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Financialization and Militarization: An Empirical Investigation¹

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Abstract

Based on Arrighi (1994), we empirically investigate whether financialization and militarization are mutually reinforcing phenomena in the US during the post-WW II period. Military spending during the 1950s and 1960s in the US, along with other external stimuli, such as a rising sales effort and expansion in finance, insurance, and real estate, counteracted the stagnation of the monopolistic stage of capitalism. *Monopoly capital* was transformed into *finance monopoly capital* as the intensity of financial capital increased during the late 1970s in response to stagnation. Considering alternative financialization variables commonly used in the literature and the profit rate in the financial sector, and using several parametric and non-parametric methods, we found a significant relationship between financialization and militarization in the US for 1949-2019. The findings show that the decline in the profit rates lead to a decline in military expenditure. The overall results suggest that the rise in financialization is parallel to the decline in the profit rates, leading to larger military expenditure in total, but with relatively smaller share in GDP.

Key Words: Financialization, military spending, Marxist economics, Generalized Additive Models

JEL Classifications: B51; C1

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1. Introduction

We empirically examine the argument, based Arrighi (1994), that financialization and militarization are mutually reinforcing phenomena during the post-WW II period for the US. *Finance capital*, as Hilferding labeled it, or *monopoly-finance capital*, as Sweezy (1994) preferred, began to dominate the dynamics of the accumulation of capital, particularly during the 1980s. According to Keynes, financialization represented the end of capitalist rationality, and he referred to it as “bubble on a whirlpool of speculation” (Sweezy 1994; Foster 2005). In *Monopoly Capital*, Baran and Sweezy (1966) argued that stagnation is the normal state of monopoly capitalism. That is, to absorb surplus, the government uses sales effort, the financial sector (i.e., finance, insurance, and real estate - FIRE), capitalists’ consumption and investment, and continuous and excessive military spending. This makes the system irrational because it can only protect itself through wasteful sales effort and military spending instead of productive civilian investment and welfare spending. That is, *financial capitalism* is not a new stage or form of capitalism but the system’s response to the decline in profitability as a new phase of neoliberalism (Kotz 2010).

Military spending during the 1950s and 1960s in the US, along with other external stimuli, such as a rising sales effort and financial expansion, counteracted the stagnation of the monopolistic stage of capitalism (Baran and Sweezy 1966). Nevertheless, the long-term problem of underconsumption required further measures. Monopoly capital was transformed into *finance monopoly capital* as the volume and intensity of financial capital increased during the late 1970s² (Magdoff and Sweezy 1987; Foster and McChesney 2012). While the role of military spending as an external stimulus continued, it may be argued that these two stimuli are not independent; rather, they mutually generated and reinforced each other to sustain the financial capitalism

² Finance monopoly capital (or financialization/financial capitalism) refers to i) the increased weight of the financial sector (e.g. finance, insurance, and real estate - FIRE) in GDP and financial profits in total profits, along with the proliferation and widespread use of opaque financial instruments; ii) the recent tendency whereby large companies self-finance by using retained earnings and capital markets (instead of relying on banks), and the emergence of shadow banking; iii) “the widespread adoption by firms of policies of shareholder value maximization; policies that focus on enriching shareholders rather than addressing the productive prospects of the enterprise”; iv) higher indebtedness of households as a share of their disposable income; and finally v) expanding role of financial bubbles (Foster and McChesney 2012; Mavroudeas and Papadatos 2018: 452).

centered in the US. The absolute dominance of the dollar secured the US global economic hegemony, thereby enabling its excessive military budget. This in turn maintained the US political power, thereby securing the dollar's hegemony. Employing detailed statistical analysis and non-parametric estimation methods, this study contributes to the literature by providing the first empirical evidence on this proposition for the US for 1949-2019.

The next section outlines the literature on the relationship between financialization and militarization. The third section presents the data, statistical analysis and the method. The fourth section presents the empirical evidence. The conclusion highlights the study's main inferences and contribution to the literature.

2. Literature on the Relationship between Financialization and Militarization

Financialization is a crucial concept in the periodization of the development of capitalism. Rudolf Hilferding's *Finance Capital* is the key work in the financialization literature, in which he develops Marx's 'fictitious capital' and explain its creation, circulation, and use by some capitalist to make a profit.

Hilferding defines *finance capital* as follows:

The dependence of industry on the banks is therefore a consequence of property relationships. An ever-increasing part of the capital of industry does not belong to the industrialists who use it. They are able to dispose over capital only through the banks, which represent the owners. On the other side, the banks have to invest an ever-increasing part of their capital in industry and in this way they become to a greater and greater extent industrial capitalists. I call bank capital, that is, capital in money form which is actually transformed in this way into industrial capital, finance capital (Hilferding, 1910: 225).

While Hilferding saw finance capital as the domination of industry by banks, what matters for Lenin and Bukharin was the merging of industrial capital and finance capital that led to the emergence of the financial oligarchy³ (Guillen 2014). For Sweezy (1942), on the other hand, the key issue was the overlap between such capital and the transition from competitive to

³ Hilferding's finance capital (i.e. financialization) argument is the generalization of the specific case of Germany. It is important to distinguish between financialization patterns across the world. While Continental European countries relied on bank finance/indirect finance, Anglo Saxon countries mostly relied on self-finance/direct finance. The latter type of financing was adopted by developing countries in the 1990s as they relied more on new issues of shares than debt as their primary source of finance (Singh and Hamid 1992; Singh 1995; Lapavitsas 2004).

monopoly capitalism. In other words, *finance capital* become the dominant form of capital in the monopolist stage of capitalism⁴ (Guillen 2014).

Neither Hobson, Hilferding, Lenin, nor Polanyi used the term financialization. Polanyi labeled it *haute finance* (high finance) while Hobson referred to *big financiers*. The term was first used by Magdoff and Sweezy (1987), and the Monthly Review school in general provided important insights (see Magdoff and Sweezy 1987; Sweezy 1994; 1997; Foster 2007, 2010; Foster and McChesney 2012). This was then used enthusiastically by post-Keynesian scholars (Stockhammer 2004, 2009; Hein 2013; cited in Mavroudeas and Papadatos 2018: 457), who refer to this “new” phase of capitalism as “finance dominated capitalism” (Hein 2013) or the “finance dominated regime of accumulation” (Stockhammer 2009).

Definitions of financialization emphasize different aspects of the process.⁵ For example, Krippner defines it as “a pattern of accumulation in which profits accrue primarily through financial channels rather than through trade and commodity production” (Krippner, 2005: 174; see also Krippner 2011) whereas, for Epstein, it is “increasing role of financial motives, financial markets, financial actors and financial institutions in the operation of the domestic and international economies” (Epstein 2005: 3). For Fine, financialization is the intensive and extensive accumulation of fictitious capital (or interest-bearing capital) in the accumulation of capital (Fine 2009, 2010). There may be three aspects of financialization: involvement of households in the credit market; change in corporate behavior; and a regime of accumulation (Van der Zwan 2014; Epstein 2015). The first refers to the increasing volume of the mortgage market and use of credit cards, consumer credit, and student loans (Epstein, 2015; Lapavitsas, 2013; Van der Zwan, 2014). The second aspect is a rise in non-financial companies’ financial activities and financial focus, as measured by increasing dependency on financial activities, increased indebtedness, the use of stock options and other stock-related compensation for CEOs and other top management, and the implementation of a shareholder-value orientation (Lazonick

⁴ There are two main problems in Hilferding’s thesis of finance capital. The first is that his theory of monopoly pricing is problematic while he ignored Marx’s labor theory of value (LTV). Second, there is no empirical evidence validating the fusion of productive with banking capital (Bond 2010; Harris 1988; cited in Mavroudeas and Papadatos 2018: 455).

⁵ There are several comprehensive studies on financialization, for example Davis (2017) and Rabinovich (2019).

and O’Sullivan 2000; Lapavitsas, 2013; Van der Zwan, 2014; Epstein, 2015). These two aspects of financialization refer to quantitative increase in finance both in terms of financial profit and volume of financial assets as a share of GDP. The third aspect of financialization, however, refers to its important role in capitalism, a new phase in capital accumulation (Epstein, 2015; Lapavitsas, 2013; Powell, 2019; Sawyer, 2014; cited in Rabinovich 2019: 29).

There are different understandings of financialization as the stage of the rapid deregulation and globalization of finance capital during the 1990s. Overall, for post-Keynesians, financialization caused stagnation as wage stagnation and income inequality led to insufficient aggregate demand. Accordingly, “increased financial investment and increased financial profit opportunities crowd out real investment by changing the incentives of the firm managers and directing funds away from real investment” (Orhangazi 2008: 864). From a general Marxist perspective, however, productive sector capitalists shifted their activity to fictitious capital operations to address the problem of lower profitability due to underconsumption / overaccumulation. Yet, Orhangazi notes the downsides of such simplifications to emphasize the contradictory role of financialization in the economy in that while it facilitates capital accumulation, it also hinders it by causing financial crises (Orhangazi 2011; 2016). He argues that explaining the rise of finance “as some external force impinging on the economy” or “as a response to accumulation problems in the non-financial parts of the economy” fails to present the complex and contradictory role of the financial sector (Orhangazi 2016: 249). Among Marxist thought, while Ben Fine (2009, 2010) and the Monthly Review school used the term along with neoliberalism and globalization within the Marxist analytical framework, Lapavitsas and Bryan referred to financialization as a new stage of capitalism by moving toward a post-Keynesian framework (e.g., Bryan, Martin, and Rafferty 2009; Lapavitsas 2009, cited in Mavroudeas and Papadatos 2018: 457).

The common insight of post-Keynesian financialization hypotheses is to consider finance as “the new and dominant exploiter, not capital as such”, thereby seeing *finance capital* as the real cause of crises, not underconsumption theory or the tendency for the profit rate to fall, as in Marxist thought (Roberts 2018). In other words, the financialization hypotheses of the post-Keynesian tradition, as well as some Marxist perspectives, such as that of Lapavitsas, argue that financialization has created profit by extracting money from workers and firms operating in the

productive sector in the form of financial commissions, fees, and interest charges. That is, it is a ‘secondary exploitation’ that does not come from the exploitation of labor (Roberts 2018). In other words, according to the financialization hypothesis, finance capital has an autonomous structure, independent from money capital (Mavroudeas and Papadatos 2018). However, in the Marxist framework, surplus value is created through production in the productive sector before being allocated between productive capital, money capital, and commercial capital in terms of profit, interest, and commercial profit, respectively. That is, profit in financial sector is simply a transfer of some part of total profit created in the productive sector; therefore, although money capital appears to dominate productive capital, its existence ultimately depends on productive capital⁶ (Hilferding 1910; Sweezy 1942; Mavroudeas and Papadatos 2018).

Financialization and militarization as response to economic downturns

There are two main Marxist crisis theories: underconsumption/stagnation and the tendency for the rate of profit to fall. Underconsumption/stagnation theory claims that because workers’ purchasing power is limited (i.e., the growth of wages is below the rate of expansion of output) there is insufficient aggregate demand when capitalists’ consumption or investment cannot absorb the surplus, leading to stagnation. The driving force of capitalism is the persistent search for surplus value to reach higher rates of profit. For this goal, the accumulation process reinforces mechanization, which has two outcomes: on the one hand, mechanization increases labor productivity as it allows workers to use more advanced tools and machinery; on the other hand, it increases organic composition. However, rising labor productivity reduces the profitability of capital, generating the fundamental contradiction of capitalism.

Baran and Sweezy in *Monopoly Capital* analyzed this chronic lack of aggregate demand in a capitalist economy to argue that capitalist development concentrates capital in fewer giant corporations, limiting production, investment, and workers’ buying power in order to reap higher profits. They concluded that “the normal state of the monopoly capitalist economy is stagnation” (Baran and Sweezy 1966: 108). This is not, however, because the economy is not productive enough; rather, it is too productive to absorb the created surplus. Therefore, the surplus is

⁶ See also Panico (1980; 1985) on this argument.

absorbed by the capitalists' consumption and investment, sales efforts, FIRE, civilian government expenditure, and military spending⁷.

A capitalist economy must grow continuously, which requires new markets, new products, and new technologies. Foster (2008) succinctly summarizes the difficulty of finding such outlets. First, as economies mature, they no longer need to develop industrial structure. Second, there are long periods during which the economy does not experience any dramatic stimulation or transformation, for example when new technologies are introduced. Third, as inequality tends to increase, low- and middle-income households consume less, and capital shifts from investing in the real economy to speculative investments in the financial sector. Fourth, price competition is weakened due to monopolization or oligopolization (Foster 2008:1). The problem with the need for constant growth, however, is that to prevent profit rates from further decreasing in the long term, the nature of capitalist production requires these expenditures to be unproductive spending, such as sales efforts and military spending, rather than productive spending, such as capitalist investment and civilian government spending, which increase wages or capital. Kalecki (1943) also noted this key difference between civilian and military spending, emphasizing that while monopoly capital was against civilian public spending due to its detrimental effect on the rate of profit, they supported military spending as it does not conflict with the interest of capitalists because it boosted the profit rate⁸ (Foster et al. 2008). This is the irrationality of the capitalist mode of production.

However, such surges in unproductive spending along with the dramatic increase of labor exploitation were not enough to prevent stagnation, the decline in the profitability. Global

⁷ Note that Smith (1977) challenged Baran and Sweezy's underconsumptionist explanation of high military spending in the 1950s and 1960s in the US. He showed that military expenditure reduces economic growth because it crowds out investment, and therefore productivity. Accordingly, for Smith, high military spending can be best explained by its strategic role in maintaining capitalism rather than its economic effect on growth. This argument from an empirical perspective generated debates among scholars (Elveren 2019). In fact, our general hypothesis is in line with Smith's argument in that higher military spending in the US is not solely due to its economic purposes in the domestic economy but rather due to strategic reasons to reinforce its economic power by maintaining the international capitalist order, as we argue in the following sections.

⁸ Military spending does not lead to labor productivity gains because, unlike welfare state expenditure, it does not expand the civilian state sector, redistribute income, or regulate the labor market in favor of labor.⁷

economic transformation was an additional development that impaired this trend for the US. Despite access to raw materials across the globe, the profitability of the US manufacturing sector fell by around 40% between 1965 and 1973 (Brenner 2006; Meyerson and Roberto 2010: 165). Moreover, the economies of Japan and Europe, particularly Germany, substantially increased their share in manufacturing exports to become two major rivals to the US.

To address the fall in profitability in the real economy (the productive sphere), capital shifted to unproductive investment in the financial sector (i.e., fictitious capital operations). That is, the lack of investment in the productive sector due to a chronic lack of aggregate demand led to financialization in the US and other major Western economies, not the other way around⁹. Marxist scholars suggested that it was stagnation that generated financialization as capital responded to the decline in profitability in the real economy, moving to the financial sector to seek a higher profit rate. However, as noted above, financialization plays a contradictory role in the economy, helping capital accumulation while also undermining it by causing periodic financial crises (Orhangazi 2011; 2016). According to Fine, financialization is a phase of neoliberalism rather than a new stage of capitalism (Fine 2009, 2010). In this new phase of neoliberalism, monopoly-finance capital has responded to stagnation by expanding its coverage toward new areas, such as insurance and pension systems, by means of the predator state, both in the US and across the world (Galbraith 2008; Foster and McChesney 2012). In other words, finance capital has expanded both at national and international level to redesign the global economic order with the state's political and military help (Lapavitsas 2013).

One argument that we based our empirical model on is the general Marxist perspective suggesting that financialization is a response to economic sluggishness¹⁰. Therefore, the US economy particularly started to rely on the financial sector along with persistent military spending as two main stimuli to deal with sluggish economic growth and declining profitability in the productive sector. In other words, based on Arrighi (1994), these two stimuli in the US are

⁹ We acknowledge that there are some countries that do not fit in this reasoning. For instance, massive financialization in China goes hand in hand with high rates of profit and growth.

¹⁰ We acknowledge the contradictory role of the financial sector in capital accumulation in the productive sector; yet this does not undermine the main hypothesis that this paper aims to test empirically – whether militarization and financialization reinforce each other.

not independent tools but mutually reinforcing. Therefore, we first discuss financialization and then focus on the dialectic relationship between financialization and militarization.

The Dialectical Relationship between Financialization and Militarization

There is a dialectical relationship between financialization and militarization. Financialization is a response to the stagnation due to underconsumption while militarization is needed to impose financialization, thereby reinforcing each other in the US. Below, we discuss why militarization is a key aspect of financialization in the US. Arrighi (1994) and others have pointed out the mutually reinforcing nexus of financialization and militarization as a contribution to an anthropology of political economy (Hart and Ortiz 2008; cited in Røyrvik 2010). The close link between declining hegemonic power and financialization has been discussed extensively (Braudel 1981; Germain 1997; Langley 2002; Wallerstein 2004; Harvey 2003; Steinmetz 2005; Martin 2007; cited in Karataşlı and Kumral 2013: 42 and Beck and Knafo 2020: 139).

Following Braudel (1981), Giovanni Arrighi (1994) argued that, throughout the history of capitalism, the decline of hegemons is associated with financial expansion¹¹. As Hobson's analysis suggests, in hegemons, capital shifts from the real economy to fictitious capital operations and to war-making activities, both as a consequence of and to slow the decline of political and economic power (Arrighi 1994; Arrighi and Silver 1999). Meanwhile, emerging economies use their competitive advantage to increase their share in the world economy. However, as global trade and development hit their limits, big capitalists turn to speculative financial markets, investing in unproductive sectors in response to the decline in profitability. Capitalists in dominant economic centers can exploit their power in the global economy as a taxing mechanism. That is, they can use financial flows to extract wealth from weaker players (Beck and Knafo 2020).

¹¹ This paper does not deal with this argument per se. We acknowledge that the decline of all hegemons cannot be associated with financialization. Moreover, with respect to the US, due to its global fiat currency, the US Hegemony's B-phase, to use Arrighi's conceptual framework, does not necessarily constitute a decline of US power in the world-system. Rather, our hypothesis is that financialization and militarization reinforce each other to maintain US economic and political power, regardless of whether it is declining or not.

The key point in Arrighi's analysis is that financialization is a product of power and can only be sustained so long as there are significant economic imbalances between major countries and peripheral countries. These originated in the establishment of three institutions of the Bretton Woods established after World War II: namely the General Agreement on Tariffs and Trade, the International Monetary Fund, and the World Bank. As the leading power, the US designed the structure of capitalist global economy while these institutions in return reinforced US economic hegemony by making it the enforcer of the rules of the game. Meanwhile, developing countries became caught in a debt trap (Magdoff 1969: 50), creating a permanent economic imbalance that favored the US. In other words, the steady financial expansion in the US economy was due to the role of the dollar in the global economy that was significantly advantageous to the US.

The unique role of dollar is also closely linked to US military power. As Andre Gunder Frank has succinctly argued, "Uncle Sam's power rests on two pillars only, the paper dollar and Pentagon" (Frank 2005), although he also noted that "[e]ach supports the other, but the vulnerability of each is also an Achilles' heel that threatens the viability of the other" (Frank 2005 cited in Meyerson and Roberto 2010: 174-75). Similarly, Magdoff argues that "[t]he positioning of U.S. military bases should therefore be judged not as a purely military phenomenon, but as a mapping out of the U.S. dominated imperial sphere and of its spearheads within the periphery" (Magdoff 1969: 50).

Foster (2006:17) notes that "[if] neoliberalism had arisen in response to economic stagnation, transferring the costs of economic crisis to the world's poor, the problem of declining U.S. economic hegemony scented to require an altogether different response—the reassertion of U.S. power as military colossus of the world system". In this sense, David Harvey contends that the goal of the US in Iraq invasion was "a full-fledged neoliberal state apparatus whose fundamental mission is to facilitate conditions for profitable capital accumulation"¹² (Harvey

¹² In fact, as Harvey noted, the war transformed Iraq into one of the world's most neo-liberalized economies (Herrera 2013). Of course, Iraq is not the only example of forcible liberalization. The same strategy has been pursued in Arab socialist or Islamic countries, implementing the neo-liberal agenda to open domestic markets to foreign companies, and export low-priced commodities to Western markets (Galbraith, 2004: 299). Moreover, the hegemonic stability theory suggests that the objective of US military policy globally goes beyond securing a business-friendly environment or providing security for US-based corporations. Rather, it functions as a core means of global order. The theory, introduced by Keohane (1980; 1984) but based on Kindleberger (1973), contends that

2005: 8). In fact, it is no secret that the US has “a strategy of retaining its economic and political hegemony through military means”, as reported in the National Security Strategy of the United States in 2002 (Foster 2005:1). Thus, the goal in Iraq went beyond simply controlling oil reserves to protecting the dollar’s dominant role, as made clear by a member of Defense Secretary Donald Rumsfeld’s Office of Special Plans, “who noted that the invasion was undertaken in part to secure the dollar as Saddam Hussein and others were in the process of switching from the dollar to the Euro to price their oil” (Clark 2005 cited in Meyerson and Roberto 2010: 174).

The dollar’s hegemony as the global economy’s dominant currency (i.e., the world’s reserve currency) is due to the Bretton Woods dollar-gold regime, which allows the US serve as the world’s leading creditor. Since the US can supply dollars if needed simply by printing them, it need not worry about trade deficits or facing a currency collapse. Since the dollar is the reserve currency and has military “protection”¹³ from the US, other nations use it to trade with each other as they need to obtain dollars to purchase oil¹⁴. Finally, some of those dollars circulate back to the US economy as other nations invest in US stocks or treasury bonds. While in the short term, this financial system substantially benefitted US businesses “because large dollar holdings in foreign hands helped to facilitate the sale of U.S. exports”, in the long run, the decline in profitability and the rise of Japan and West Germany led to “the end of the U.S. role as a leading

“global economic health” is “dependent on the presence of a single dominant power”. US hegemonic power, as the single dominant power, establishes and maintains a stable global order necessary for a stable global economy. Thus, military power essential to access and control resources to dominate markets, thereby ensuring the smooth functioning of the U.S. economy.

¹³ The role of the US is to racketeer the third world countries just like the Mafia “claims money off clients to protect them against a danger that is, in fact the Mafia itself” (Gambetta 1993; Varese 2001; Røyrvik 2010: 10). US foreign policy was quick to adopt a new enemy, global terrorism, to pursue this protection role to maintain its economic hegemony by political means and military force.

¹⁴ This is in line with the Cartalist (or Chartalist) view of money, which “emphasize that money has definite social and political conditions of existence” (Fields and Vernengo 2012:6). This approach suggests that “it is the power of state, rather than the confidence of the markets, that is essential for the moneyness of a particular asset”, which holds for the dollar as the international currency as well (ibid, 8).

global exporter of industrial goods” (Brenner 2006: 125; cited Meyerson and Roberto 2010: 166).

The hardship for the US economy in terms of the imbalance in the positions of the dollar (i.e., a drain in gold reserves) intensified with the US defeat in Vietnam as the flow of dollars abroad created a huge Euro-dollar market (Clark 2005; Wallerstein 2003; Foster 2005; Meyerson and Roberto 2010). This led to the end of the dollar-gold regime when Nixon delinked the dollar from gold in 1971 de facto and in 1973 officially (D’Arista 2009). This is considered as the beginning of the decline of US economic hegemony (Foster 2006), which was supposed to be cured by financialization. The oil shock in 1973 led to a vast flow of petrodollars into the oil-producing states, which in turn flowed back to the US, mostly via American banks. This was a new phase of US economic hegemony. “The process of petrodollar recycling underpins the U.S.’s economic domination that funds its military supremacy. Dollar/petrodollar supremacy allowed the U.S. a unique ability to sustain yearly current account deficits, pass huge tax cuts, build a massive military empire of bases, and still have others accept its currency as medium of exchange for their imported goods and services” (Clark 2005: 28, quoted in Meyerson and Roberto 2010: 167). For the first time in history, a hegemon, the U.S., had the ability to be a global debtor to provide a default-risk-free asset to facilitate global capital accumulation (Fields 2015:146). In other words, the US as the hegemon, has served as the source of global stability, a lender of last resort, and equally important the source of global demand¹⁵ (Fields and Vernengo 2012).

Financialization intensified under the neoliberal paradigm, which promoted flexible exchange rates, free trade, and liberalizing capital accounts to expand toward developing countries, perpetuating the power of finance capital. While financialization is a global process it has varied between developed and developing countries so as to subordinate the latter to the former (Lapavitsas 2013). In this hierarchical financial system, funds recycle back to the US from developing countries through different channels, such as “repatriation of profits from

¹⁵ Fields and Vernengo note that hegemony is more a reflection of providing an asset that is free from the risk of default to spur global accumulation. Although gold served as the reference category, it was more a means of regulating exchange rates when Bretton Woods was in force. Therefore, when this regime fell, they argue, US power was strengthened rather than weakened because the dollar became a global fiat currency (Fields and Vernengo 2012).

foreign direct investments or from portfolio investments, repayment of external debts, and transformation of official reserves into credits” (Herrera 2013: 162). Foster and McChesney (2012) succinctly discuss the interdependence between the South and the North as the surplus created in the South through extremely low wages can only be consumed in the North.¹⁶ Even as most of the value created in developing countries goes to the North, the developing countries remain more prone to macroeconomic risk (Bonizzi et al. 2020). As profits are realized by exporters in emerging capitalist economies, domestic demand may be constrained, limiting prospects for profitable investment, leading non-financial firms and wealthy people to invest in financial markets, just like in developed economies. There is evidence that non-financial firms have amassed an increasing share of assets in financial investments, mostly at the expense of fixed capital formation (Demir 2007; Correa et al. 2012; Seo et al. 2012; Karwowski 2015; Tori and Onaran 2017; cited in Bonizzi et al. 2020; 181).

Although wages have been stagnant in the North, particularly in the US, consumption has been boosted with increased borrowing and using up personal savings. This was “made possible by the infusion of capital from abroad, itself encouraged by the hegemony of the dollar” (Foster 2008: 1). Furthermore, finance capital has imposed the very same addiction to high consumption by means of borrowing and promoted domestic financial markets, and aggressively attacked social welfare institutions (such as the health and education sector) to open up them for local and international private sector by means of *the predator state* (Galbraith 2008). This is part of what Harvey (2005) has labeled “accumulation by dispossession”, creating profit rather than wealth for the capital groups (in most cases, those that have close organic ties with the government) by exploiting public sources.¹⁷

¹⁶ Milberg (2008) and Milberg & Winkler (2010) argue that US companies have earned higher profits due to the mark-ups generated from their powerful role in global value chains, allowing them to maintain financialization by freeing up capital for financial investments. Another economic imbalance between developed and developing countries is that while the former basically fund themselves in domestic financial markets and currencies, the latter has to borrow in foreign currency, becoming more vulnerable to risk caused by currency volatility (Bonizzi et al. 2020: 179-80).

¹⁷ James K. Galbraith has argued that in the era of financial neoliberalism, capitalists aimed for “complete control of the apparatus of the state” (Galbraith 2008: 131), where the government “became little more than an alliance of representatives from the regulated sectors—mining, oil, media, pharmaceuticals, corporate agriculture—seeking to

With its absolute control over technology and communications, and by means of military power, financial capital has been able to sustain such a drain of capital from the South to the North, particularly the US (Klein 2007; Foster and McChesney 2012; Herrera 2013). Militarization of production is indispensable for global finance capital because it is a major source of profits and an extremely useful tool to reproduce itself by protecting and expanding markets¹⁸. Finance capital increased its power over the military sector by buying stock in giant arms corporations to become a major component of the military industrial complex. Herrera (2013) provides valuable information in this regard: “At the beginning of the 2000s, the proportion controlled by finance capital reached 95.0 per cent of the capital of Lockheed Martin, 86.5 per cent of that of Engineered Support Systems, 85.9 per cent for Stewart & Stevenson Services, 84.7 per cent for L-3 Communications, 82.8 per cent for Northrop Grumman, 76.0 per cent for General Dynamics, 70.0 per cent for Raytheon, 66.0 per cent for Titan, 65.0 per cent for Boeing, etc.” (Herrera 2013: 170). As the neoliberal paradigm reinforces privatization in the ‘defense sector’, finance capital also increases its share by taking this outsourced defense business (Cicchini and Herrera 2008; Herrera 2013).

Finally, Nölke provides an excellent discussion on the role of financialization in degrading democracy. That is, financialization leads to higher military spending by overcoming objections by weakening democratic structures in the developing countries, thereby helping the interests of the global military financial industrial complex (Nölke 2020).

bring the regulatory system entirely to heel” (ibid.131), seeing “the economic activities of the government not in the ideological terms but merely as opportunities for private profit on a continental scale” (ibid. 131).

¹⁸ Serfati shows that certain banks, known as the ‘armament banks’ were involved in arms production and trade, funded the large arms producing companies (Engelbrecht and Hanighen 1934; cited in Serfati 2020:206). Moreover, he notes that, in contrast to one’s expectation, banks (English, French, and German) contributed to the internationalization of the industry by funding competitor arms companies in other countries, acting against “national interests”, in (Lewinsohn 1935; Serfati 2019; cited in Serfati 2020:206).

The Impact of Financialization on the Rate of Profit

Financialization is a response to the crisis of accumulation due to underconsumption or the tendency of profit rates to decline.¹⁹ This subsection briefly discusses the relationship between militarization and financial profit rate.

The third volume of *Das Kapital* focused on the financial sphere of a capitalist economy. Marx examined the critical role of credit and financial speculation in capital accumulation, foreseeing the rise of the financial sector, and the centralization and concentration of capital (Roberts 2018). For Marx, financial investment was a counteracting factor to the tendency of the rate of profit to fall. Although credit helps to boost trade, its effect is limited because when the rate of exploitation of labor begins to decline, credits cannot be repaid. Against this background, some have analyzed financialization as a counteracting factor to the tendency of the rate of profit to fall, along with other counteracting factors originally noted by Marx and Engels²⁰ (Giacché 2011; Guillén 2014; Mavroudeas and Papadatos 2018; Ramirez 2019; Di Bucchianico 2020).

Financialization keeps aggregate demand high despite stagnant real wages by easing borrowing and creating wealth through increases in prices in the housing market. This in turn prevents the rate of profit from falling while opening up new investment opportunities in the financial sphere. Finally, financialization generates opportunities to earn money by speculating. Investigating the various channels through which financialization impacts the rate of profit, Di Bucchianico (2020) found effects due to technical innovations in the financial sector, the size of the financial sector in terms of its share in total profits and GDP, and rising household indebtedness. In addition, socio-political factors that reduce workers' bargaining power also had

¹⁹ The tendency for the rate of profit to fall is perhaps one of the most controversial issues in Marxist thought. There has been a sizeable theoretical and empirical literature that discusses the issues in three layers (Elveren 2019: 50): the tendency for the falling rate of profit in Marx's thinking; measuring the rate of profit – perhaps the least controversial area; and empirical studies of the sources of change in the rate of profit.

²⁰ In volume III of *Das Kapital* there are four countertendencies noted, namely raising the intensity of exploitation, depression of wages, cheapening the elements of constant capital, and foreign trade. Marx originally noted six counteracting factors. The two extra are the calculation of the rate of profit and 'relative overpopulation', related to depression of wages (Elveren 2019: 61).

a significant effect on the normal rate of profit. However, it is important to distinguish between the normal rate of profit (or non-financial profit rate) and the financial profit rate.

Bakir and Campbell (2010: 325) note that, from a Marxist perspective, financial profits are simply a transfer of part of the total profits to the financial sector. That is, profits are created in the real economy (i.e., productive capital), and such a transfer may theoretically have positive or negative effect on accumulation. On the one hand, it is a subtraction from the capital accumulation because “net interest payments to the financial sector from the non-financial sector are deductions from the produced profit that is available for productive reinvestment and accumulation” (ibid. 326). On the other hand, financial profits may increase the rate of accumulation by improving the conditions for further accumulation (Bakir and Campbell 2010: 325). In other words, Marx argues in the third volume of *Das Kapital* that credit does not create profits directly but improves the conditions to earn higher profits. The expansion of credit can accelerate the process of capital concentration. In terms of the circuit of capital model, the expansion of credit shortens the ‘turnover of capital’, thereby reducing finance lag (Foley 1982). Bakir and Campbell (2010) claim that, in financial capitalism, a smaller portion of profits was re-invested in the productive sphere of the economy because corporations were forced to pay significant fees for the money they borrowed from the financial sector, which otherwise would have been redirected to productive investment, causing a decline in the rate of accumulation.

Only a few studies have measured the financial rate of profit (Duménil and Lévy 2004; Bakir and Campbell 2013; Freeman 2012). Freeman shows that when financialization is taken into account, the corrected rate of profit exhibits a consistent long-run fall in the US and UK. Because it would be illogical to assume that monetary assets are capital in the hands of a bank but not in the hands of a company in the non-financial sector, one should also consider ownership of financial assets in calculating the profit rate for non-financial sector (Freeman 2012). Therefore, Freeman suggests adding medium- and long-run marketable assets to the denominator of the profit rate. Following such an alteration, the profit rate for the US and UK shows a steady decline up to the 1980s instead of a recovery as the traditional method suggests.

Bakir and Campbell (2013) provide three measures of the financial rate of profit: the Weisskopf rate of profit, the National Income and Product Accounts (NIPA) rate of profit, and the augmented rate of profit. They identify five major patterns:

- 1) The financial rate of profit has completely returned to its pre-1960s' levels.
- 2) The volatility in the augmented profit rate has increased since the 1990s.
- 3) The “Weisskopf” and “NIPA” rates of profit are only rough proxies for the augmented rate of profit.
- 4) The financial rate of profit is significantly higher than the non-financial rate of profit.
- 5) Under neoliberalism, recovery and growth were stronger for the financial rate of profit than the nonfinancial rate of profit (Bakir and Campbell 2013: 299-300).

As discussed above, military spending has been used as a stimulus to overcome chronic lack of aggregate demand, chronic stagnation problem due to underconsumption, and overaccumulation. Some studies have empirically analyzed the impact of military spending on the rate profit from a Marxist perspective (Elveren and Hsu 2016; Elveren 2019). Elveren (2019), in a comprehensive study, showed that while military expenditure counteracted the decline in the rate of profit throughout 1950-2014, the effect was not significant during the neoliberal era. He also noted that the counteracting effect holds for arms-exporting countries but not arms-importing countries. Moreover, using an adapted circuit of capital model, proposed by Foley (1982), he showed that a larger share of military sector is associated with a higher rate of profit as the finance lag is smaller in the military sector²¹. Elveren (2020) provided empirical evidence for this proposition. However, as we discussed, the pattern of the financial rate of profit differs from the normal rate of profit (i.e., the non-financial profit rate). To distinguish the difference between the two definitions of profit, financial and non-financial, and to reveal their mutual connection with militarization, a comprehensive statistical and empirical analysis will follow in the next section.

²¹ The model includes five key parameters: the proportion of surplus value recommitted to production, the mark-up over costs, and the production, realization, and finance lags. The production lag is the average number of periods required for an atom of value in capital outlay to be turned into a finished product. The realization lag shows how many periods are required to turn value as finished products into sales flow. Finally, “finance lag represents how many periods are required on average to turn value as sales flows into new capital outlay” (Foley 1982; Elveren 2020:6).

3. Data and Method

Our empirical analysis uses financialization and militarization indicators in the U.S. since it is the ‘best’ representative of the capitalist mode of production and there is a wide literature on its transformation as a financialization center and military power. But an empirical link between the two processes is still not covered in depth. We used yearly data from 1949 to 2019, which is the longest possible time series available. The indicators of financialization and militarization were selected based on the previous literature. The descriptions of the data are presented in Table 1.

Table 1: Data and Descriptions for Financialization and Militarization (1949-2019)

Series	Definition	Source
Finprof	Financial profits (in millions of US\$)	NIPA
Nonfinprof	Nonfinancial profits (in millions of US\$)	NIPA
fin_nonfinprof	Ratio of financial profits to nonfinancial profits	NIPA
int_gdp	Ratio of net interest to Gross Domestic Product	NIPA
divid_gdp	Ratio of Net dividends to Gross Domestic Product	NIPA
pr_general	Freeman’s general profit rate	Freeman (2012)
pr_corrected	Freeman’s corrected profit rate	Freeman (2012)
pr_nipa	Bakir&Campbell’s ‘NIPA’ Profit Rate	Bakir & Campbell (2013)
pr_weisskopf	Bakir&Campbell’s ‘Weisskopf’ Profit Rate	Bakir & Campbell (2013)
pr_augmented	Bakir & Campbell’s ‘Augmented’ Profit Rate	Bakir & Campbell (2013)
Milex	Military expenditure at current prices and exchange rates (in millions of US\$)	SIPRI
milex_gdp	Ratio of military expenditure at current prices to Gross Domestic Product	SIPRI

Notes: All variables are expressed in millions of dollars. The ratios are calculated accordingly. NIPA and SIPRI correspond to National Income and Product Accounts and Stockholm International Peace Research Institute. Freeman’s calculations are updated by the authors.

To measure financialization, we used various definitions of financial profits, together with interest and dividends as a ratio of gross domestic product. In her comprehensive literature survey, Davis (2017) presents empirical definitions of financialization, which reveals that these three measures as the most commonly used indicators in the literature. Additionally, we used the two profit rates calculated by Freeman (2012) and the three profit rates by Bakir and Campbell (2013). To measure militarization, we used military expenditure and the ratio of military expenditure to gross domestic product. Although militarization and militarism refer to different

aspects of the same process, it is not uncommon to use them interchangeably²². Militarism is a much broader concept than militarization in that the latter refers to only one aspect of the former, namely the increase in military spending. However, we acknowledge that it is not easy to operationalize militarism, so it is appropriate for our purposes in this study to limit our focus to militarization measured by military expenditure. The summary statistics for the overall data are presented in Table 2.

Table 2: Summary Statistics for the Data

Series	N	Mean	St. Dev.	Min	Max
finprof	71	126,429.30	152,032.30	3,055.00	462,028.00
nonfinprof	71	391,619.20	405,867.80	24,840.00	1,306,353.00
fin_nonfinprof	71	24.86	11.48	8.70	58.24
int_gdp	71	3.89	1.94	0.94	7.96
divid_gdp	71	3.52	1.31	2.28	6.74
pr_general	71	19.49	3.55	14.07	28.29
pr_corrected	71	7.18	2.12	4.19	12.00
pr_nipa	71	19.34	9.02	-5.88	33.25
pr_weisskopf	71	12.01	3.86	2.25	19.30
pr_augmented	71	4.81	13.27	-51.52	20.23
milex	71	273,918.80	233,899.70	14,088.16	752,288.00
milex_gdp	71	6.03	2.49	3.10	13.52

To form the empirical model correctly, the characteristics of the data need to be determined using appropriate statistical tests. As the data set is a rather long time series, we first tested for non-stationarity. The outcomes in Table 3 reveal that all variables are integrated at order one.

²² For example, while Peterson and Runyan (1999: 258) define militarization as “processes by which characteristically military practices are extended into the civilian arena”, Stavrianakis and Selby (2013:1) define militarism as “the social and international relations of the preparation for, and conduct of, organized political violence”.

Table 3: Testing for Stationarity

Series	lag	Level		Differences		Order of Integration
		ADF	p-value	ADF	p-value	
finprof	3	-1.75	0.673	-6.34	0.010	I(1)
nonfinprof	3	-1.24	0.884	-5.94	0.010	I(1)
fin_nonfinprof	3	-2.05	0.310	-5.02	0.010	I(1)
int_gdp	3	-1.60	0.484	-4.05	0.010	I(1)
divid_gdp	3	1.08	0.990	-4.43	0.010	I(1)
pr_general	3	-2.87	0.058	-4.52	0.010	I(1)
pr_corrected	3	-2.70	0.084	-4.07	0.010	I(1)
pr_nipa	3	-1.22	0.616	-5.21	0.010	I(1)
pr_weisskopf	3	-2.48	0.145	-4.78	0.010	I(1)
pr_augmented	3	1.68	0.990	-3.52	0.012	I(1)
milex	3	-2.41	0.400	-3.63	0.010	I(1)
milex_gdp	3	-2.64	0.094	-4.56	0.010	I(1)

Notes: ADF refers to the Augmented Dickey-Fuller test for unit root.

After conducting the unit root analysis, the empirical time series literature mostly uses cointegration methods to find the parameters explaining the overall structure. While such parametric models are quite common, they rely on several critical underlying assumptions, with linearity being the most important and restrictive. If the true data-generating process does not satisfy these assumptions, the results are misleading since the estimated coefficients become biased and inconsistent. Thus, unless it can be shown that a linear functional form between the dependent variable and the covariates holds globally, parametric models are not the best choice.

We therefore conducted statistical tests for possible nonlinearity in the model. There are numerous test statistics used in the literature based on distinct nonlinearity structures expressed by different null and alternative hypothesis. The neural network test of Teraesvirta and Granger (1993) and the White neural network test for nonlinearity (Lee, White and Granger, 1993) both test for the null hypothesis of linearity in the mean while the latter is also consistent with arbitrary nonlinearity in the mean. Keenan's one-degree test for nonlinearity (Keenan, 1985) compares departures from the linear autoregressive (AR) model against the square of the AR function while Tsay's test for nonlinearity (Tsay, 1986) similarly assesses quadratic nonlinearity in a time series. The difference is that Tsay's test incorporates the cross products of covariates, which increases the power of the test statistic. Finally, Chan's (1991) likelihood ratio test for

threshold nonlinearity uses the null hypothesis of AR process and the alternative hypothesis is specified as the threshold autoregressive process.

In particular, we are interested in a possible Bayesian structure as suggested by the initial statistical and graphical analysis, which will be described in the next section. Hence, we used the Teraesvirta and White neural network test with the null hypothesis of linearity in the mean. The results are presented in Table 4. The results of the other possible nonlinearity tests are also provided for cross-checking²³.

Table 4: Testing for Nonlinearity

Series	Teraesvirta		White		Keenan		Tsay		LR	
	Chi-sq	p-value	Chi-sq	p-value	F	p-value	F	p-value	Chi-sq	p-value
finprof	2.11	0.348	1.79	0.408	1.43	0.235	1.53	0.22	8.63	0.128
nonfinprof	4.47	0.107	4.45	0.108	3.01	0.088	3.96	0.051	8.17	0.148
fin_nonfinprof	2.54	0.280	1.04	0.594	0.56	0.456	0.56	0.455	12.00	0.038
int_gdp	0.04	0.983	0.04	0.980	0.24	0.623	0.30	0.826	8.79	0.209
divid_gdp	4.43	0.109	4.59	0.101	3.24	0.077	2.00	0.123	6.73	0.309
pr_general	1.62	0.445	1.85	0.396	0.00	0.958	2.75	0.020	7.74	0.324
pr_corrected	2.61	0.271	2.60	0.272	0.62	0.434	0.68	0.413	4.43	0.337
pr_nipa	37.40	0.000	33.50	0.000	19.04	0.000	19.10	0.000	27.44	0.000
pr_weisskopf	25.54	0.000	18.14	0.000	11.05	0.001	11.06	0.001	20.95	0.001
pr_augmented	9.61	0.008	10.57	0.005	8.14	0.006	9.71	0.003	13.67	0.019
milex	13.25	0.001	7.57	0.023	2.91	0.093	4.92	0.03	33.79	0.000
milex_gdp	1.40	0.497	1.15	0.562	0.02	0.897	2.07	0.070	22.14	0.004

Notes: Teraesvirta's neural network test: H0=Linearity in the mean

White neural network test: H0=Linearity in the mean

Keenan's one-degree test for nonlinearity: H0=The time series follows some AR process

Tsay's Test for nonlinearity: H0=The time series follows some AR process

Likelihood ratio test for threshold nonlinearity: H0=The time series follows some AR process.

H1=The time series follows some TAR process

The nonlinearity test results show that profit rates provided by Bakir and Campbell and the military expenditure data exhibit nonlinearity in the mean. For financial profits and non-financial profits, the test results do not reject the null hypotheses of AR process while the unit root tests already showed that financial profits and non-financial profits are nonstationary. As for the ratio of financial to nonfinancial profits and military expenditure to GDP, the neural network tests show linearity in mean, but the LR statistic suggests evidence of a threshold autoregressive

²³ The nonlinear time series analysis was carried out using the package “nonlinearTseries” in R statistical software.

process. Finally, net interests and dividends as a ratio of GDP and the Freeman profit rates show linearity in the mean. In sum, the non-stationarity and nonlinearity test results for our financialization and militarization indicators necessitate an empirical model that is flexible enough to handle nonlinear mean relationships.

We used nonparametric methods for dealing with these complexities in the empirical model. Nonparametric methods provide flexible tools as they avoid assumptions regarding the functional form of the regression equation, including linearity. Instead, the functional form of the relationship can vary locally over the range of covariates in the model. Such methods also provide a more comprehensive framework as they incapsulate the linear model as a limiting condition. As an intermediary solution, semiparametric models combine parametric and nonparametric techniques. The estimation of these models is essentially nonparametric, although some covariates are allowed to be parametric. Such hybrid approaches are especially useful if the model contains categorical variables that can only be included parametrically because their functional form is specified intrinsically.

Generalized Additive Models (GAMs), which can be applied as either a nonparametric or semiparametric tool, outperform the linear parametric models by relaxing two critical assumptions. The early Generalized Linear Models (GLMs) of Nelder and Wedderburn (1972) offer an expansion by allowing non-normal error distributions. This means that the ordinary least squares (OLS) method is no longer appropriate for estimating GLMs, so iteratively reweighted least squares (IRLS) are used instead. As a further extension, Hastie and Tibshirani (1990) relaxed the global functional form assumption in GAMs, which directly confronts the possibility of nonlinearity²⁴. While the model structure of GAMs was quite appealing initially, estimating the complexity of these models has remained a challenge until the necessary computational tools were developed. Recently, however, researchers have developed powerful statistical software for dealing with this issue, so the model has become even more functional.

Typically, GAM can be specified as follows (Wood, 2017: 249):

²⁴ Beck and Jackman (1998) provide a rigorous discussion about going beyond linearity.

$$g(\mu_i) = A_i\gamma + \sum_j^p f_j(x_{ji}) \quad (1)$$

where A_i is the parametric model matrix and f_j is a smooth function of covariates. The dependent variable y_i is assumed to be a member of the exponential family distribution $EF(\mu_i, \phi)$ with mean $E(y|x_1, \dots, x_p)$. This model is semi-parametric in the presence of the parametric component A_i . If, on the other hand, A_i does not appear in the model, GAM becomes entirely nonparametric. Under these circumstances, the whole function is based on the so-called *smoothing splines* f_j .

The estimation of the model is based on finding the optimal parameter set, with a trade-off calling for a balance between two aims. On the one hand, the fitted model should capture the true data-generating process by being close enough to the data. This is typically measured by the likelihood. On the other hand, the fitted model should reveal the complexity or nonlinearity inherent in the data. This complexity is explained by how much the fitted curve changes its shape – a measure known as *wiggleness*. It should be exactly the right amount needed to avoid fitting the noise in the model, i.e. over-fitting the data. Thus, the estimation is carried out by maintaining this delicate balance. The wiggleness of the model is mathematically incorporated through the spline functions, which are composed of simpler functions called *basis functions*. When we model using splines, each basis function b_k has a coefficient β_k . The resultant spline is the sum of these weighted basis functions:

$$f(x) = \sum_k \beta_k b_k(x) \quad (2)$$

The term in the summation introduces complexity into the model through wiggleness, which needs to be controlled. To avoid overfitting the model, we penalize this term, with the penalty measured by the *smoothness parameter* denoted by λ . This estimation method is then based on maximizing the following *penalized log-likelihood*:

$$l_p(\beta) = l(\beta) - \frac{1}{2\phi} \sum_j \lambda \beta^T S_j \beta \quad (3)$$

where the first component, the log-likelihood $l(\beta)$, measures closeness to the data and the second component, $\sum_j \lambda \beta^T S_j \beta$, is the smoothing penalty for wiggleness, with the penalty matrix defined

by S . Solving the optimization problem during estimation, we choose the appropriate smoothness parameter λ for each covariate in the model.

Several smoothness selection criteria can be used for the estimation²⁵. In this paper, we used the approach known as *empirical Bayes*. The basic idea of this method can be summarized as follows. We took the smoothing penalties to be represented by a Gaussian prior on the model coefficients and then we maximized the Bayesian log marginal likelihood. This approach departs from a fully Bayesian approach in that the latter puts a prior on λ before obtaining the corresponding posterior density. Our empirical Bayes approach, based on a *Restricted Maximum Likelihood* (REML) procedure, provided robust results, as discussed in the next section.

4. Empirical Results and Discussion

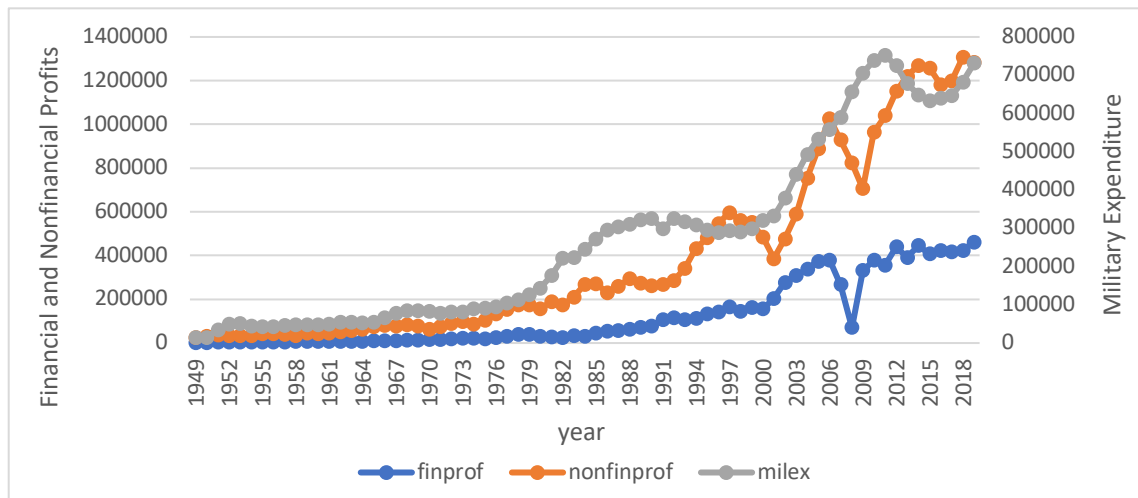
In this study, we used nonparametric GAM estimations to empirically evaluate the three main approaches regarding the link between financialization and militarization, outlined above. First, we consider a generic model for financialization and militarization, to gain an initial idea about the co-movement of the two indicators. This discussion does not yield any causal relationship between the two indicators but potentially reflects the relationship between financialization and militarization as a response to the economic conjuncture. Second, we investigate how financialization and militarization affect each other. To do so, we control for the effect of gross domestic product as an underlying factor before obtaining a model of how the two variables respond to each other. Hence, this part provides a discussion on the dialectical link between financialization and militarization. Third, we discuss the Marxist analysis of declining profit rates in relation to military expenditure. We employ different definitions of the profits rates in Freeman (2012) and Bakir and Campbell (2013), and investigate their link with militarization.

²⁵ The interested readers can refer to Wood (2017) Chapter 5 for a detailed analysis of smoothers.

Financialization and Militarization as Potential Response Variables

Starting with the most generic form of the model to understand the characteristics of financialization and militarization, we look first at financial profits and military expenditure. Figure 1 shows that financial and nonfinancial profits increased after the neoliberal transformation. Nonfinancial profits, which still represent the larger portion of total corporate profits, experienced more volatility after 1980 whereas financial profits increased more slowly and steadily, except for the financial collapse during the mortgage crisis in 2008-2009. Even in 2001, when nonfinancial profits declined, financial profits were relatively stable. Moreover, this rise in financial profits paralleled the upsurge in the military expenditure with even more accelerated amounts.

Figure 1: Indicators of Profits and Military Expenditure



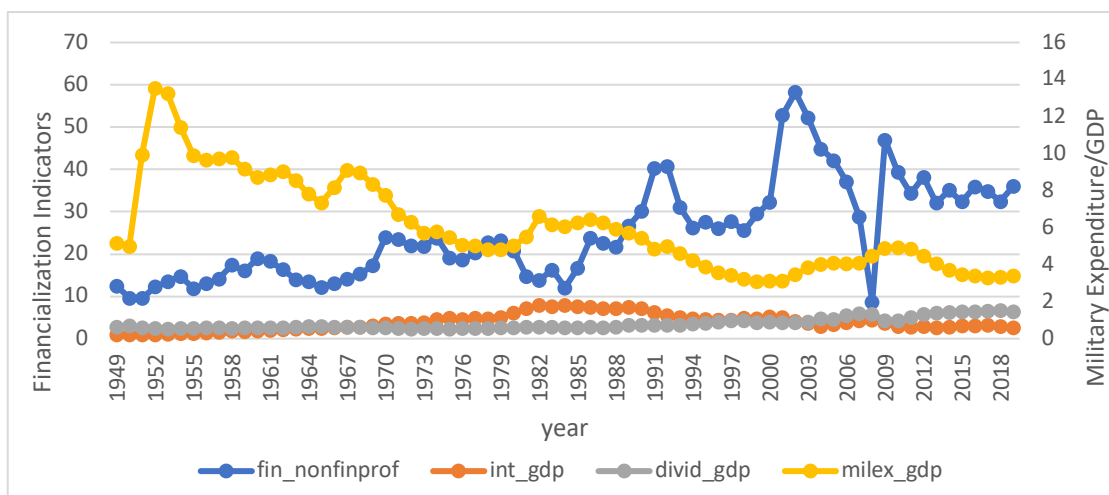
Following the initial observation about the simultaneous rise in financial profits and military expenditure, we need to uncover the potential linkages between the two indicators. There are possible scenarios. First, the two indicators may be correlated in the long run. As the military expenditure data exhibits nonlinearity, this can only be demonstrated by a nonlinear cointegration test. Second, the two indicators may be not only correlated but also causally linked. The possibility of univariate/bivariate causality can be tested using nonlinear Granger causality tests. Following a nonlinear autoregressive distributed lag (ARDL) type of specification, the two nonlinear causality tests by Hiemstra and Jones (1994) and Kyrtsou and Labys (2006) can be used for these purposes. Third, the most likely outcome is that both variables are responding to the growth in the economy. In this case, without controlling for the effect of the underlying factor, the remaining risk of

estimating a spurious regression is not eliminated. In fact, the estimations of these generic models exhibit unusually high coefficient of determination although the diagnostics of the models are not satisfactory²⁶. Thus, we revised our models for financialization and militarization by controlling for the effect of the overall economic conjuncture, which can be proxied by the measure of GDP.

The Dialectics of Financialization and Militarization

The degree of financialization and militarization can be better described by taking the ratios rather than the totals. Figure 2 displays the most frequently used measures for financial indicators in the literature (see Davis, 2017) in conjunction with the ratio of military expenditure to GDP. It appears that the rate of financial profits to nonfinancial profits generally increased apart from local deviations. Military expenditure as a share of GDP, on the other hand, declined slightly before 1980 but remained relatively stable after that. Net interest and dividends as a ratio of GDP did not vary much, which may not alter the overall pattern between the financialization and militarization. Thus, when the ratio of financial to nonfinancial profits is used as a measure of financialization, there is a roughly inverse relationship with the selected measure of militarization.

Figure 2: Selected Indicators for Financialization and Militarization



Before constructing the formal model, we should identify the response variable and rule out possible endogeneity in the model. The results of the Teraesvirta and White tests (Table 4) indicate that all four variables are linear in the mean, which allows testing for usual Granger

²⁶ The results of these generic models are presented in the Appendix.

causality among them. Table 5 presents the results of the Granger causality tests. There is bivariate causality between military expenditure as a ratio of GDP and financial profits as a ratio of nonfinancial profits. However, there is no causality between military expenditure and the net interests as a ratio of GDP or net dividends as a ratio of GDP.

Table 5: Testing for Linear Causality in Selected F&M Indicators

Specification	Null Hypothesis	lag	F	p-value
FM.1	milex_gdp does not cause fin_nonfinprof	1	4.221	0.044
	fin_nonfinprof does not cause milex_gdp	1	6.113	0.016
FM.2	milex_gdp does not cause int_gdp	1	0.731	0.396
	int_gdp does not cause milex_gdp	1	2.560	0.114
FM.3	milex_gdp does not cause divid_gdp	1	0.870	0.354
	divid_gdp does not cause milex_gdp	1	0.627	0.431

One caveat should be noted about nonparametric techniques. Their precision declines if several explanatory variables are included in the model, which is known as *the curse of dimensionality* (Härdle et al., 2004: 4). Moreover, additional covariates may have concurrency even if they are not collinear, which implies that they may behave like smooth curves of each other. In our financialization-militarization model, the ratio of financial profits displayed strong concurrency with the ratios of net interest rates and dividends as the corresponding test values were greater than 0.6 for each pair of variables. As these outcomes may affect the precision of the estimates, we used univariate rather than multivariate GAM models²⁷. Based on the bivariate causality found in Table 5, we estimated the following financialization-militarization (FM) models:

$$fin_nonfinprof_t = \alpha_0 + f_1(milex_gdp_t) \quad (FM.1)$$

$$milex_gdp_t = \beta_0 + f_1(fin_nonfinprof_t) \quad (FM.2)$$

²⁷ However, the presence or absence of these additional covariates do not change the overall relationship between the ratio of financial to nonfinancial profits and militarization since the effect of interest rates and dividends are negligible and do not follow a causal pattern. Interested readers can compare these results with those in the Appendix.

Table 6 presents the estimation results for the FM.1 and FM.2 models²⁸. The constant term, which appears as a parametric component, is significant for both models. In both of our estimated models, there are nine basis functions and the effective degrees of freedom (edf) are significant and greater than one. The value of edf measures the complexity of the smoothness or wiggleness in the estimation. If it is close to one, the estimated model is closer to a straight line whereas higher edf values describe more wiggly curves.

Table 6: GAM Estimation Results of F&M Models

		<i>Dependent variable</i>	
		<i>milex_gdp</i>	<i>fin_nonfinprof</i>
		FM.1	FM.2
Constant	estimate	6.032***	24.856***
	std. err.	0.194	0.972
s(fin_nonfinprof)		<i>see Figure 3</i>	
s(milex_gdp)			<i>see Figure 4</i>
<i>Approximate significance and basis dimension of smooth terms</i>			
s(fin_nonfinprof)	edf	4.875	–
	p-value	0.000	–
	k	9	–
s(milex_gdp)	edf	–	2.633
	p-value	–	0.000
	k	–	9
Observations		71	71
Adjusted R ²		0.569	0.491
Deviance Explained		59.90%	51.00%
Log Likelihood		-139.437	-252.825
UBRE		140.852	248.72

Notes: (***) denotes significance at 1%. The values in parentheses are p-values. Edf and k are effective degrees of freedom and basis functions, respectively. UBRE denotes Unbiased Risk Estimator.

It is customary in nonparametric models to show the resultant smooths using plots rather than printing the coefficients. This is because each smooth has several coefficients, one for each basis functions. The estimated smooth curve of the FM.1 model presented in the left-hand panel of Figure 3 demonstrates that, at the overall level, $fin_nonfinprof_t$ ratio as a financialization measure has a nonlinear negative effect on the $milex_gdp_t$ ratio. However, there are some

²⁸ For all of the GAM estimations presented, we used R statistical software packages “mgcv” and “gratia”.

exceptions where the curve is upward trending when $fin_nonfinprof_t$ has relatively small values at the beginning and also when it reached a medium level.

The right-hand panel of Figure 3 presents the diagnostic results for the estimated FM.1 model. The quantile-quantile plot in the top-left graph compares the model residuals to a normal distribution. It should be close to a straight line for a well-fitted model. The bottom-left graph shows the histograms of the residuals, which should have a symmetrical bell shape. The top-right plot displays the residual values, which should be evenly distributed around zero. Finally, the bottom-right graph plots the response against the fitted values, which ideally should form a straight line. All these overall diagnostics seem to be satisfactory for FM.1 model.

Figure 3: GAM Estimations for FM.1 Model



Figure 4 shows the results of the GAM estimation modelling the effect of $fin_nonfinprof_t$ on the $milex_gdp_t$ ratio. In this case, the considered financialization measure has a negative effect on militarization. The diagnostics of the estimation given in the right-hand panel outperform the FM.1 specification, especially in terms of normality and the fitted value graphics.

Figure 4: GAM Estimations for FM.2 Model

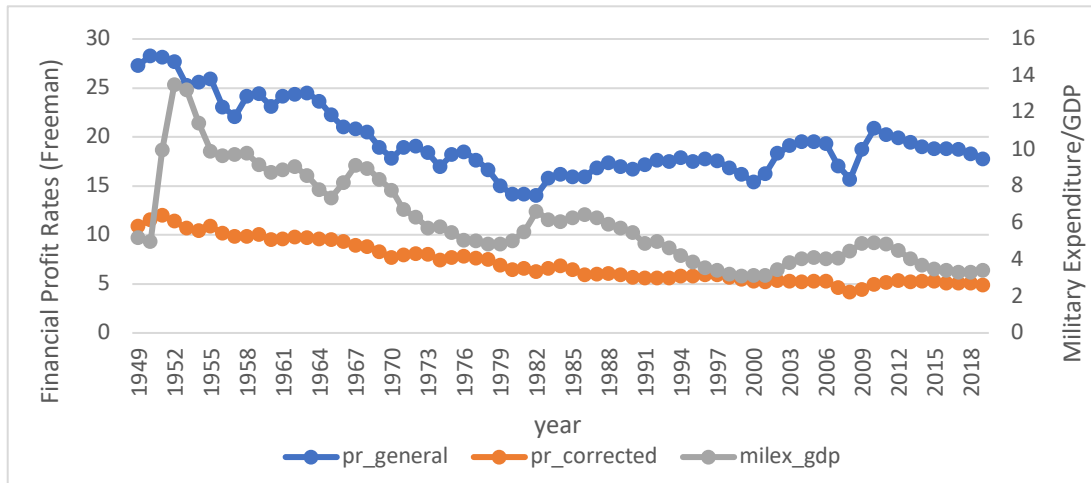


These results imply that militarization is negatively associated with the degree of financialization when the financialization measures used – including the interest rates and dividends – are selected from the previous literature. However, the interpretation of these two models should be regarded with caution. Although the fact that financial profits increased more quickly than nonfinancial profits indicates the degree of financialization, it is an ambitious measure to assess overall financialization because we are observing acceleration rather than the increase itself. In other words, when financial profits and non-financial profits and their corresponding profit rates increase simultaneously, the ratio of financial to nonfinancial profits may still be falling. Indeed, Figure 2 shows a rise in this accelerated measure. However, regarding the association with the military expenditure as a ratio of GDP, we believe that financial profit rates may better characterize the actual relationship.

Financial Profit Rates in Relation to Militarization: Freeman definitions

Freeman (2012) discusses two different definitions for profit rates tied up with financialization. First, he discusses the general profit rate traditionally measured by most Marxist scholars. This definition is calculated as a ratio of corporate value added with respect to corporate capital stock. This has tended to rise since the 1970s. Freeman then presents a corrected measure of the profit rates that includes financial securities in the denominator. After this adjustment, he claims, the tendency of the rate of profit to fall become apparent in both the UK and US economies, even after the 1980s. Our research question follows from this: Are these general or uncorrected profit rates in the US economy also related to militarization of the country? Our initial observations based on the graphical analysis of Figure 5 suggest that there may be such a correlation.

Figure 5: Financial Profit Rates (Freeman definition) and Militarization



The three indicators, namely the two profit rate definitions and military expenditure as a ratio of GDP, seem to have a similar long-run pattern (Figure 5). However, we need to demonstrate that the relationship is not spurious by applying linear cointegration analysis and vector error correction models²⁹. We do not go into details here for two reasons. First, the likelihood ratio test suggested the possibility of threshold nonlinearity in the *milex_gdp* variable. Thus, we believe Bayesian inferences may more reliably detect the underlying cointegrating pattern. Second, as we aim to provide an overall discussion on the profit rates together with Bakir and Campbell’s specifications – which are in fact nonlinear in the mean, we prefer the analyses to be comparable. Given that the empirical Bayesian model that we use here works both with linear and nonlinear variables, we retain this method for the Freeman type profit rates, although they are linear (Table 4).

Table 7 presents the causality test results regarding the patterns of correlation between profit rates *pr_general* and *pr_corrected* in relation to *milex_gdp*. They indicate univariate causality running from the financialization measure using the Freeman-type (F) profit rates to the measure of militarization *milex_gdp*.

²⁹ Both the Johansen trace and maximum eigenvalue test statistics show that there is cointegration between the variables *pr_general* and *milex_gdp*. The same test statistics also show evidence of cointegration between the variables *pr_corrected* and *milex_gdp*. The Johansen cointegration test is applied on the grounds that it is robust against endogeneity in the regressors. The results can be provided on request.

Table 7: Testing for Linear Causality in Financial Profit Rate Models (F)

Specification	Null Hypothesis	lag	F	p-value
F.1	milex_gdp does not cause pr_general	1	0.024	0.878
	pr_general does not cause milex_gdp	1	11.949	0.001
F.2	milex_gdp does not cause pr_corrected	1	1.455	0.232
	pr_corrected does not cause milex_gdp	1	27.623	0.000

Thus, we specify the following two univariate models to determine the effect of financial profit rates on militarization:

$$milex_gdp_t = \alpha_0 + f_1(pr_general) \quad (F.1)$$

$$milex_gdp_t = \beta_0 + f_1(pr_corrected) \quad (F.2)$$

Table 8 presents the estimation results for the F.1 and F.2 models. Both smoothing splines are significant with nine basis functions. The effective degrees of freedom indicate that the general profit rates result in a wigglier curve whereas the Freeman-corrected profit rates appear to be smooth.

Table 8: GAM Estimation Results of Financial Profit Rate Models (F)

		<i>Dependent variable: milex_gdp</i>	
		F.1	F.2
Constant	estimate	6.032***	6.032***
	std. err.	0.194	0.164
s(pr_general)		<i>See Figure 6</i>	
s(pr_corrected)			<i>See Figure 7</i>
<i>Approximate significance and basis dimension of smooth terms</i>			
s(pr_general)	edf	4.298	–
	p-value	0.000	–
	k	9	–
s(pr_corrected)	edf	–	1.000
	p-value	–	0.000
	k	–	9
Observations		71	71
Adjusted R ²		0.571	0.69
Deviance Explained		59.70%	69.40%
Log Likelihood		-139.014	-125.902
UBRE		139.796	124.689

Notes: (***) denotes significance at 1%. The values in parentheses are p-values. Edf and k are effective degrees of freedom and basis functions respectively. UBRE denotes Unbiased Risk Estimator.

Figures 6 and 7 show the resultant smooths for the estimated F.1 and F.2 models . At the overall level, *pr_general*, which denotes the general profit rate definition commonly used in the Marxist literature, is positively associated with the military expenditure/GDP ratio. This overall pattern is not observed only for very small or very large profit rate levels, which is where the Freeman correction comes into play. As the denominator is corrected via the inclusion of securities in the *pr_corrected* rates, the profit rates become more representative of financialization. Remarkably, after applying this adjustment to the profit rates, their effect on militarization now becomes linear and positive throughout. Thus, when the Freeman-corrected profit rates are used as a measure of financial instruments, the decline in this rate causes a decline in military expenditure as a ratio of GDP.

Models specified with the corrected rates also exhibit better diagnostics than uncorrected profit rates. Specifically, the residual histogram becomes closer to a normal distribution while the fitted values become closer to the observed values, as can be seen from the right-hand panels of Figures 6 and 7.

Figure 6: GAM Estimations for F.1 Model



Notes: Left-hand panel shows the estimation outcomes. Right-hand panel shows the diagnostics of the estimations.

Figure 7: GAM Estimations for F.2 Model



Notes: Left-hand panel shows the estimation outcomes. Right-hand panel shows the diagnostics of the estimations.

Estimating financial profit rates using the Freeman definition provides interesting results. Freeman (2012) argues that *fictitious capital* is also a form of capital that must be accounted for when calculating the profit rate. Our analysis is in line with his results in that his corrected profit rate calculation suggests a more coherent measure that better represents how profit rates are changed by financialization. His basic hypothesis is that, after including this financial component, profit rates continued to decline after the 1980s, unlike the general profit rates used in the previous literature. He observes that “it smooths out some of the volatility in the uncorrected rate before 1982” (p. 178). This smoother effect is observed also in our analysis when the corrected and general profit rates are compared.

For both definitions of profit rates, the estimation results indicate a positive relationship with military expenditure as a ratio of GDP. The causal relationship is now univariate and runs from the profit rate definitions to the militarization indicators. A couple of observations are needed regarding this critical results, in conjunction with the previous financialization-militarization model. First, the graphical analysis in Figure 5 shows that the military expenditure/GDP ratio tends to decline and declines more quickly than the Freeman-corrected profit rates, which include financialization. In fact, Freeman notes that the “US economy has, for the past 30-40 years, performed worse than at any time since the 1930s” (p. 168). The surplus shared by capitalists has been shrinking, which leads to a decline in all expense items, including

military expenditure. Under these conditions, the decline in the profit rates is inevitable and may lead also to a decline in military expenditure as a ratio of GDP. Thus, the causality running from the contracted profit rates to the military expenditure as a rate of GDP can be expected.

On the other hand, this may still be consistent with our earlier observations on the acceleration of financialization. We found before that the ratio of financial profits to nonfinancial profits is negatively associated with the ratio of military expenditure to GDP while the causality was bivariate. This may also be due to current crises in the US capitalist system. Under these crisis conditions, it is always easier to shift to unproductive sectors represented by financial instruments. Thus, when all expenditure is shrinking – including military expenditure – we may observe an escape to unproductive capital, leading to an overall rise in the degree of financialization measured by the ratio of financial profits to nonfinancial profits. In other words, the acceleration in financialization may be accompanied by a fall in the Freeman-corrected profit rates. The uncorrected profit rates, on the other hand, may have an erratic pattern, as shown by the nonlinear pattern observed in our model (Figure 6). This explains why Dunne et al. (2013) and Elveren (2019) found that military spending has a less significant impact on the general rate of profit rate. For instance, using four different general rates of profit covering different time periods, Elveren (2019) found that only one of the rates had a significant relationship (but only at the 10-percent level) with militarization in the U.S. As discussed earlier, the general Marxist argument is that capital shifts to unproductive sectors in response to the capital accumulation problem, thereby increasing the share of financial profits in total profits. An increase in the financial profits/nonfinancial profits ratio reflects this trend, which is accompanied by a decline in the Freeman-corrected profit rate and Bakir and Campbell's rates. Therefore, an increase in military spending is associated with an increase in financial profits more clearly than an increase in the general rate of profit.

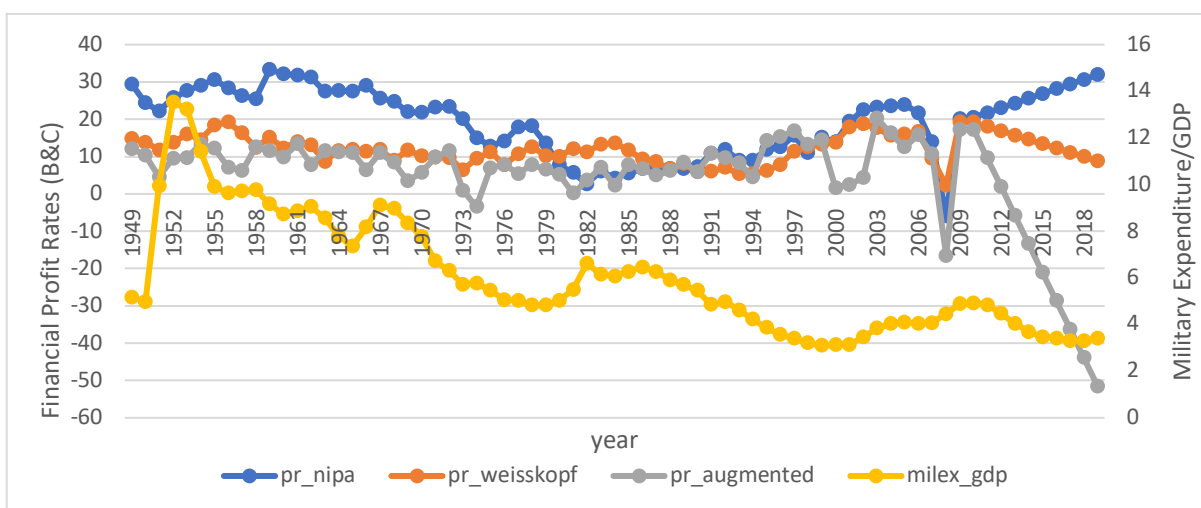
Financial Profit Rates in Relation to Militarization: Bakir and Campbell definitions

Bakir and Campbell (2013) move a step further. Using meticulous calculations, they define and monitor three types of financial profit rates: Weisskopf, NIPA, and augmented. The augmented profit rates, which include financial earnings and capital, experienced greater volatility

than before. The Weisskopf and NIPA rates, on the other hand, are poor proxies for the augmented rates, especially when there are strong volatile contributions from the omitted financial variables.

Figure 8 presents the three financial profit rates of Bakir and Campbell (B&C) in relation to the ratio of military expenditure to GDP³⁰. The Weisskopf rate is slightly better at tracking the augmented financial profit rates whereas the NIPA rate is a much poorer proxy. Similar to Freeman’s discussion before, these profit rates cannot capture the declining trend when they fail to properly describe the financial components.

Figure 8: Financial Profit Rates (B&C Definition) and Militarization



Notes: For Bakir and Campbell’s NIPA, Weisskopf, and Augmented profit rates, the missing observations after 2011 were obtained by extrapolation.

The three B&C financial profit rate definitions can be modeled in relation to the militarization indicator *milex_gdp* using the following three specifications. All three financial profit rates are nonlinear in the mean and estimated by the empirical Bayesian method as before. We form the specifications in an analogous way to the previously described Freeman-type profit rates, not only for the sake of obtaining comparable results but also because both discuss the same underlying pattern between financial profits and militarization.

$$milex_gdp_t = \alpha_0 + f_1(pr_nipa) \tag{BC.1}$$

³⁰ The results do not change when the original data for 1949-2011 is used. The results can be provided on request.

$$mileyx_gdp_t = \beta_0 + f_1(pr_weisskopf) \quad (BC.2)$$

$$mileyx_gdp_t = \gamma_0 + f_1(pr_augmented) \quad (BC.3)$$

The estimation results are presented in Table 9. The augmented profit rate model shows high nonlinearity, which can be handled by the generalized additive model estimations. This result is a corollary of the fact that augmented profit rates better characterize the complexity of financial profits and have much greater volatility, as Bakir and Campbell suggest (p. 299).

Table 9: GAM Estimation Results of Financial Profit Rate Models (BC)

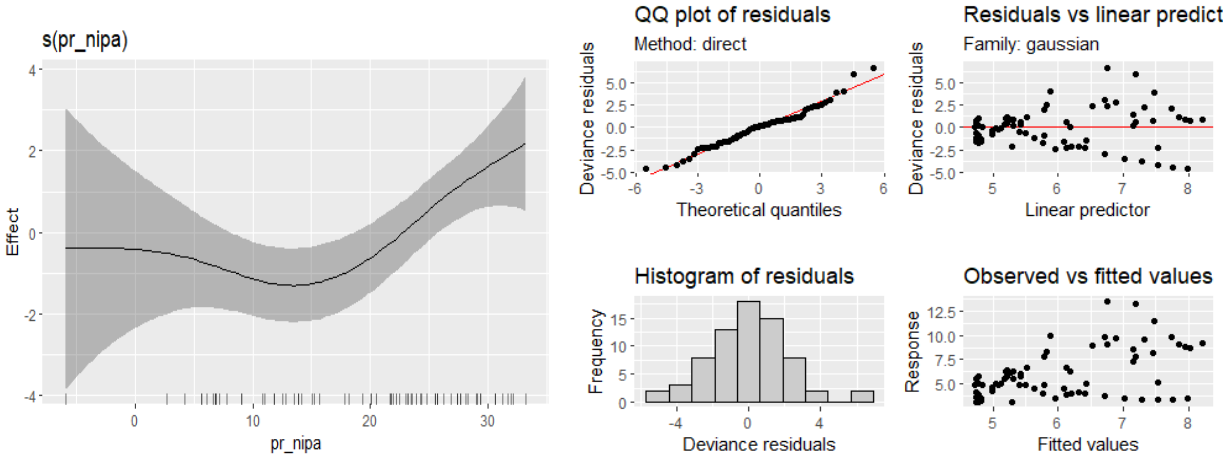
		<i>Dependent variable: milex_gdp</i>		
		BC.1	BC.2	BC.3
Constant	estimate	6.032***	6.032***	6.032***
	std. err.	0.265	0.293	0.266
s(pr_nipa)		<i>See Figure 9</i>		
s(pr_weisskopf)		–	<i>See Figure 10</i>	–
s(pr_augmented)		–	–	<i>See Figure 11</i>
<i>Approximate significance and basis dimension of smooth terms</i>				
s(pr_nipa)	edf	2.828	–	–
	p-value	0.00267	–	–
	k	9	–	–
s(pr_weisskopf)	edf	–	1.597	–
	p-value	–	0.327	–
	k	–	9	–
s(pr_augmented)	edf	–	–	4.134
	p-value	–	–	0.00922
	k	–	–	9
Observations		71	71	71
Adjusted R ²		0.195	0.018	0.188
Deviance Explained		22.70%	4.07%	23.60%
Log Likelihood		-160.66	-167.111	-161.583
UBRE		159.205	164.827	161.536

Notes: (***) denotes significance at 1%. The values in parentheses are p-values. Edf and k are effective degrees of freedom and basis functions respectively. UBRE denotes Unbiased Risk Estimator.

Figures 9-11 present the estimated effects of financial profit rates on the military expenditure/GDP ratio. The outcomes are parallel to what we found before for the Freeman-type

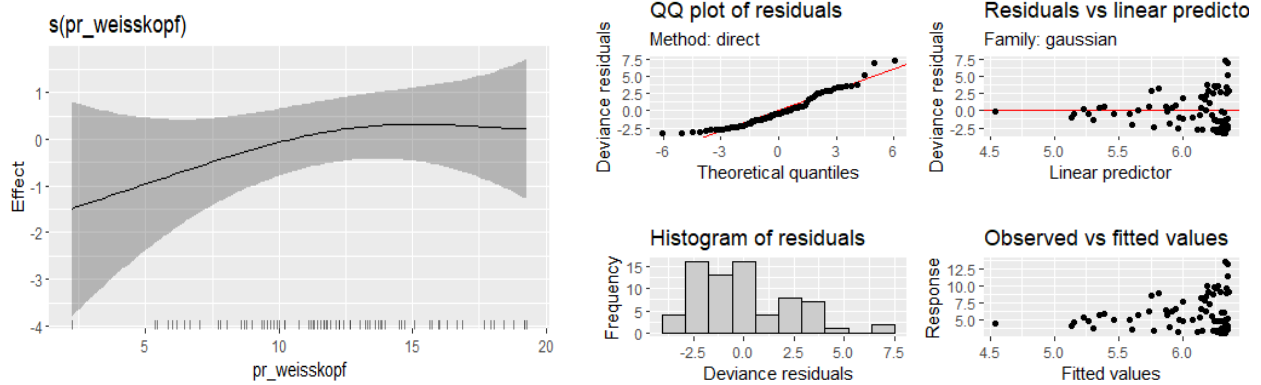
profit rates. At the overall level, the three B&C financial profit rates are positively associated with the military expenditure/GDP ratio. However, one interesting observation follows for the augmented profit rate models. For very large values of the financial profit rates, the relationship is reversed. This actually corresponds to higher stages of financialization where an escape towards unproductive financial capital is accompanying the decline in military expenditure as a ratio of GDP. Since the NIPA and Weisskopf profit rates are poor proxies as they only partially represent the financial variables, this reversal does not emerge in the BC.1 and BC.2 models.

Figure 9: GAM Estimations for BC.1 Model



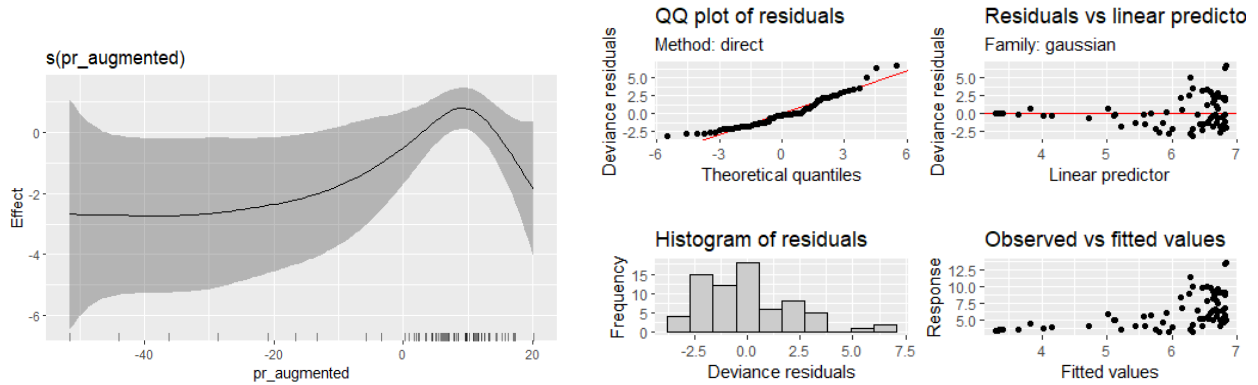
Notes: Left-hand panel shows the estimation outcomes. Right-hand panel shows the diagnostics of the estimations.

Figure 10: GAM Estimations for BC.2 Model



Notes: Left-hand panel shows the estimation outcomes. Right-hand panel shows the diagnostics of the estimations.

Figure 11: GAM Estimations for BC.3 Model



Notes: Left-hand panel shows the estimation outcomes. Right-hand panel shows the diagnostics of the estimations.

The results of the overall empirical analysis of the financialization-militarization models explain different pieces of the theory of *fictitious* capital and their determination with respect to militarization. The main results can be summarized by several crucial observations. First, the graphical analyses reveal that both financial and nonfinancial profits generally rose after the neoliberal transformation. Even when nonfinancial profits declined, financial profits remained relatively stable and this rise in financial profits went hand in hand with an upsurge in military

expenditure. Moreover, the degree of financialization, measured by the ratio of financial profits to nonfinancial profits, also generally increased apart from local deviations. Military expenditure as a share of GDP, on the other hand, declined slightly. The economic conjuncture, remarkably, has not been very promising for the capitalist mode of production. As the profit rate calculations of Freeman (2012) and Bakir and Campbell (2012) show, profits rates tend to decline steadily, especially after accounting for financial instruments. The decline in the profit rates may have also led to a decline in all expense items, including military expenditure as a ratio of GDP. This is reflected by the negative effect of financial profit rates on the military expenditure/GDP ratio. Whenever financial profits rose during crises, military expenditure as a ratio of GDP contracted slightly as a compulsory measure. US capitalism may thus have been searching new ways for a solution to its crisis by occupying *through* Wall Street, rather than merely invading other countries with its armed forces.

5. Conclusion

This study aimed to provide the first comprehensive empirical evidence on the nexus of financialization and militarization. We focused on the U.S. as the key country due to its hegemonic role in the world economy and politics, analyzing this relationship for 1949-2019 with respect to the argument of Arrighi (1994) that financialization and militarization are mutually reinforcing phenomena in the US.

One key contradiction of a capitalist economy is that it must grow continuously. However, constant growth is restricted by the availability of new markets, new products, and new technologies. This inevitably leads to a decline in profitability. To prevent profit rates from further decreasing in the long term, there must be spending in the unproductive sphere of the economy. The system responded with two counteracting stimuli: the increasing volume of financialization and the growing role of the financial sector in the economy, and militarization in terms of consistently excessive military spending. However, we stressed that they may be mutually interacting rather than independent factors. The absolute dominance of the dollar secured US global economic hegemony, making the US the center of global financialization. This economic power allowed it to have an excessive military budget and hundreds of military bases across the world. This, in turn, maintained the US political power, thereby securing the dollar's hegemony.

To investigate this argument empirically, we used various variables based on different approaches of measuring financialization, namely interest, dividends, and alternative definitions of financial profits, along with military spending and military spending as a share of GDP. Employing several parametric and non-parametric methods, we provided suggestive evidence on the relationship between financialization and militarization in the US.

First, we found significant and complex relationships between different measures of financialization and militarization. Whereas, overall, increased financialization co-exists with increased military expenditure, a more careful analysis is required for acceleration. While there were no causal relationships between military expenditure/GDP and the net interests/GDP or net dividends/GDP ratios, there was bivariate causality between the ratio of military expenditure to GDP and the ratio of financial profits to nonfinancial profits. The model estimations suggest a dialectical relation in which the rise in the degree of financialization is intertwined with a relative decline of military expenditure as a ratio of GDP.

Second, based on different financialization and financial profit variables, our results suggest that the definitions of the profit rate and whether they reflect the financial components are critical. For instance, for very large values of the augmented financial profit rate, there is a negative relationship with military spending. This corresponds to higher stages of financialization, where an escape towards the unproductive financial capital goes hand in hand with a decline in the military expenditure as a ratio of GDP. However, this effect cannot be captured by Weisskopf or NIPA definitions. This result also holds true for the Freeman's corrected profit rates. Here, the link with militarization is more apparent when financial instruments are included in calculating the profit rates.

Third, the results complement the findings of Dunne et al. (2013), Ansari (2018), and Elveren (2019), who found that military spending increased the general rate of profit in the U.S. for 1949-2010, 1973-2015, and 1951-2016, respectively. The findings in this study show that military expenditure is positively associated with both the general profit rate and financial profit rate. As in the case of the profit rates of Freeman, both the general and corrected rates of profits have a causal effect on military expenditure as a ratio of GDP.

Finally, our findings suggest that military expenditure is more significantly correlated with financial profit than the general (i.e., uncorrected) rate of profit as in the case of Freeman's corrected profit rate and Bakir and Campbell's alternative financial profit rate definitions. While corrected profit rates (i.e., financial profit) have a linear positive impact on military spending, the uncorrected profit rates show an erratic pattern. This is an important finding, particularly when considered in relation to the finding that the financial profits/nonfinancial profits ratio is negatively associated with the military expenditure/GDP ratio, and the causality is bivariate. That is, these two findings together explain why previous studies reported a less significant effect of military spending on the rate of (general) profit rate.

We acknowledge that there are several ways to further investigate this important relationship. For example, using alternative statistical methods and investigating other major countries in the global financial system would provide further insights.

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Appendix

When the financial profits and military expenditure are expressed in totals, the following generic model specifications are under consideration:

$$finprof_t = \alpha_0 + f_1(milex_t) \quad (GM.1)$$

$$milex_t = \beta_0 + f_1(finprof_t) \quad (GM.2)$$

The estimation results are presented in Table A.1 and the estimated smooths are shown in Figures A.1 and A.2.

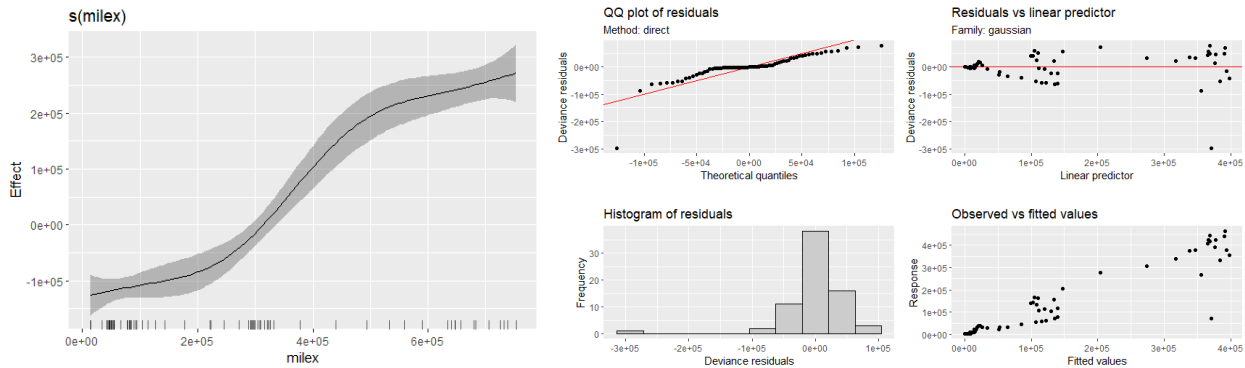
Table A.1: GAM Estimation Results of Generic Models (GM)

	<i>Dependent variable</i>	
	<i>finprof (GM.1)</i>	<i>milex (GM.2)</i>
Constant	126,429.300 ^{***} (0.000)	273,918.800 ^{***} (0.000)
s(milex)	<i>See Figure A.1</i>	-
s(finprof)	-	<i>See Figure A.2</i>
<i>Approximate significance and basis dimension of smooth terms</i>		
s(milex)	edf	4.32

		(0.000)	
	k	9	
s(finprof)	edf		6.41 (0.000)
	k		9
Observations		71	71
Adjusted R ²		0.887	0.923
Deviance Explained		89.4%	93%
Log Likelihood		-874.122	-891.896
UBRE		854.509	874.888

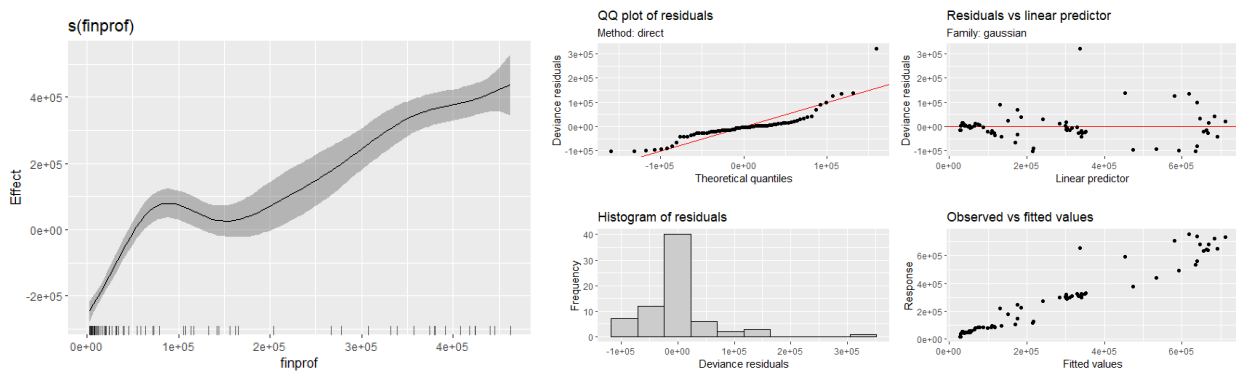
Notes: (***) denotes significance at 1%. The values in parentheses are p-values. edf and k are effective degrees of freedom and basis functions, respectively. UBRE denotes Unbiased Risk Estimator.

Figure A.1: GAM Estimations for GM.1 Model



Notes: Left panel shows the estimation outcomes. Right panel shows the diagnostics of the estimations.

Figure A.2: GAM Estimations for GM.2 Model



Notes: Left panel shows the estimation outcomes. Right panel shows the diagnostics of the estimations.

These generic models have unusually high R-squared measures; yet, they may be triggered by an underlying factor such as the economic conjuncture measured by the gross domestic product. As these effects should be controlled in the analysis, we abstain from working with the totals.

The financialization-militarization model expressed in ratios, rather than the totals, are studied. When all of the covariates are included in the specification, the model becomes:

$$miles_gdp_t = \beta_0 + f_1(fin_nonfinprof_t) + f_2(int_gdp_t) + f_3(divid_gdp_t) \quad (FM)$$

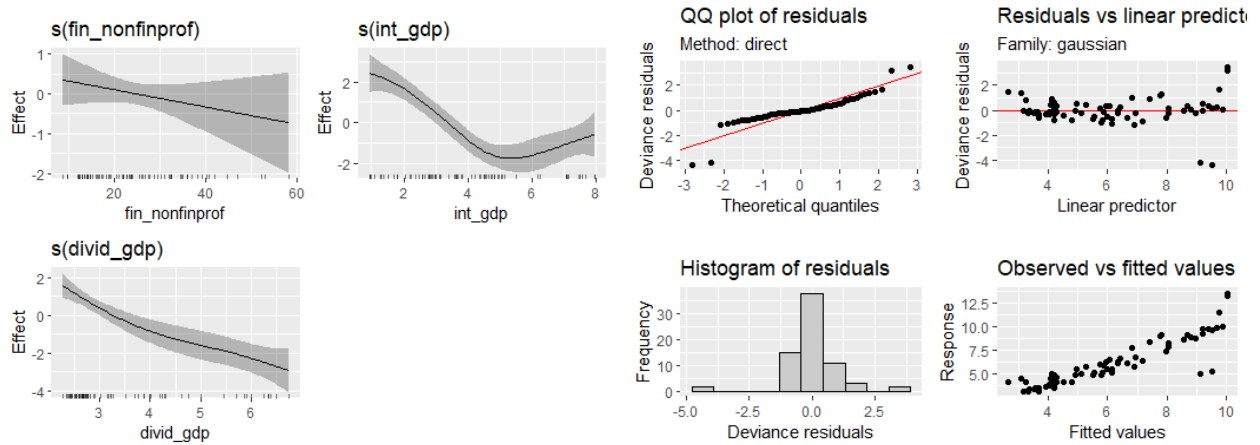
The estimated results are presented in Table A.2 and Figure A.3. When the results are compared to the univariate FM.1 and FM.2 models, we observe that the inclusion of the additional covariates for interests and dividends do not improve the specifications and also does not alter the overall relation between the ratio of financial to nonfinancial profits and militarization.

Table A.2: GAM Estimation Results of Financialization-Militarization Models (FM)

		<i>Dependent variable: miles_gdp</i>
		FM
Constant	estimate	6.032 ^{***}
	std. err.	0.137
s(fin_nonfinprof)		<i>See Figure A.3</i>
s(int_gdp)		<i>See Figure A.3</i>
s(divid_gdp)		<i>See Figure A.3</i>
<i>Approximate significance and basis dimension of smooth terms</i>		
s(fin_nonfinprof)	edf	1.000
	p-value	0.251
	k	9
s(int_gdp)	edf	3.584
	p-value	0.000
	k	9
s(divid_gdp)	edf	2.120
	p-value	0.000
	k	9
Observations		71
Adjusted R ²		0.786
Deviance Explained		80.60%
Log Likelihood		-115.462

Notes: (***) denotes significance at 1%. The values in parentheses are p-values. edf and k are effective degrees of freedom and basis functions respectively. UBRE denotes Unbiased Risk Estimator.

Figure A.3: GAM Estimation of Financialization-Militarization Models (FM)



Notes: Left panel shows the estimation outcomes. Right panel shows the diagnostics of the estimations.