkage between military expenditures and profit rates in an economy within a formal theoretical framework by means of Foley's (1982) model of the circuit of capital.

3. A Theoretical Approach: The Marxian Model of the Circuit of Capital

We adopt a Marxian model of the circuit of capital outlined by Foley (1982) to specify the impact of military expenditures on the rates of profit. This precise model is an appropriate one to specify the role of military expenditures on the rate of profits for two reasons. First, the model yields the dynamics of Keynes's general argument that economic activity relies on effective aggregate demand. This aspect of the model allows one to extend this discussion into the view of 'military Keynesianism.' Second, the model explicitly represents the parameters for which an increase in the share of military expenditures would have a direct effect. Changes in military spending impact the parameters and therefore the whole model. Below is a contour of the model introduced by Foley (1982), and it mainly relies on Foley (2013). Here, we do not attempt to modify the entire model to better understand the role of military expenditures on the rate of profit, but rather make a modest augmentation that may serve as a basis for further studies.

The circuit of capital model in Marx's analysis in Volume II of *Das Kapital* represents the money value stock-flow relations for capital (Marx 1992-orig. 1885). Marx represents the three stages of capital with the formula of M-C…P…C`-M`, in which M, C and P refer to money, commodity and production process, respectively, where money purchases the means of production and labor power used to create a new commodity that will be sold at a markup (Marx 1992).

$$P(t) = \int_{-\infty}^{\infty} a(\tau)Z(t-\tau)\,d\tau \tag{1}$$

$$U'(t) = Z(t) - P(t) \tag{2}$$

$$R(t) = \int_{-\infty}^{\infty} b(\tau)P(t-\tau)\,d\tau \tag{3}$$

$$X'(t) = P(t) - R(t) \tag{4}$$

$$Z(t) = (1+pq)\int_{-\infty}^{\infty} c(\tau)R(t-\tau)\,d\tau \tag{5}$$

$$F'(t) = (1+pq)R(t) - Z(t) \tag{6}$$

where *Z(t)* is the flow of money value of capital outlays on constant and variable capital a(τ) is a distributed lag function showing the rate of capital expenditures, *P(t)* is the value of finished goods at cost, *U(t)* is the value of capital currently used in production, R(t) is the value of sales at cost, b(τ) is a distributed lag function representing the rate of goods sales, *X(t)* is the value of the stock of final products to be sold, *q* = *ek* is the markup of sales price with *e* as the rate of surplus value, k is the ratio of variable capital to total capital outlays, p is the fraction of surplus value given back to the system, c(τ) is a distributed lag function representing the rate at which revenue and surplus value are returned to production, and *F(t)* is the stock of financial capital. With traditional notation $Z=c+v$, $e=s/v$, $k=v/(c+v)$, and the rate of value $q=s/(c+v)$. These equations model the Marxian M-C…P…C`-M`.

Foley then builds upon this basic circuit of capital model by appointing specific time delays in production, sales and stock (T_P, T_R, and T_F, respectively, as the lags) to the integral equations (1), (3), and (5). This allows the equations to be transformed as follows:

$$P(t) = Z(t - T_P) \quad (7)$$

$$U'(t) = Z(t) - P(t) \quad (8)$$

$$R(t) = P(t - T_R) \quad (9)$$

$$X'(t) = P(t) - R(t) \quad (10)$$

$$Z(t) = (1 + pq)R(t - T_F) \quad (11)$$

$$F'(t) = (1 + pq)R(t) - Z(t) \quad (12)$$

These time lags result in additional fluctuations on the value of finished goods at cost, the value of sales at cost, and the flow of money value of capital outlays on constant and variable capital.

If the circuit of capital is at its steady state growth g, stocks and flows grow at a common rate. By combining the above equations (7) through (12), we obtain:

$$Z(t) = Z(0)e^{gt} = (1 + pq)Z[t - (T_P + T_R + T_F)] = (1 + pq)Ze^{-g(T_P + T_R + T_F)} \quad (13)$$

Equation (13) represents one closure of the system, with exogenous parameters p, $q = e\,k$, T_P, T_R, T_F, and the growth rate, profit rate, and level of net new borrowing, g, r, B. The stock-flow ratios, including the value of the stock of the finished product awaiting sales to the value of finished product emerging from production at cost, inventories of finished commodities awaiting sale to the flow of the value of capital outlays on constant and variable capital, and the value of the stock of financial capital to the value of sales at cost, are determined when the system is in the steady-state.

The circuit equations (1)-(6) or (7)-(12) rely on the assumption that aggregate demand will consume the finished products after delay T_R. This is important to understand in terms of the realization crisis and the differing role of military expenditures. Aggregate demand consists of spending by different sectors. The first sector is comprised of capitalist firms, which spend Z^F, with (1-k) Z^F representing purchases of inputs produced by other firms. This is constant capital, *c*. Wages for production workers are kZ^F, referring to variable capital, *v*. The second sector, made up of capitalist households, spends Z^C. The third sector, including worker households, spends Z^W. Finally, we can divide a consolidated government/finance/foreign sector (which spends Z^G) into two sectors, non-military and military, as distinct from the original model. These can be referred as Z^N and Z^M, respectively.

Therefore we define

$$Z^G = Z^M + Z^N \qquad (14)$$

where $Z^M = \varphi Z^G$ and $Z^N = (1-\varphi)Z^G$ $\quad 0< \varphi <1$

All of these flows add up to the total sales at market price:

$$(1+q)R = (1-k)Z^F + Z^C + Z^W + Z^M + Z^N$$

Then, rewriting the equation in terms of capital K, the equation takes the form of

$$(1+q)r = (1-k)z^F + z^C + z^W + z^M + z^N \qquad (15)$$

The capitalist sector contains productive capital, 1, and net financial position, f^F. The total assets change alongside total sales *(1+q)r*, capital outlays, $-z^F$, payments to equity holders of η, net interest, $(1-g)f^F$ and taxes ŧ.

Productive capital at cost changes according to $K' == Z^F - R$, or,

$$1' + g = g = z^F - r \qquad (16)$$

The total net assets for firms vary along with cash flow:

$$(1+f^F)' + g(1+f^F) = 0 + f^{F'} + g(1+f^F) = (1+q)r - z^F + if^F - \eta$$

Firms adjust their net financial position to a specific ratio of capital expenditures:

$$f^{F'} = \beta^F(\lambda^F z^F - f^F) \quad (17)$$

An average firm's capital expenditures include sales revenue at production cost, *r* plus a target growth rate γ, a stock adjustment, $\alpha^F(\gamma - g)$ for the sales value that helps maintain a target growth rate, and a term $\mu^F(\lambda^F z^F - f^F)$, which helps to maintain a target financial position:

$$z^F = r + \gamma + \alpha^F(\gamma - g) - \mu^F(\lambda^F z^F - f^F) \quad (18)$$

Capitalist firms thereby spend all of their sales revenue at cost plus a target growth γ, an accelerator effect of sales of $\alpha^F$and a financial accelerator of μ^F. The dividend makes up the difference:

$$\eta = (1+q)r - z^F + (i-g)f^F - \beta^F(\lambda^F z^F - f^F) \quad (19)$$

This, using (18), implies

$$\eta = qr - \gamma + (i-g)f^F - \alpha^F(\gamma - g) - (\beta^F - \mu^F)(\lambda^F z^F - f^F).$$

A key sector of our interest is the 'Financial/Government/Foreign Sector'. This consolidated sector generates demand via the government deficit or surplus, or net exports. Debt in this sector finances next expenditures as per:

$f^{N\prime} = z^N + (i-g)f^N$ and
$f^{M\prime} = z^M + (i-g)f^M$

The system is closed by assuming a target financial position ratio, endogenizing government spending:

$f^{N\prime} = \beta^N(\lambda^N - f^N)$,

$f^{M\prime} = \beta^M(\lambda^M - f^M)$, and

$z^M + Z^N = \beta^M(\lambda^M - f^M) + \beta^N(\lambda^N - f^N) - (i-g)(f^M + f^N)$.

The financial sector steady state is then:

$f^{M^*} = \lambda^M$ and $z^{M^*} = -(i-g)\, f^M$ and

$f^{N^*} = \lambda^N$ and $z^{N^*} = -(i-g)\, f^N$.

To simplify, it is assumed that there is no worker household saving or capitalist spending.

From (18), at the steady-state

$z^{F*} = r^* + \gamma,$

$g^* = z^{F^*} - r^* = \gamma$, and

$qr^* = kz^{F^*} = (q+k)r^* + k\gamma.$

From (15), given $z^C = 0$ and $z^W = kz^F$ we have

$$(1+q)r^* = z^{F^*} + z^{M^*} + z^{N^*} = r^* + \gamma - (i-g)\,(\lambda^M + \lambda^N),$$

$qr^* = \gamma - (i-g)\,(\lambda^M + \lambda^N), and$

$$r^* = \frac{\gamma - (i-g)\,(\lambda^M + \lambda^N)}{q}$$

Structural deficit spending ($(i-g)(\lambda^M + \lambda^N) < 0$) raises the profit rate by increasing the turnover of capital.

Steady-state spending is:

$z^{M^*} = -(i-g)\lambda^M$,

$z^{N^*} = -(i-g)\,\lambda^N$, and

$$z^{F*} = r^* + \gamma = \frac{\gamma-(i-g)\,(\lambda^M+\lambda^N)}{q} + \gamma = \frac{\gamma(1+q)-(i-g)\,(\lambda^M+\lambda^N)}{q}$$

Equation (17) leads to a steady-state in which $f^{F\prime} = 0$:

$$f^{F*} = \lambda^F z^{F*} = \lambda^F \frac{\gamma(1+q)-(i-g)\,(\lambda^M+\lambda^N)}{q}\,.$$

The dividend from (19) at the steady-state is:

$$\eta^* = qr^* - \gamma + (i - g^*)f^{F*} = z^{M^*} + z^{N^*}(i - g^*)f^{F*} = (i - g)\lambda^F \frac{\gamma(1+q) - (i-g)(\lambda^M + \lambda^N)}{q}.$$

Then,

$$g^* = z^{F*} - r^* = qr^* - \left(z^{M^*} + z^{N^*}\right) = \gamma - (i - g)\lambda^M + (i - g)\lambda^N + (i - g)\lambda^M - (i - g)\lambda^N = \gamma.$$

From (14), it is concluded that

$qr^* = g^* + z^{M^*} + z^{N^*}$ or $qr^* = g^* + \varphi z^{G^*} + (1 - \varphi)z^{G^*}$.

That is, profit rate is equal to the rate of capital accumulation, along with military and non-military expenditures, with the share of φ and $(1 - \varphi)$ in total government sector expenditures, respectively. So, it is important to specify the mechanisms that distinguish the impact of military expenditure on profit rates from any other category of expenditure, because a higher φ, or higher share of military expenditures with higher mark-up pricing, leads to higher profit rates.

One crucial mechanism through which an increasing share of military expenditures in total public expenditures in particular or in 'aggregate demand' in general would affect the rate of profit is that although there still might be a production lag, T_P, it is plausible to argue that the delays in stocks and sales, T_F and T_R, are negligible, if there are any at all. This is because armaments production, in most cases, does not rely on market forces, but rather on the production of armaments by private firms according to contracts with the government, guaranteeing the sales in advance of production. That is, we argue that the exogenous T_F and T_R will be much lower than those for usual products in a competitive marketplace, which in turn increases the present value at the every discount rate (Foley 1982: 307).

Second, the major effect of military expenditures on the profit rates occurs via $q=s/(c+v)$. It is a fact that military spending arises not as a result of competition but as a result of contracts that are independent from the purchasing power of individuals or from the economic situation in general. So, it is plausible to argue that the mark-up is higher in military sector products. It might also be argued that military expenditures transfer technology to the civilian sector, thereby raising the organic composition of capital via the so-called spin-off effect (Kidron, 1967), lowering profit rates[4]. Mandel also points out that a high organic composition of capital in military expenditures accelerates the decline in the rate of profits (Mandel 1978).

In our discussion so far, we have found that military expenditures influence profit rates primarily in terms of their short-term demand effects. However, from a long-run perspective, the dynamics of military expenditures are explained by the Military-Industrial Complex (MIC) theory. It is essential to understand the role of the U.S. in the current world, as the great bulk of military expenditures on behalf of the capitalist system are undertaken by the U.S. Therefore, below we attempt to provide a brief discussion of Military Keynesianism, the MIC and the role of the US in the framework of the international division of military labor.

Military Keynesianism is the policy of using military expenditures as countercyclical economic tools. Military Keynesianism in fact suffers from a lack of theoretical sophistication. That is, there is no clear theory of military Keynesianism. The MIC, on the other hand, has a sound institutional perspective to explain military power and conflict (Dunne 2011). The MIC is defined as unified groups of vested interests within the state that bring about decisions favorable to those in power and not necessarily favorable to the requirements of national security. This is an important explanation of high military expenditures during the Cold War.

The MIC theory argues for the detrimental effects of military expenditures on the economy. This is because defense spending arguably does not result in economic growth, and even channels resources away from civilian industries that are more productive (Melman 1965). Within the MIC, the Defense Department de facto acts as a 'planning ministry' (Melman, 1970), transforming the economy into a military-based type of 'state capitalism' (Melman 1974). However, Melman also points to the 'positive' role of military expenditures by stating that military expenditures may have Keynesian economic effects.

Many aspects of the MIC theory have remained even after the end of the Cold War. Major contractors continue to dominate the market and heavily influence government policy.

[4] However, it has been noted that technological developments in the armament industry have not been applicable to the civilian sector since the 1980s, weakening the validity of the 'spin-off' effect (Dunne and Coulomb 2008).

Contractors are, in turn, dependent on domestic government support despite the internationalization of the military industry. New firms have been unable to displace incumbents in core areas of arms production (Dunne and Sköns 2011). The MIC theory therefore continues to be relevant today in explaining the impact of vested interests.

As the Soviet Union collapsed, the US military remained powerful, continuing to spend a relatively large percentage of the government budget on military interests. Sophisticated new weapons continued to be developed (Dunne and Sköns 2011). In this era, priority of the US security concern shifted from Communism toward global terrorism, sustaining the so-called international division of military labor, in which the US takes the hard power tasks of destruction by investing heavily in super-high tech armaments, leaving the soft power work of stabilization and peacekeeping to its allies.

4. Data and Method

4.1 Data

In the empirical model, the dependent variable, *profit,* is the gross profit rate (the ratio of surplus value to invested capital) taken from the Extended Penn World Tables[5] v. 4.0 (EPWT). It is calculated as

profit=100*(1-*wage share*)**productivity of capital*,

where *wage share* is the share of the employee compensation in the Gross Domestic Product, calculated in current prices of the local currency; *productivity of capital* is the output-capital ratio calculated using real Gross Domestic Product in 2005 purchasing power parity (Chain Index) divided by the estimated capital stock[6].

Military spending data is not entirely unbiased as it depends on different definitions and is subject to strategic manipulation by governments. There are two major sources of data sets for

[5] The data is constructed by Duncan Foley and Adalmir Marquetti, based on the Penn World Tables and other sources, available at https://sites.google.com/a/newschool.edu/duncan-foley-homepage/home/EPWT
It is worth noting that profit rates in major countries in EPWT have highly similar pattern with those in major studies that compute profit rates in traditional Marxist thought (see Roberts 2012).
[6] A few missing years for Turkey in the data are filled in according to the data set provided by Ongan (2011).

military expenditures, the Correlates of War Project (COW) and the Stockholm International Peace Research Institute (SIPRI). It is acknowledged that SIPRI and COW data diverge when they overlap. However, we still do not hesitate to borrow data utilized by a major study, Nordhaus, Oneal and Russett (2012). The authors incorporate the commonly used SIPRI data from 1989 onward, and data from COW for the rest of the period. In addition, we extend the SIPRI data set to the year 2008.

Military expenditures, *milex,* are measured as the ratio of military expenditures to GDP. We derive this variable based on a data set that includes the logarithm of military spending in constant dollars measured with purchasing power parities (PPP) and the logarithm of real GDP --ln(military spending/GDP)--, provided by Nordhaus, Oneal and Russett (2012).

Depending on the assumptions (i.e. full employment, structure of military expenditures in terms of R&D or personnel expenditures etc.) and short term-long term distinction, military expenditures may have a positive or negative effect on the profit rate. Kollias and Mantias (2003) note such effects. Accordingly, positive effects include increasing demand, avoiding the rise in organic composition of capital and accompanying fall in the profit rate, increasing labor productivity, increasing the rate of surplus value, and bringing about international trade dominance. Negative impacts include crowding out of investment, reducing productivity through purchase of "unreproductive" goods, increasing the organic composition of capital by expanding a capital intensive sector, and taxing capital income. In this context, one may expect a differing effect of military expenditures on the rates of profit in the neo-liberal period due to a rising financial sector with a smaller fraction of profits reinvested in the capital stock.

GDP data (in constant 2005 US$) is taken from the World Development Indicator data set provided by the World Bank. Higher GDP leads to higher capital accumulation. Therefore, it is expected that higher GDP is associated with higher rates of profit.

Unemployment rate data, *unemp,* is taken from the World Bank[7]. An increase in unemployment reduces wage bargaining power and lowers the wage rate, positively impacting the rate of surplus value and the rate of profit. However, rising unemployment places downward

[7] Missing years are completed according to national sources or the IMF World Economic Outlook.

pressure on effective demand, raising the organic composition of capital and possibly reducing the rate of profit at the same time.

Our data encompasses 24 OECD countries[8]. As both T and N are large, we conduct a panel ARDL cointegration test for two different time periods, 1963-2008 and 1980-2008, with and without unemployment to determine the overall impact of military spending.

4.2 Method

The standard panel models are unable to capture the dynamic relationship among our variables of interest. One widely used method of dynamic panel data analysis is GMM, particularly for the common cases of large N and small T data. However, this method has some shortcomings as it is mostly employed in the case of short time periods, capturing only short term dynamics. Therefore, Kiviet (1995) states that in GMM estimations the homogeneity assumptions on the slope coefficients of lagged dependent variables could create significant biases. Therefore, GMM estimations are likely to lead to inconsistent and misleading long-run coefficients if the slope coefficients are not identical (Pesaran and Smith, 1995).

It had been argued that the long-run relationships exist only in the context of cointegration among integrated variables (Johansen 1995; Philipps and Hansen 1990). However, Pesaran and Smith (1995), who introduce the mean group, and Pesaran, Shin and Smith (1999), who introduce the pooled mean group, provide a new technique that has made it possible to derive consistent and efficient estimates of the parameters in a long-run relationship between both integrated and stationary variables in a panel data structure. These methods, the autoregressive distributed lag models, ('ARDL approach'), allow the variables in question, *profit*, *milex*, *GDP*, and *unemployment*, to be I(0) or I(1).

There are three main requirements for the validity of the panel ARDL cointegration analysis. First, there must exist a long-run relationship among the variables in question. Second, the model must include regressors that are strictly exogenous and a resulting residual that is serially uncorrelated. Third, in order to prevent the bias in the average estimators and to resolve

[8] Sample includes Australia, Austria, Belgium, Canada, Chile, Denmark, Finland, France, Greece, Ireland, Israel, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, UK, and US.

the issue of heterogeneity, both number of years (T) and number of countries (N) have to be large. The condition for the existence of a long-run relationship among the variables is that the coefficient of the error–correction term has to be negative and not lower than -2. Our results meet this requirement. The second requirement is resolved by including lags for the dependent and independent variables in error-correction form. We are also interested in short-run dynamics of the model and therefore employ a common lag structure (which is 2 for the first model) determined by the Schwarz Information Criterion (SC). Considering the shorter time dimension, we impose one lag for the 1980-2008 period. Finally, by including 24 countries and a time period of 29 years (i.e. 1980-2008) and 46 years (i.e. 1963-2008), our model satisfies the third requirement as well[9].

Based on Pesaran, Shin, and Smith (1999), using the autoregressive distributed lag ARDL (p,q), the dynamic heterogeneous panel regression equation with the error correction model can be formed as:

$$\Delta(y_i)_t = \sum_{j=1}^{p-1} \gamma_j^i \, \Delta(y_i)_{t-j} + \sum_{j=0}^{q-1} \delta_j^i \, \Delta(X_i)_{t-j} + \varphi^i\left[(y_i)_{t-1} - \left\{\beta_0^i + \beta_1^i (X_i)_{t-1}\right\}\right] + \epsilon_{it} \qquad (20)$$

where y is the profit rate, X represents explanatory variables, including military expenditures, real GDP, global profit rate, and unemployment, p and q refer to the lags of the dependent and independent variables, respectively, γ and δ are the short-run coefficients for profit rates and its determinants, respectively, β is the long run coefficient, φ is the coefficient of speed of adjustment to the long run- equilibrium ϵ, and is a time-varying disturbance term, and i and t refer to country and time, respectively[10]. The long-run regression coefficient in the square brackets in (20) is derived from equation (21) as follows:

$$(y_i)_t = \beta_0^i + \beta_1^i (X_i)_t + \mu_{i,t} \text{ where } \mu_{i,t} \sim I(0) \qquad (21)$$

[9] We utilize the 'xtpmg' command in Stata for nonstationary heterogeneous panel data models, provided by Blackburne and Frank (2007).

[10] It is worth noting that the econometric model is not based on the theoretical model in a strict sense. Rather, we use a specific theoretical model to show possible linkages between military expenditures and profit rates, but use a general model to investigate the relationship in question in line with Kollias and Maniatis (2003) and Dunne et al (2013). An empirical model that is specifically constructed according to Foley's (1982) model would be a topic for further studies.

A number of multi-country methods can allow for parameter differences across countries, including the fully heterogeneous coefficient model, which allows for complete diversity in cross-country parameters given a sufficient size of time series data, a mean group estimator created by Pesaran and Smith (1995) in which the cross-country dimension is also large, and the fully homogeneous-coefficient model which requires that all slope and intercept coefficients be equivalent for all countries.

In between these extremes, there are many estimators, including, for example, the dynamic fixed effects (DFE) estimator which equalizes all slope coefficients across countries, and the pooled mean group (PMG) estimator by Pesaran, Shin, and Smith (1999), which equalizes long-run slope coefficients across countries and creates consistent estimates of the mean of short-run coefficients across countries.

5. Results and Discussion

We employ Levin, Lin and Chu (LLC) (2002), Im, Pesaran and Shin (IPS) (2003), and Breitung (2000, 2005) in panel unit root tests. All variables are used in their natural logarithmic forms. Table 1 reports that the series are a mix of I(0) and I(1) and that no series is I(2), allowing us to employ the ARDL approach. On the other hand, it is likely that panel data models present cross-sectional dependence in the errors, which may occur as a result of common shocks and unobserved components that form part of the error term. Considering this fact, we also utilize CADF and CIPS unit root tests suggested by Pesaran (2003) and Pesaran (2007), which allow for cross-sectional dependence. Cross sectional dependence is tested by Pesaran's CD test (Pesaran 2004) as well as by tests suggested by Frees (1995) and Friedman (1937). All tests reject the null hypothesis of cross sectional independence. Therefore, we control for cross sectional dependence by incorporating the global profit variable. The results are provided in Table 2.

Table 1: Panel unit root tests

Variables	Deterministic Terms	LLC	IPS	Breitung	CADF	CIPS
Levels						
Profit	Intercept, trend	-1.809**	-0.5274	0.4377	-2.239	-1.891
Milex	Intercept, trend	-3.005***	-1.0591	-1.8972**	-3.437***	-3.135***
GDP	Intercept, trend	-5.234***	-2.914***	4.7021	-2.360	-2.024
Unemployment	Intercept, trend	-2.449***	-3.977***	0.0303	-2.281	-1.864
First Differences						
ΔProfit	Intercept	-19.650***	-16.662***	-13.419***	-3.135***	-2.893***
ΔMilex	Intercept	-27.836***	-25.394***	-21.336***	-3.686***	-4.571***
ΔGDP	Intercept	-17.495***	-16.705***	-11.451***	-3.248***	-3.350***
ΔUnemployment	Intercept	-9.361***	-10.167***	-5.360***	-2.404***	-2.705**

Notes: The number of lags is determined according to SC. For CADF the number of lags is 2, for CIPS the max lag number is taken as 2 for unemployment and 3 for other variables. Significance is denoted by *** at 1%, ** at 5% and * at 10% level.

Table 2: Cross Sectional Independence Tests

	Pesaran's Test	Frees' Test	Friedman's Test
Test Statistic	12.736	4.021	112.711
Probability	0.0000	0.0000	0.0000

The Hausman h-test that measures the comparative efficiency and consistency of estimators suggests that DFE is more efficient than PMG, and PMG is more efficient than MG, for all models. Therefore, it is plausible to emphasize the results of DFE and PMG to reach the general conclusion, deemphasizing MG.

Table 3 reports the results of DFE for the 1963-2008 period along with those of PMG and MG estimations for comparison purposes. PMG estimations show the positive impact of military expenditures on profit rates in the long run. MG and DFE also suggest a positive link, but not a significant one. Since the model includes a time trend, the GDP coefficient should be interpreted in terms of its deviation from trend. The negative coefficient suggests that profits are countercyclical, which might be the case if workers can increase their share in the boom and the capital-output ratio is constant. In terms of the short run dynamics among variables, we note that the error correction coefficient, emerging with a significantly negative sign and values less than -2 suggests that the panel error correction model holds for each estimator. GDP, as expected, has a positive impact on profit rates and military expenditures have a significantly negative impact. Overall, all three estimators present the same short-run dynamics among variables of interest, yielding highly consistent results.

Although Table 3 reports evidence on the positive linkage between military expenditures and the rate of profit, we extend our discussion to include unemployment, another crucial factor that affects profitability, to further investigate the relationship of interest. However, this comes with a cost, reducing our time period due to data unavailability.

Table 3: The Long- and Short-run Effects of Military Expenditures on Profit Rates (1963-2008)

	Pooled Mean Group	Mean Group	Dynamic Fixed Effect
Long Run Coefficients			
Milex	0.357*** [0.072]	0.001 [0.144]	0.050 [0.097]
GDP	-1.499*** [0.196]	-2.197*** [0.625]	-1.069*** [0.266]
Global profit	0.521** [0.202]	0.083 [0.534]	0.175 [0.416]
Time trend	0.059*** [0.007]	0.079*** [0.021]	0.042*** [0.101]
Short Run Coefficients			
Error Correction Coefficient	-0.054*** [0.011]	-0.113*** [0.026]	-0.045*** [0.008]
Δprofit (-1)	0.352*** [0.018]	0.312*** [0.018]	0.377*** [0.017]

Δmilex	-0.025*** [0.008]	-0.017** [0.009]	-0.017** [0.008]
ΔGDP	0.569*** [0.071]	0.729*** [0.099]	0.485*** [0.045]
ΔGlobal profit	0.545*** [0.071]	0.406*** [0.081]	0.610*** [0.042]
Intercept	2.085*** [0.431]	4.320*** [0.872]	1.335*** [0.238]
No. Countries	24	24	24
No. Observations	1056	1056	1056

Standard errors in brackets. Significance denoted by *** at 1%, ** at 5% and * at 10% level.

Table 4 presents the results of all estimators for the 1980-2008 period (Model 1 with unemployment, and Model 2 without unemployment). The results confirm the negative effect of GDP (i.e. profits are countercyclical) on the profit rates reported in Table 3. Two out of three estimators present a positive long-run effect of unemployment on the profit rate. This is in accordance with our expectations in the context of the reserve army of the unemployed, and in line with countercyclical profits. Error correction coefficients across all model specifications have the expected sign and are within the range of required size, as in Table 3. The short run dynamics, again, are consistent across all model specifications. Also, we note that, comparing Table 3 and 4 for the short run dynamics, the adjustment process for profit rates is much faster over the shorter period from 1980 than over the longer period.

Table 4: The Long- and Short-run Effects of Military Expenditures on Profit Rates (1980-2008)

	Pooled Mean Group		Mean Group		Dynamic Fixed Effect	
Long Run	1	2	1	2	1	2
Milex	-0.004 [0.028]	0.093** [0.037]	-0.041 [0.067]	-0.207* [0.117]	-0.176** [0.071]	-0.170** [0.071]
GDP	-0.101 [0.077]	-1.521*** [0.117]	-0.557 [0.603]	-0.839 [0.813]	-0.461*** [0.161]	-0.760*** [0.175]
Unemployment	0.284*** [0.023]		0.021 [0.092]		0.357*** [0.066]	
Global profit	-0.018 [0.119]	0.236* [0.125]	0.006 [0.316]	-0.238 [0.405]	-0.490 [0.389]	0.018 [0.363]

Time trend	0.003** [0.002]	0.046*** [0.004]	0.027 [0.021]	0.022 [0.029]	0.008 [0.005]	0.018*** [0.005]
Short Run						
Error Correction Coefficient	-0.165*** [0.018]	-0.138*** [0.021]	-0.390*** [0.046]	-0.248*** [0.027]	-0.101*** [0.013]	-0.101*** [0.014]
Δmilex	-0.005 [0.008]	-0.026*** [0.009]	0.009 [0.012]	0.001 [0.011]	-0.004 [0.011]	-0.009 [0.011]
ΔGDP	0.917*** [0.155]	0.834*** [0.115]	0.937*** [0.179]	0.975*** [0.150]	0.689*** [0.080]	0.641*** [0.071]
ΔUnemp	-0.008 [0.019]		-0.005 [0.019]		-0.010 [0.011]	
ΔGlobal profit	0.481*** [0.134]	0.578*** [0.129]	0.340*** [0.125]	0.443 [0.120]	0.625*** [0.072]	0.723*** [0.074]
Intercept	0.902*** [0.107]	5.776*** [1.042]	3.027 [4.403]	9.980*** [1.946]	1.669*** [0.400]	2.326*** [0.391]
No. Country	24	24	24	24	24	24
No. Obser.	672	696	672	696	672	696

Standard errors in brackets. Significance denoted by *** at 1%, ** at 5% and * at 10% level.

When it comes to the long-run effect of military expenditures on the profit rates, Table 4 reports that while only one out of six models suggests a significant positive effect, the rest, with three significant signs, suggest a negative effect. In fact, the DFE estimator for both models, which is the most efficient estimator according to the Hausman t-test, shows that there exists a negative effect of military expenditures in this period, in contrast to the whole period in question. Following Love and Zicchino's (2006) routines using impulse-response functions in a panel vector autoregression (PVAR) suggested by Holtz-Eakin et al (1988), we confirm our results in that while the response of profit rates to *milex* is positive for the 1963-1980 model, it turns out to be gradually negative in the post-1980 period. This finding might result from the changing structure of major economies in the neoliberal era. The rise of the financial sector and the rentier class has led to an increasing share of profits earned by firms and going to interest payments, dividends and other unproductive expenditures, resulting in a smaller fraction of profits being reinvested in the capital stock. We note that this divide is also consistent with the fact that the post-1980 period gave rise to the neoliberal model, and major studies contend that while profit rates were on the decline until 1982, the rest of the period is associated with an increase in profit rates (Roberts 2012). Dividing the period by taking 1980, 1981 or 1982 as a break year, as one may expect, does not change the results[11].

Moreover, we investigate the relationship with respect to the countries' role in the arms trade. We repeat each model specification in Table 3 and Table 4 for twelve arms-exporting countries versus non-exporting countries in our data to better understand the military expenditures-profitability nexus[12]. We argue that there are grounds for making such a distinction, as the size of the military burden does not tell us anything about the armament industry itself. In fact, it can be argued that the negative consequences of production of an armament system are more likely to be realized in the arms-importing countries than those in arms-producing (exporting) countries. Therefore, one may expect a difference between countries like Greece and Turkey, which are mainly arms importers, with the US and the UK, which contain much larger armaments sectors by comparison. Tables 5, 6 and 7 report the results. The error correction model holds in each case, and the short-run dynamics yield highly consistent results across all regressions. In terms of short-run dynamics, the negative effect of *milex* and the positive effect of GDP on the rate of profits exist for each model specification, which is in line with the previous set of regressions. For tables 5, 6 and 7, comparing within estimators, out of nine cases, there is no significant evidence that while military expenditures in exporting countries have a positive effect on the rate of profits, the one for non-exporting countries is negative.

Table 5: The Long- and Short-run Effects of Military Expenditures on Profit Rates, Arms-exporting vs Non-exporting (1963-2008)

	Pooled Mean Group		Mean Group		Dynamic Fixed Effect	
Long run	Exporter	Non-exporter	Exporter	Non-exporter	Exporter	Non-exporter
Milex	0.165*** [0.062]	0.121 [0.088]	0.106 [0.127]	-0.104 [0.262]	0.643 [0.480]	-0.174 [0.119]
GDP	-1.805*** [0.242]	-1.358*** [0.178]	-1.951** [0.914]	-2.442*** [0.888]	-1.396 [1.023]	-1.180*** [0.314]
Global profit	0.014 [0.193]	0.575** [0.230]	-0.417 [0.979]	0.585 [0.433]	-1.842 [1.857]	0.509 [0.522]

[11] We do not report these results to save space, but they can be provided upon request.
[12] The arms exporting countries are Belgium, Canada, France, Israel, Italy, Netherlands, Norway, Spain, Sweden, Switzerland, UK, US according to SIPRI (SIPRI 2014).

Time trend	0.055*** [0.008]	0.055*** [0.006]	-0.059** [0.022]	0.099*** [0.036]	0.079 [0.051]	0.041*** [0.012]
Short run						
Error correction coefficient	-0.065*** [0.026]	-0.057*** [0.021]	-0.153*** [0.028]	-0.073** [0.036]	-0.020* [0.011]	-0.057*** [0.011]
Δprofit (-1)	0.332*** [0.024]	0.352*** [0.029]	0.290*** [0.022]	0.336*** [0.029]	0.372*** [0.027]	0.372*** [0.024]
Δmilex	-0.013 [0.011]	-0.028** [0.011]	-0.016 [0.011]	-0.019 [0.014]	-0.016 [0.011]	-0.011 [0.012]
ΔGDP	0.611*** [0.139]	0.549*** [0.160]	0.803*** [0.135]	0.656*** [0.146]	0.619*** [0.066]	0.457*** [0.063]
ΔGlobal profit	0.430*** [0.064]	0.672*** [0.109]	0.237*** [0.88]	0.574*** [0.120]	0.459*** [0.048]	0.754*** [0.068]
Intercept	3.329*** [1.097]	1.983*** [0.759]	3.844*** [1.475]	4.796*** [0.980]	0.880*** [0.326]	1.7666*** [0.360]
No. Countries	12	12	12	12	12	12
No. Observations	528	528	528	528	528	528

Standard errors in brackets. Significance denoted by *** at 1%, ** at 5% and * at 10% level.

Table 6: The Long- and Short-run Effects of Military Expenditures on Profit Rates (with Unemployment), Arms-exporting vs Non-exporting (1980-2008)

	Pooled Mean Group		Mean Group		Dynamic Fixed Effect	
Long run	Exporter	Non-exporter	Exporter	Non-exporter	Exporter	Non-exporter
Milex	0.013 [0.025]	0.001 [0.081]	-0.081 [0.052]	-0.002 [0.126]	-0.035 [0.077]	-0.260** [0.115]
GDP	-0.072 [0.072]	-0.354** [0.163]	-0.404 [0.628]	-0.711 [1.059]	-0.529** [0.218]	-0.323 [0.243]
Unemployment	0.170*** [0.018]	0.513** [0.066]	0.075* [0.045]	-0.032 [0.182]	0.276*** [0.059]	0.443*** [0.127]
Global Profit	0.335*** [0.107]	0.021 [0.273]	0.189 [0.305]	-0.168 [0.565]	-0.831** [0.418	-0.136 [0.635]
Time trend	0.002 [0.001]	0.007 [0.005]	0.012 [0.017]	0.042 [0.039]	0.014** [0.006]	0.002 [0.009]
Short run						
Error correction coefficient	-0.226*** [0.047]	-0.122*** [0.019]	-0.445*** [0.049]	-0.334*** [0.078]	-0.114*** [0.018]	-0.097*** [0.021]
Δmilex	-0.012 [0.017]	-0.001 [0.006]	0.005 [0.016]	0.012 [0.019]	-0.012 [0.013]	-0.001 [0.016]

ΔGDP	1.156*** [0.212]	0.648*** [0.237]	1.134*** [0.235]	0.740*** [0.268]	1.094*** [0.122]	0.541*** [0.112]
Δunemployment	0.025 [0.019]	-0.044 [0.035]	0.001 [0.013]	-0.012 [0.036]	0.029** [0.012]	-0.043** [0.019]
ΔGlobal profit	0.250** [0.125]	0.595*** [0.220]	0.170* [0.096]	0.511** [0.227]	0.393*** [0.081]	0.764*** [0.119]
Intercept	0.852*** [0.195]	1.389*** [0.221]	2.909 [5.862]	3.145 [6.834]	2.242*** [0.646]	1.125* [0.611]
No. Countries	12	12	12	12	12	12
No. Observations	336	336	336	336	336	336

Standard errors in brackets. Significance denoted by *** at 1%, ** at 5% and * at 10% level.

Table 7: The Long- and Short-run Effects of Military Expenditures on Profit Rates, Arms-Exporters vs Non-exporters (1980-2008)

	Pooled Mean Group		Mean Group		Dynamic Fixed Effect	
Long run	Exporter	Non-exporter	Exporter	Non-exporter	Exporter	Non-exporter
Milex	0.026 [0.029]	-0.130* [0.074]	-0.091 [0.084]	-0.322 [0.219]	-0.122* [0.071]	-0.256** [0.0.120]
GDP	-0.745*** [0.108]	-1.238*** [0.157]	-1.332** [0.527]	-0.345 [1.563]	-0.739*** [0.214]	-0.934*** [0.295]
Global profit	0.555*** [0.107]	0.361 [0.243]	0.335 [0.290]	-0.812 [0.737]	-0.438 [0.367]	0.543 [0.633]
Time trend	0.019*** [0.003]	0.042*** [0.004]	0.036*** [0.016]	0.009 [0.056]	0.015** [0.006]	0.025** [0.010]
Short run						
Error correction coefficient	-0.210*** [0.046]	-0.101*** [0.035]	-0.309*** [0.042]	-0.187*** [0.027]	-0.124*** [0.018]	-0.093*** [0.021]
Δmilex	-0.022 [0.018]	-0.016 [0.012]	0.001 [0.016]	-0.001 [0.015]	-0.003 [0.014]	-0.011 [0.016]
ΔGDP	0.978*** [0.112]	0.636*** [0.215]	1.128*** [0.218]	0.822*** [0.205]	0.908*** [0.106]	0.543*** [0.097]
ΔGlobal profit	0.316** [0.133]	0.755*** [0.192]	0.295*** [0.085]	0.590*** [0.222]	0.503*** [0.084]	0.886*** [0.121]
Intercept	4.504*** [1.067]	3.373*** [1.201]	9.250** [3.758]	10.711*** [1.271]	3.063*** [0.658]	2.338*** [0.563]
No. Countries	12	12	12	12	12	12
No. Observations	348	348	348	348	348	348

Standard errors in brackets. Significance denoted by *** at 1%, ** at 5% and * at 10% level.

Except for one case (negative and significant), the time trend has a positive and significant sign in 16 specifications, and a positive sign in 10 out of 27 model specifications in total. This can be interpreted as general counter evidence that there is a 'tendency' for the profit rate to fall, for the period in question in a panel context, in addition to comprehensive studies in the Marxist literature.

Except for the mean group (MG), the least efficient estimator according to the Hausman test, which does not report significant results in Table 4 and in one model in Table 6, all other specifications yield a positive relationship between unemployment rates and profit rates. Together with the insignificant effect of unemployment in the short-run, it can be argued that the impact of unemployment on profitability is realized through changes in distribution within the economies (toward the capital-investing "rentier") rather than via a reduction in demand (through workers' declining wages). This is evidence for the operation of a mechanism such as the reserve army of the unemployed, in which higher unemployment rates lower the bargaining power of workers, push down wages, change the organic composition of capital, and increase profit rates.

The findings show that there exists a significantly positive relationship between military expenditures on profit rates for the 1963-2008 period. On the other hand, for the whole group, the post-1980 period is associated with a negative linkage between military expenditures and profit (which is also confirmed and supported by unreported impulse response functions), and there exists a hint of a negative relationship in the case of non-arms exporting countries. These results can be interpreted as follows. First, in the case of arms-exporting countries and the whole period in question, it is plausible to argue that these findings support Baran and Sweezy's underconsumptionist view that military expenditures stimulate aggregate demand, which in turn helps to prevent the realization of a surplus resulting from underconsumption. Second, regarding non-arms exporting countries, military expenditures divert resources away from productive uses, reducing long run productivity and growth potential of the economy. And also, it seems that the positive impact of military expenditures is no more valid in the neoliberal era, as we previously suggested[13].

Conclusion

[13] This finding suggests the necessity for a study that specifically addresses the structural change during the neo-liberal period. Such an investigation is left for future studies.

Although there have been a number of empirical works on the effect of military expenditures on economic growth in the defense economics literature, there are only three works (country level studies) that deal with the relationship between military burden and profit rate in the economy. Considering this fact, the paper has attempted to provide further evidence on the issue by employing a panel ARDL method on a dataset of 24 OECD countries for a relatively long period, from 1963 to 2008.

The paper contends that profit rates are countercyclical; and that there has been a substantial direct relationship between unemployment and profit rates regardless of the time period or model specifications, conforming with the reserve army of the unemployed mechanism.

The major finding of the paper is that while there is evidence that military expenditures have a positive effect on the whole period for the whole sample of countries, there is significant evidence that the military expenditure burden has resulted in a negative impact on profit rates in the neoliberal era. It should also be noted that the short-run effect is negative for all time periods. On the other hand, while we divide the countries into two sub-groups, namely arms exporters and the rest (i.e. non-arms exporters) there appears to be no substantial empirical evidence in that military expenditures have a negative impact on profit rates for non-exporting countries, and a positive impact for arms-exporting countries. That is, for both sets of countries, military expenditures in terms of military wages and spending on related materials do not stimulate demand and profitability in the short run. In the long run, however, in case of non-exporting countries, it can be suggested that military spending diverts resources from productive uses, reducing the long-run productivity and growth potential of the economy.

We acknowledge that the paper is a modest attempt to provide some empirical evidence on the effect of military expenditures on the rate of profits within a Marxist framework. For future studies, one may prefer to focus on a specific linkage between military expenditures and profit rates, and panel data analysis can be extended for different sets of countries, --for example to include BRIC countries and Germany-- and can be supported by time series analyses. Also, from the viewpoint of theoretical model, modifying Foley (1982)'s Marxian model of the circuit of capital to allow specific dynamic for military expenditures would be an challenging topic for further research, allowing for specific analysis of certain interaction mechanisms between military expenditures and profit rates.

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Appendix

Table 1A: Descriptive Statistics

Variable	**Mean**	**Std. Dev.**	**Min**	**Max**
Profit	33.16	11.348	17.06	95.94
Milex	3.15	2.943	0.5	28.47
GDP	26.30	1.431	22.71	30.24
Unemployment	7.23	3.735	0.8	23.9

Note: GDP is log of real GDP