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# Economic Impact of Defense Expenditures in Turkey: A Dual-Approach Analysis from 1974 to 2021

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**Abstract:** This study presents a comprehensive analysis of the influence of defense expenditures on the Gross Domestic Product (GDP) in Turkey from 1974 to 2021. Defense spending, crucial for national security, often diverges from regular civic investments such as education, healthcare, and transportation. The significance of these expenditures becomes evident in times of international tension, terrorist threats, and warfare. Globally, defense budgets are escalating, and Turkey, a North Atlantic Treaty Organization (NATO) member, is no exception. Recent trends show a decline in Turkey's public defense spending, with current levels lower than in the 1960s yet higher than the NATO average during 2014-2021. Concurrently, private sector investment in the defense industry has risen, underscoring Turkey's involvement in global defense dynamics. This research adopts the Autoregressive Distributed Lag (ARDL) bounds test and the Toda-Yamamoto causality test to scrutinize the long-term and causal relationships between defense spending and economic growth. The ARDL bounds test reveals a long-term negative cointegration relationship, while the Toda-Yamamoto test indicates a unidirectional causal relationship from defense expenditures to GDP at a 10% significance level. These findings affirm the Neoclassical economic theory's postulation of a negative impact of defense spending on growth. Despite this, the paper argues for the necessity of sustained defense expenditures in Turkey, given its unique historical and geopolitical context. The study navigates through various theoretical perspectives, notably the Keynesian and neoliberal approaches, and their specific adaptations in defense economics: military Keynesianism and private military services. It critically assesses these frameworks, integrating their critiques into the analysis. The study contributes to the discourse on defense economics by providing empirical evidence from a critical NATO member, balancing the theoretical debate with practical insights from Turkey's experience. This dual approach, combining empirical analysis with theoretical exploration, offers a nuanced understanding of the complex interplay between defense spending and economic growth, particularly in geopolitically sensitive regions.

**Keywords:** Defense expenditures; Economic growth; Military Keynesianism; Private military companies; Turkey

## 1. Introduction

Historically, states have secured necessary defense systems through domestic production or importation. The latter, however, elevates current account deficits and compromises resource utilization efficiency. Countries with limited financing resources, notably developing and underdeveloped nations including Turkey, are often impelled towards imports, given their heightened political vulnerabilities. This import reliance not only exacerbates current account deficits but also engenders economic complications. In this vein, the defense industry assumes paramount importance for economic development in such nations. Success in domestic production not only mitigates security risks but also harbors potential for generating income through exports, thereby contributing to economic growth. This research delves into the economic implications of defense expenditures on the defense industry and their subsequent impact on economic growth. It is observed that political governance in Turkey has been investing in the defense sector to foster a self-reliant national defense industry. The underlying rationale transcends mere

reduction in foreign dependency; it also encompasses economic growth stimulation through private sector support.

Since the inception of the Republic in 1923, Turkey has been proactively engaged in defense investments, a trajectory underscored by the establishment of strategic facilities. This includes the Gölcük shipyards, Ankara's ammunition production units, Kayseri's aircraft and engine factories, and Istanbul's ammunition and aircraft production facilities. The commitment to augmenting defense capabilities has persisted, reflecting the nation's geopolitical dynamics on the global stage. The imperative for such continued investment is rooted in Turkey's unique geopolitical position and historical encounters. Post-World War II developments, notably Russia's territorial and straits demands on Turkey and the impediments faced during the 1974 Cyprus Peace Operation, underscored Turkey's need for a robust domestic defense industry. These instances, coupled with the emergence of terrorism post-1984, conflicts in the Middle East, and the ramifications of the ongoing Arab Spring, have reinforced the nation's focus on self-reliance in defense. The post-World War II period, particularly Russia's demands and the challenges encountered in utilizing military aid from the United States (US) during the Cyprus Peace Operation, highlighted the essentiality of domestic defense investments for preserving sovereignty. The experiences surrounding the Cyprus Peace Operation were pivotal in Turkey's realization of its solitary stance in the international domain, compelling a reliance on indigenous capabilities to safeguard its compatriots on the island.

This study endeavors to elucidate the impact of Turkey's defense expenditures on its GDP from 1974 to 2021. The focus is on assessing how investments in the defense sector have influenced the trajectory of the Turkish economy, with the aim of providing insights for future policy directions. The research methodology employed encompasses an extensive review of relevant literature, utilizing sources such as historical analyses of the Turkish economy, industry reports, academic articles, theses, and statistical data to construct a comprehensive understanding of the topic. In conducting this study, a historical and theoretical examination of defense expenditures forms the initial phase of analysis. This is followed by a detailed exploration of the evolution of Turkey's defense spending, both historically and statistically. Subsequently, the paper delves into the research methodology, reviewing pertinent literature, and discussing the findings. The study culminates in a section that synthesizes the conclusions drawn from the research and outlines recommendations.

## 2. Theoretical Framework

### 2.1 Concept and Scope

The defense industry, comprising both public and private sector investments, is defined as an amalgamation of industries engaged in producing, designing, and modernizing weapon systems and military equipment required by armed forces. This industry also encompasses the creation of investment goods related to these systems and demonstrates significant interconnections with other economic sectors (Arslan, 1990; Canbay, 2010) delineates the defense industry as a sector established and operated for military strategies and tactics, encompassing defense and attack operations, and bearing strong correlations with other industrial segments.

It is recognized that the defense industry exerts a substantial influence on the economic, political, and social structures of nations. Furthermore, this sector is pivotal in stimulating other production investments, is characterized by the intensive use of advanced technology, and is distinguished by its focus on research and development (R&D) and high-quality standards. The concept of defense spending encompasses a wide array of interpretations in both academic discourse and international politics, leading to a lack of uniformity in its definition. This ambiguity stems from various factors. For instance, the role and institutional representation of armed forces vary across different nations, with some countries exhibiting an indistinct delineation between the functions of the police and the military (Giray, 2004). Such disparities complicate the task of developing a universally accepted definition of defense expenditures. Internationally, organizations like the United Nations (UN), NATO, and the International Monetary Fund (IMF) offer distinct definitions of defense spending, further complicating scientific international comparisons. To facilitate these comparisons, standard definitions provided by these organizations are often employed. Table 1 presents the definitions ascribed by the UN, IMF, and NATO. Notably, the UN's definition stands out for its clarity and detail, having been specifically formulated for international comparative purposes. Conversely, NATO's definition, originally aligned with the organization's internal objectives, was later harmonized with data from other sources such as the Stockholm International Peace Research Institute (SIPRI) to support broader data series (Brzoska, 1995).

Each item is marked with an 'X' if it is included in the defense expenditure category by the respective organization, or a '-' if not included. Notably, some items have conditional inclusions, such as item 11 (stocking of strategic goods), which NATO includes only if managed and financed by the defense organization, and item 20 (borders/customs guards), which is included by the IMF when these forces are trained, equipped, and available for military activities.

As evidenced in Table 1, the categorization of defense expenditures demonstrates considerable variation across international organizations. Notably, items identified as defense expenditures by NATO, such as subsidies for weapons production and contributions to international organizations, are not recognized as such by the IMF and

UN. Conversely, civil defense activities, deemed defense expenditures by the IMF and UN, are excluded from NATO's definition. It is essential to highlight that for an expenditure to be classified as a defense expenditure, it must be managed by a defense organization, and associated training and equipment must be tailored for military activities. These variations in definitions by international organizations inevitably lead to discrepancies in reported defense expenditure amounts.

**Table 1.** Classification of defense expenditures by international organizations (NATO, IMF, UN)

| S. Nu | Made for Defense, Power and Supporters<br>Possible Defense Expenditure Items | NATO | IMF | BM |
|---|---|---|---|---|
| 1 | (Personnel) payments for soldiers and officers | X | X | X |
| 2 | Fees of technicians and bureaucrats related to military organizations or within the army | | | |
| 3 | Medical services, tax privileges and social benefits (including relatives) | X | X | X |
| 4 | Pension | X | X | X |
| 5 | Military schools, hospitals and similar things | X | - | X |
| 6 | Weapon expenditures (including imported weapons) | X | X | **?** |
| 7 | Infrastructure investments, buildings, etc. | X | X | X |
| 8 | Maintenance and repair | X | X | X |
| 9 | Supply of other goods | X | X | X |
| 10 | Military research and development | X | X | X |
| | **Other expenditures related to military/defense/strategic purposes** | X | X | X |
| 11 | Stocking of strategic goods | | | |
| 12 | Weapons and production sites, etc. to protect | X[b] | - | - |
| 13 | Weapons production subsidies/exchange Subsidies | X[b] | X | - |
| 14 | Military aid to other countries | X | - | - |
| 15 | Contributions to international organizations (military agreements, UN peacekeeping, etc.) Civil defense | X | X | X |
| 16 | **Expenditures on former military forces/activities** | X | - | - |
| | Veterans' benefits, etc. | - | X | X |
| 17 | War debts | | | |
| 18 | **Expenditures on forces** | - | - | - |
| | Non-military forces/gendarmerie force | - | - | - |
| 19 | Borders/customs guards | | | |
| 20 | Police administration | X[c] | X[c] | X[c] |
| 21 | **Expenses in other accounts** | X[c] | X[c] | X[c] |
| | Relief/disaster recovery | X[c] | - | - |
| 22 | UN peacekeeping | | | |
| 23 | **Obligations for future expenditures** | X | - | - |
| | Loan provision | X | X | - |
| 24 | | X | X | - |

**Source:** Brzoska, 1995.

The defense industry sector, also known as the arms industry, encompasses all activities from the production to the sale of weapons and military technology. This sector includes a commercial industry engaged in research and development, engineering, production, and servicing of military equipment, supplies, and facilities. As Turkey is a member of NATO, its investments in this sector are classified as "investment expenditures for the defense industry" in accordance with NATO criteria.

Determinants of defense expenditure levels can be bifurcated into internal and external factors. Internally, factors such as a country's governance structure and economic strength play a pivotal role in shaping defense expenditures. Decisions by political authorities within a nation can significantly influence regional and global armament trends. An illustrative example of this phenomenon is the observed decline in global military spending rates following the dissolution of the Union of Soviet Socialist Republics (USSR). External factors impacting defense investment levels include geopolitical positioning, defense and military expenditures of neighboring countries, and international alliances (Karakuş, 2006).

The relationship between a nation's GDP and its defense spending is elucidated in Table 2, which delineates the top 20 countries with the highest GDP and their corresponding defense expenditures for the year 2021. This data, derived from the "SIPRI defense expenditures" database and the "2021 GDP ranking," reveals a significant correlation between economic prowess and defense spending. According to the table, a noteworthy observation is that 16 of the top 20 countries with the highest GDP also feature prominently among those with the highest defense expenditures. This trend indicates that nations with substantial economic resources, such as the US and China, occupying the top two positions in both GDP and defense spending, do not hesitate to allocate considerable funds for defense. These investments are not solely focused on ensuring national security but also serve as a strategic signal to other nations. Contrastingly, countries with limited economic capabilities must exercise prudence in

defense spending. Overreliance on borrowing for defense purposes can have detrimental effects on their economies. Intriguingly, despite not being among the top ten in GDP rankings, countries like Russia and Saudi Arabia rank within the top seven for defense spending, reflecting a strategic emphasis on deterrence against potential threats (Ergün, 2021).

**Table 2.** Top 20 countries with the highest GDP and the highest defense spending in 2021

| S. Nu | GDP Ranking (Top 20 Countries) | GDP (Billion $) | S. Nu | Defense Spending (Top 20 Countries) | Defense Spending (Billion $) |
|---|---|---|---|---|---|
| 1 | US | 23.315 | 1 | US | 767 |
| 2 | Chinese | 17.734 | 2 | Chinese | 270 |
| 3 | Japan | 4.940 | 3 | India | 73 |
| 4 | Germany | 4.259 | 4 | Russia | 63 |
| 5 | India | 3.176 | 5 | England | 62 |
| 6 | England | 3.131 | 6 | Japan | 55 |
| 7 | France | 2.957 | 7 | Saudi Arabia | 53.7 |
| 8 | Italy | 2.107 | 8 | France | 53.5 |
| 9 | Canada | 1.988 | 9 | Germany | 52 |
| 10 | South Korea | 1.810 | 10 | South Korea | 47 |
| 11 | Russia | 1.778 | 11 | Italy | 30 |
| 12 | Brazil | 1.608 | 12 | Australia | 28 |
| 13 | Australia | 1.552 | 13 | Canada | 24 |
| 14 | Spain | 1.427 | 14 | Israel | 22 |
| 15 | Mexican | 1.272 | 15 | Brazil | 18.7 |
| 16 | Indonesia | 1.186 | 16 | Spain | 18.4 |
| 17 | Holland | 1.012 | 17 | Iranian | 17 |
| 18 | Saudi Arabia | 833 | 18 | Turkey | 16 |
| 19 | Turkey | 819 | 19 | Hollanda | 13.1 |
| 20 | Switzerland | 800 | 20 | Poland | 13.0 |

Source: SIPRI, 2021.

Investments in the defense industry by developed nations have been identified as significant contributors to their respective economies. Data prepared by the World Bank and the SIPRI for the year 2021 illustrates this impact, particularly in the cases of the US and China, which lead in defense spending. The GDP of the US was recorded at $23.315 trillion, with defense expenditures amounting to $767 billion. In comparison, China's GDP stood at $17.734 trillion, accompanied by defense spending totaling $270 billion.

### 2.2 Defense Expenditures in the Context of Economic Theories

A fundamental challenge addressed by economics is the effective utilization of scarce resources. Defense expenditures, particularly those funded by the public sector, also draw upon these limited resources. This issue assumes greater significance in developing countries where the opportunity cost of scarce resources is more critical compared to relatively developed nations. Defense spending occupies a prominent role in public expenditures and is recognized as a key driver of expenditure increases during both peace and wartime. When defense expenditures are conceptualized as investment spending, they can potentially exert positive impacts on other industries and, consequently, on national production. These impacts may manifest through various positive externalities such as employment generation, knowledge enhancement, technological advancements, and export opportunities. The discourse on whether defense spending positively or negatively influences economic growth and development, and which of these effects predominates, will be explored in the ensuing sections within the framework of two main theoretical perspectives.

#### 2.2.1 Keynesian economics perspective on defense expenditures

From the Keynesian economics standpoint, grounded in supply-side economics principles, it is posited that defense expenditures positively influence economic growth through the augmentation of total demand and the multiplier effect. The concept of military Keynesianism, a specific adaptation of Keynesian Economics formulated by British economist John Maynard Keynes, advocates substantial governmental military spending as a mechanism to spur economic growth. Proponents of military Keynesianism argue for varied effects on supply and demand. On the demand side, increased government spending meets the military establishment's growing need for goods and services, leading to a multiplier effect on overall consumer spending. Conversely, on the supply side, the sustenance of a standing army impacts the civilian workforce by displacing employees. Recruitment opportunities are offered in areas such as training or mastery. Additionally, it is contended that military spending on R&D enhances productivity in civilian sectors by yielding new systems and advanced technology (Bilişli, 2011). The Military Keynesian Approach views defense expenditures through the lens of positive externalities on the "supply-

side," suggesting that substantial military investment triggers demand, thereby increasing capacity utilization and output levels. This ultimately contributes to economic growth (Looney, 1994).

Keynes advocated for stimulating stagnant markets through expansionary public fiscal and monetary policies, such as adjustments in taxes or interest rates. These principles shaped the "New Order" adopted by Roosevelt in the US following the 1929 Depression and significantly influenced the recovery of European nations post-Second World War. The period from 1945 to 1975, marked by the implementation of Keynesian policies, is referred to as the "Golden Age" in economic literature. This era witnessed the highest growth rates in modern history, with trade expanding more than production. The post-war repair process saw an average annual increase of 9% in both world exports and imports, continuing until 1973. This expansion was not solely attributed to the burgeoning world economy but also to the positive conjuncture created by the Korean and later the Vietnam wars, coupled with low global interest rates. Consequently, markets capitalized on low-cost funding opportunities to augment investments. The Golden Age was characterized by the market economy's increasing reliance on state intervention. However, the collapse of the Bretton Woods system and the early 1970s oil crisis marked the end of this era. The subsequent economic downturn, driven by rising oil prices in 1973 and 1979, necessitated a policy shift towards reducing state interventions and downsizing state involvement in economic and social life. This crisis impacted all Organization for Economic Co-operation and Development (OECD) countries, especially those in Europe, leading to slowed economic growth, heightened inflation, structural unemployment, and a climate of chronic budget deficits and elevated public expenditures. The new era's political and economic philosophy embraced Neo-liberal policies, termed the "New Right," representing a contemporary interpretation of classical liberal thought and emerging as an alternative to Keynesian policies (Tuz, 2010). The stagflation that began in the 1970s led to criticism of these policies, diminishing the popularity of the Keynesian approach. Subsequently, the Neoclassical approach regained prominence in response to the new economic crisis. Leading figures of this critical wing included the Monetarists from the Chicago School, spearheaded by Milton Friedman (1912-2006), influential during the 1950s-60s, and Friedrich A. Hayek (1899-1992) from the Austrian School, a proponent of neoliberalism, along with his followers.

### 2.2.2 Neoclassical economics perspective on defense expenditures

The Neoclassical economic approach, in contrast to Keynesian economics, interprets the impact of defense expenditures on economic growth within the realm of negative externalities, characterizing it as "demand-side" focused. It is posited that excessive investment in defense leads to the inefficient allocation of scarce resources, diverting them from high-potential growth projects and resulting in escalating costs. Ultimately, defense spending is seen as reducing both public expenditures and private sector spending (Looney, 1994). A modest reduction in defense expenditures may facilitate budgetary savings, thereby allowing for an increase in public welfare expenditures (health, education, etc.) or the application of lower taxes to citizens (Durgun & Timur, 2017). Advocates of free market dominance, such as Friedman and Hayek, argue for minimal state intervention, confined to ensuring internal and external security, maintaining justice and order, honoring private agreements, promoting competitive markets, and overseeing the monetary system. Hayek, attributing the onset of stagflation in Western economies in the 1970s to Keynesian expansionary fiscal policies, contends that the state's role should be limited to facilitating the market economy's functioning. To foster competitive equality, he suggests the privatization of public enterprises and even the currency issuance process (Adaçay, 2022).

In the context of globalization, neoliberal economic policies have catalyzed a paradigm shift in the production system, fostering a global transition from industrial to service-oriented production. This shift has instigated a transformational process affecting the state, labor force, and markets for goods and services. These changing dynamics have notably influenced the defense industry, presenting new opportunities for enhancing the profitability of capital investments within this sector. Globalization, accompanied by the insecurities and crises it engenders, has led to an escalation in arms sales and a subsequent intensification of concentration within the defense industry. Concurrently, the neoliberal ideology, advocating for market-driven solutions over state intervention, has precipitated the privatization of military services. This ideological shift has given rise to the emergence of private military companies, epitomizing the market-oriented approach of neoliberalism that has proliferated globally (Yayım, 2006).

The phenomenon of privatizing military services, leading to the entrustment of the defense market to the mechanisms of a free market economy, represents a significant shift in defense dynamics. The implications of this transition, particularly within democratic legal regimes, have raised critical concerns. It is observed that the privatization of security and defense services, traditionally a primary state responsibility, has engendered serious challenges in these political structures. Post-Cold War, the marketization of unemployed military personnel, intelligence agents, and weapon stocks through private military companies has become a notable trend. More significantly, states grappling with maintaining national unity, and seeking to avoid intervention by major powers in the new world order, have increasingly turned to private entities offering military services. This shift is further driven by the structural transformation of warfare, characterized by the utilization of advanced technology, computer systems, and the requirement for specialized technical staff and engineers. These private military companies, in an effort to enhance their technological capacities, have been actively acquiring or merging with

computer and electronics companies. This strategic move aims to augment their capital accumulation. However, a repercussion of this development is the reduction of consumer choices in the arms market, where states are the primary purchasers. Consequently, these firms are evolving into monopolies, capitalizing on the tenets of the liberal economy.

## 3. Discussion

The influence of defense expenditures on economic growth remains a contentious topic in academic circles due to divergent viewpoints. Research in this domain has yielded varied conclusions, suggesting that defense spending can have positive, negative, or negligible effects on economic growth. While a consensus on the specific direction of this impact is elusive, it is broadly acknowledged among economists that defense expenditures wield significant implications for the economy. A comprehensive understanding of the effects of defense expenditures on economic growth necessitates consideration of a country's political, social, economic, strategic, and demographic structures. This discussion first examines differing perspectives within the Keynesian and neoclassical economic approaches and then extends to broader economic theories.

### 3.1 Comparison in Terms of Keynesian and Neoclassical Approaches

The neo-classical growth model has observed successive growth patterns, with public sector effects on growth being scrutinized under "endogenous growth theories." According to these theories, the public sector exerts both direct and indirect economic influences (Bekmez & Destek, 2015; Pevcin, 2004). In Keynesian macroeconomic theory, positive ratios of public expenditure to national income are explicated. In contrast, the neo-classical approach contends that increased public expenditures, including defense spending, contract the economy by crowding out private sector investments.

Classical economics, with its theoretical assumptions of perfect competition and transparency, does not entirely encapsulate the defense industry's characteristics, primarily due to national security considerations. The implications of entrusting national security-related initiatives to market-driven entities have been observed globally. Efforts to address the social, cultural, and economic problems created by private military services are often insufficient and overshadowed (Schreier & Caparini, 2005). It is reported that there is no systematic evidence demonstrating cost efficiency through outsourcing or privatization in defense due to inadequate contract supervision, which in itself incurs additional costs.

The International Consortium of Investigative Journalists-ICIJ (2002) has highlighted that developed countries either support or tacitly condone the operations of private military companies established within their borders or linked by capital. It is noted that these countries perceive private military company activities as commercial ventures, occasionally overlooking the negative consequences of such operations. A case in point involves Vinnell, a significant military logistics firm, which held a $48 million contract with the US. Despite this agreement, Vinnell refrained from dispatching supplies to certain high-risk areas in Iraq, leading to a deficiency in essential provisions such as fresh food and water for some troops. Consequently, intervention by the Jordanian army was solicited to address this shortfall (Hartung, 2004). This scenario underscores a critical issue concerning private military companies, the lack of moral accountability inherent in contract-based private military services. Such an arrangement potentially paves the way for more complex and severe incidents, as evidenced by various reported instances. The absence of legal regulation over private military companies often results in illicit activities and human rights infringements, with transgressions frequently concealed and perpetrators escaping penalization. A notable instance is the involvement of DynCorp, a private military company, in a sex scandal while operating in the Balkans under the United Nations' aegis (Singer, 2003).

Traynor (2003) cautions that the lack of criminal liability for those authorized to employ lethal force could transform each private military company into a quasi-military entity. Developed countries, while advocating democracy in developing nations, increasingly utilize subcontracted private military services, potentially reducing domestic public opposition. Such involvement in foreign nations under the guise of promoting democracy raises concerns about the compatibility of these actions with democratic principles. The post-September 11 "Bush Doctrine" signifies a contemporary manifestation of US military Keynesianism. This policy led to increased defense expenditures and legitimized "preemptive strikes" against perceived threats to US interests, thereby prioritizing the concept of prevention. The Iraq war, framed as a counter-terrorism effort, marked a significant assertion of US hegemony in the Middle East (Bilişli, 2011). Conversely, the operations of private military companies undermine the democratic principle of transparency and can escalate to the level of crimes against humanity. With the privatization of defense services, it has become feasible for economically capable smaller states, or those willing to finance through the privatization of natural resources, to opt for military solutions, thereby altering regional balances. For instance, it is documented that drug cartels in Colombia have acquired sophisticated weapon systems and special military services from Hod Hahanit, a company formed by former Israeli army officers (Singer, 2002). Consequently, both in countries exporting these companies and in importing

countries, as Avant (2005) observes, the executive branch can overshadow the legislature, facilitating increased commercial influence on politics.

The spread of industrialization through globalization has shifted the global balance of power, leading to renewed hegemonic conflicts. Analyzing the period just before the global crisis, particularly post-2000, the 49% increase in defense expenditures between 2000-2009 was predominantly attributed to the US, China, France, the United Kingdom (UK), and Saudi Arabia. Post-crisis assessments reveal a relative decrease in defense spending since 2010, reaching $1.7 trillion in 2015 amidst rising political tensions. The US continued to outspend the next 14 countries combined, followed by China and Saudi Arabia. The crisis saw Europe reduce its defense budget due to the Euro's appreciation, while developing countries invested in weapon technology development. With globalization, the defense industry's increasing interdependence through transnational initiatives and supply chains presents challenges for national sub-producers to integrate into the global network without domestic state support. This creates a cycle wherein American hegemony in the defense industry remains unchallenged. However, during the crisis, it was observed that seven of the ten largest defense industry companies were US-based (Şişman, 2017). The US's pursuit of a unipolar world order, contrasted with the multipolar world order advocacy of China, the Russian Federation, and India, is likely to spur a global increase in defense expenditures. This trend will particularly affect Middle Eastern countries, where defense spending is already high and expected to rise further. Such developments are likely to negatively impact the socioeconomic development of the region. However, Israel, which Alp (2006) notes as being least affected by this trend due to its advanced economy and defense industry, has leveraged its position for territorial expansion in Palestine.

It is widely acknowledged by experts that the global upward trend in defense expenditures is likely to persist. In 2022, catalyzed by the conflict initiated by Russia in Ukraine, worldwide military spending surged by 3.7%, reaching a record $2.24 trillion. Notably, Europe's defense outlay of $345 billion exceeded its Cold War peak in 1989 for the first time. Post-Cold War, many European nations reduced their military forces and budgets. However, as German Chancellor O. Scholz articulated, there is an evolving perception of the global landscape. He characterizes Russia's incursion into Ukraine as a watershed moment (Scholz, 2022). The prevailing belief in Germany is that a passive military stance in this new European context could jeopardize German foreign policy and security interests. To maintain its status as an "independent actor" in an increasingly multipolar world, Germany advocates for the fortification of its military capabilities. In a marked shift in German security policy since 1955, a special fund of $100 billion has been established to bolster the German military. Additionally, a commitment to allocate "two percent of GDP on defense" has been made, envisioning a substantial annual defense budget of at least $80 billion. Scholz has called for a coordinated and integrated approach among European states to enhance defense capabilities, citing the European Sky Shield Initiative, joined by 14 other European countries.

Simultaneously, the Middle East is experiencing rapid and significant developments. Historically a region of diverse conflicts, the Middle East's discord stems from religious, political, economic, and social roots. Besides being a historical nexus of religions and cultures, the region has been a battleground for power centers, largely due to its subterranean wealth, making it one of the world's most volatile regions.

Following the decline of the Ottoman Empire's control in the region, a significant struggle for dominance ensued, marked by the efforts of various state and non-state actors to fill the resulting power vacuum. This period was characterized by frequent conflicts, often fueled by ethnic, religious, and sectarian divisions. Consequently, the Middle East has witnessed a persistent escalation in violence, terrorism, and conflicts, showing no signs of abatement. Within this context, certain states, notably the US and Russia, have emerged as influential external actors deeply involved in these regional conflicts. These superpowers' involvement further complicates the geopolitical landscape. Additionally, regional powers such as Saudi Arabia, adhering to Wahhabism, an austere form of Salafism, and Iran, with Shiism as its state ideology, play pivotal roles in shaping regional dynamics. In the geopolitical landscape of the Middle East, the role of Israel, with its aspirations to expand territorial and geopolitical influence, is significant. This ambition is reinforced by support from the US, which engages in various interventions within the region. These interventions aim to assert control over Middle Eastern geography and ensure the security of Israel, a key strategic ally of the US. However, the presence of the US, far from establishing peace and democracy, appears to exacerbate regional conflicts. Contrasting the US' influence in the region is the role of Russia, which, as a successor to the Soviet Union's Cold War stance, maintains strong ties with Iran and Syria. Through these alliances, Russia seeks to assert its presence in the Middle East. Both Russia and the US endeavor to extend their influence by engaging with other nations in the region. Furthermore, Iran's foreign policy is noteworthy for its support of non-state actors, particularly in opposition to nations it perceives as rivals or threats within the region. For instance, Iran's backing of Lebanon-based Hezbollah against the anti-government Houthis in Yemen exemplifies its pragmatic approach to regional politics. This strategy, however, may contribute to escalating the already prevalent conflicts across the Middle East.

The geopolitical landscape of the Middle East has undergone significant transformations, especially in the context of Israel's security concerns. Historically, nations perceived as threats to Israel's security have been systematically neutralized, either through diplomatic efforts, exemplified by the establishment of bilateral relations with Egypt following the Camp David Accords, or due to internal conflicts within these nations. For instance, Iraq

and Syria, previously deemed significant threats, no longer pose substantial security challenges to Israel, as noted by Deniz (2016). Furthermore, the regions of Iraq, Syria, Lebanon, Palestine, Bahrain, and Yemen have emerged as arenas for power struggles among various state and non-state actors. Economically, the Middle East's share of global military expenditures is disproportionate to its contribution to the world economy. While representing only 5 percent of the global economy, the region accounts for 11 percent of the world's total annual military spending. This disparity is evident in the per capita military expenditure in the region, averaging around 500 dollars annually, significantly higher than the global average of approximately 250 dollars.

Turkey's strategic interests are deeply entrenched in a region where global powers are vying for influence, and the future of this area is being shaped by dominant international actors. This region, crucial for energy resources, is witnessing a daily redrawing of its geopolitical landscape, with implications for its inhabitants shaped by proponents of a new world order. Historically, this has led to armed conflicts, including the Iran-Iraq War, the Gulf Wars, and the US invasion of Iraq. The ongoing repercussions of these conflicts, particularly the Iran-Iraq War that commenced in 1980 and lasted eight years, continue to impact the region and Turkey. Turkey has faced multiple challenges due to the turmoil and instability in its neighboring countries. Notably, the rise of terrorist activities along Turkey's eastern and southeastern borders coincided with the Iran-Iraq War period. The terrorist organization (PKK), established in 1978, intensified its assaults against the Turkish Armed Forces and civilians starting in 1984. Amidst the chaos of the war, the PKK found opportunities to establish and strengthen its presence in camps along the Iran-Iraq-Syria border and in Lebanon.

Furthermore, the issue of PKK terrorist activities is intricately linked to Turkey's national integrity. Following the Iran-Iraq War, terrorist centers established in northern Iraq continued to pose security threats to Turkey. The influx of refugees into Turkey in 1988, estimated at around 60,000, added another dimension to the challenges faced by Turkey. While some refugees were repatriated, the Kurdish refugee crisis has persisted as an ongoing issue for Turkey to manage (Yaycı, 2019).

Turkey has faced significant repercussions from regional conflicts in which it was not a direct participant, with impacts spanning political, social, and economic dimensions. These impacts have extended to persistent threats such as terrorism on its borders (Özdemir, 2020). The 1990-91 Gulf War, in particular, exerted profound and lasting effects on Turkey's foreign policy, economy, and society. This conflict resulted in substantial economic losses for Turkey due to surging oil prices, disrupted road transportation, contracting services, and diminished exports. The cessation of trade with Iraq, a major trading partner, persisted into the early 2000s, leading to an estimated export loss of approximately 30 billion dollars for Turkey. Additionally, unresolved debts due to Iraq's insolvency inflicted a loss of approximately 2.54 billion dollars on the Turkish banking sector. The tourism industry experienced a cumulative loss of around 6.3 billion dollars over 12 years. The societal and cultural consequences of these conflicts are also significant. Turks residing in the Middle East, particularly in regions of conflict, are of critical importance to Turkey due to kinship ties, making them vulnerable to the repercussions of regional power struggles. Notably, a substantial number of Turks reside in oil-rich cities such as Kirkuk and Mosul in Iraq. In Syria, despite the challenges in obtaining precise figures due to the civil war, it is estimated that around 6% of the current population of approximately 17 million is Turkish, equating to about 1 million Turkish residents.

The analysis of defense expenditure trends reveals a global increase, particularly in leading nations such as the US, China, Russia, and European countries. As reported by the research firm Wisevoter in 2023, the US leads with military expenditures of $800.672 billion, followed by China at $293.351 billion and India at $76.598 billion. Turkey, ranking 18$^{th}$ globally, allocates $15.478 billion to military spending. Despite a global context of escalating conflicts where new wars emerge before the resolution of existing ones, Turkey's public defense spending has shown a downward trend in recent years. This development poses a challenge for Turkey, as remaining aloof from global military advancements seems implausible. The nation must closely monitor international defense trends and prepare for potential future risks. The direction and economic impact of Turkey's defense industry developments are particularly crucial, especially considering the country's focus on economic growth. Understanding the opportunity costs of defense investment expenditures is vital in this regard. The implications of these investments for Turkey's economic objectives necessitate careful analysis and strategic planning, balancing the needs of national security with those of economic development.

The September 11 attacks had a profound global impact. Although the attacks occurred on US soil, NATO countries viewed the incident as a terrorist act against them. Post-attack, the necessity for developing security strategies in the US and Europe was underscored. In response, NATO's European allies contributed to the expenditures incurred by the US. The lowest defense expenditures worldwide from 2000 to 2009 were $1.122 billion in 2000, rising to $1.768 trillion in 2009, a 58% increase over the decade. Despite a decrease in defense investment expenditures from 2010 to 2015, there was an upward trend between 2015 and 2021. Expenditures in 2015 were $1.742 trillion, rising to $1.969 trillion in 2021. Europe's military spending in this period notably exceeded the levels at the end of the Cold War in 1989, with significant increases in Finland, Lithuania, Sweden, and Poland. Russia's military expenditures in 2022 were $86.4 billion, marking a 9.2% increase from the previous year. The surge in arms imports has been particularly notable in Europe, with European states witnessing a 19% increase in arms imports between 2017-2021 compared to 2012-2016, accounting for 13% of global arms transfers.

The largest European arms importers were the UK, Norway, and the Netherlands. Future projections indicate a significant increase in arms imports by European states, with large orders for warplanes recently placed with the US. In the Middle East, arms imports increased by 2.8% between 2017-2021 compared to 2012-2016, although this marked a decline from the 86% increase between 2007-2011 and 2012-2016. Tensions in Yemen and ongoing regional conflicts have accentuated the importance of arms imports for security in the Gulf. Saudi Arabia, the world's second-largest arms importer, saw a 27% increase in arms imports between 2012-2016 and 2017-2021. Qatar's arms imports surged by 227%, moving it to the 6th position among the largest arms importers.

An analysis of defense expenditure trends, as illustrated in Figure 1, reveals a declining proportion of Turkey's national income allocated to military spending since 1975. Data from SIPRI indicates that the ratio of Turkey's military expenditures to its national income stood at 1.2% in 2022, marking a downward trend over the past three years. This represents the lowest level of military spending relative to national income since 1960. A peak expenditure ratio of 5.1% was recorded in 1975, reflective of the period's specific conditions. In 2022, Turkey's military expenditures amounted to $10.6 billion, a 26% decrease from the previous year, positioning Turkey 23rd globally in terms of military spending. In comparison, NATO member countries' defense expenditures as a percentage of GDP were 1.43% in 2014, increasing to 1.70% by 2021. Turkey's defense spending remained close to this average, registering 1.45% in 2014 and 1.6% in 2021. Relative to NATO allies, Turkey's defense expenditures are above average, yet they represent a historical low when compared to the 1960s. This trend reflects an increase in private defense services, suggesting a Neoclassical approach in Turkey's defense industry, with a growing prominence of the private sector.

The presence of Turkish defense industry companies on the globally recognized “Defense News Top 100” list has shown a notable increase, rising from two entities in 2021 to four in 2023. Among the top ten companies on this prestigious list, six are based in the US, three in China, and one in the UK, with the leading trio being U.S. companies. This upward trajectory of Turkish companies on the list underscores the growing prominence of Turkey in the global defense sector. According to the 2022 SIPRI Report, Turkey's military expenditures in 2022 surged nominally by 28%, yet there was a real-term decline of 26% attributed to the country's high inflation rate. This decline represents the most significant annual decrease in Turkey's military spending ever recorded. Despite this decrease, the Turkish defense industry's export performance has been robust. Data from the Turkish Exporters Assembly (TİM, 2023) indicates that the sector exported $657.5 million in July alone, with total exports reaching $3.035 billion in the first seven months, accounting for 2.4% of Turkey's total exports. The sector's annual exports have escalated from $1.3 billion in 2012 to $4.4 billion in 2022, with a target of $6 billion set for 2023. The defense industry's share in total exports has progressively risen, from 0.8% in 2012 to 1.9% in 2022. Prominent countries in the export market for Turkey's defense and aerospace industry include the US, Qatar, the United Arab Emirates (UAE), the Philippines, Poland, Rwanda, India, Burkina Faso, Senegal, Tunisia, Pakistan, and England. These figures and trends reflect the sector's expanding global footprint and Turkey's evolving role as a significant player in the international defense market.

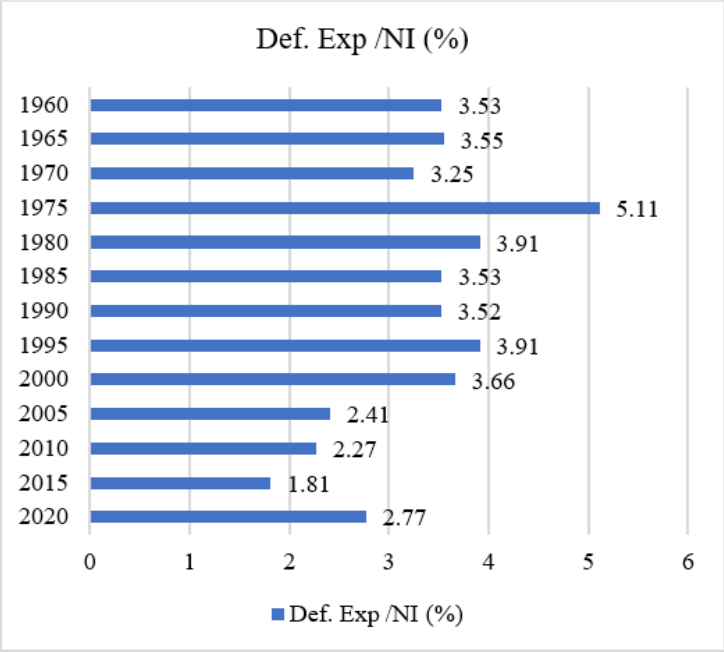


**Figure 1.** Ratio of Turkey's defense expenditures to national income (%)
Source: Constructed by the author utilizing World Bank data, 2022.

The contribution of the Turkish defense industry to the national economy extends beyond export revenues. From 2017 to 2020, defense industry companies consistently comprised a significant portion of the top 50 R&D investing companies in Turkey. This trend highlights the defense sector as a leading force in R&D development within the country. With ongoing military tensions in regions such as Ukraine, the Middle East, Azerbaijan, Syria, and Israel, sustained high R&D investments in the Turkish defense industry are anticipated. However, the challenging economic climate, the lingering effects of Covid-19, and the Treasury's substantial debt repayments in 2022-2023 present a complex dilemma between defense investments and economic priorities. Civilian sectors have faced difficulties in expanding their R&D investments in recent years, partly due to explicit and implicit embargoes on Turkish defense. Despite these economic pressures, defense industry companies have generally achieved growth in R&D. The intensification of economic challenges for civilian sectors and Turkey's need to finance comprehensive R&D across all sectors, while bolstering its defense industry, may lead to heightened difficulties in international competition (Özözer, 2021).

Analysis of the R&D investment trends of the top 50 companies reveals a fluctuating growth pattern from 2017 through 2020. The total R&D investments escalated from 6,461 million TL in 2017 to 9,507 million TL in 2018, marking a 47.2% increase. This upward trend continued in 2019, reaching 12,521 million TL, a 31.7% increase. However, in 2020, a modest nominal growth of 5.5% was observed, culminating in a total investment of 13,214 million TL. It is crucial to interpret this nominal growth in the context of broader economic factors. The global economic conditions and the pandemic's impact contributed to declining profit rates for these companies. Additionally, the majority of R&D equipment investments being denominated in US dollars highlights a relative contraction when considering currency fluctuations. The CBRT $/TL average buying rate, which stood at approximately 3.65 in 2017, rose by 23.5% from an average of $/TL 5.67 in 2019 to $/TL 7.00 in 2020. Considering the anticipated $/TL rate approaching 30 by the end of 2023, a significant contraction in real terms is foreseeable. Defense industry companies, which consistently held the largest shares of total R&D investments among the top 50 companies (54.1% in 2017, 56.3% in 2018, 62.6% in 2019, and 60.7% in 2020), are projected to be the most affected by this contraction. This projection is supported by data presented in Table 3. The anticipated downsizing will likely have a substantial impact on the defense sector's R&D initiatives, given their considerable share in the total investments.

**Table 3.** Ratio of total R&D investments to the total of top 50 companies (%)

| | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|
| Defense industry companies | 54.1 | 56.3 | 62.6 | 60.7 |
| Automotive companies | 17.4 | 14.2 | 10.6 | 13.1 |
| Automotive sub-industry companies | 2.7 | 2.1 | 2.3 | 2.8 |
| Appliances and consumer electronics companies | 13.1 | 8.4 | 6.3 | 6.34 |
| Pharmaceutical companies | 1.6 | 2.3 | 1.6 | 2.9 |

Source: Özözer, 2021.

The Global Peace Index (GPI) reports for 2022 and 2023 provide insightful data regarding the state of peace across various nations. Turkey's ranking in these reports, at 147$^{th}$ out of 163 countries, indicates a moderate level of peace. This position is consistent in both years. The GPI employs 23 qualitative and quantitative indicators to evaluate peace in three domains: social safety and security, the extent of domestic and international conflicts, and the degree of militarization. In a global context, the top four countries characterized by a highly peaceful structure are Iceland, New Zealand, Ireland, and Denmark. Conversely, the bottom three, indicating low levels of peace, are Syria, Yemen, and Afghanistan. Among European countries, Turkey's ranking as the least peaceful in 2023 is a point of concern. The GPI's 2023 findings show a global peace deterioration of 0.42 percent, marking the 13$^{th}$ decline in the past 15 years. In 2022, 84 countries showed improvements in peacefulness, while 79 experienced deteriorations. The GPI's methodology and its implications invite scrutiny, especially in comparison with other countries in similar or more severe conflict situations. For instance, Israel, despite being in a constant state of conflict and having a high level of individual armament, ranks 143$^{rd}$, a more peaceful position than Turkey. Similarly, the US, with a significant military presence in the Middle East, ranks 131$^{st}$. These rankings raise questions about the GPI's evaluative criteria and their application. The GPI is compiled by the Sydney-based Institute for Economics and Peace, an independent, non-partisan, non-profit think tank. Its rankings and analysis are vital for understanding global peace trends and the factors influencing them. The discrepancies in rankings, particularly in countries like Turkey that have not been engaged in any recent wars and are governed by democratic principles, necessitate a deeper examination of the GPI's methodologies and the broader context of global peace assessments.

### 3.2 Comparison in Terms of the Effects of Defense Expenditures on Macroeconomic Quantities

The theoretical underpinnings of the economic impacts of the shifts experienced in Turkey and globally warrant

examination, specifically in relation to the defense industry's effects on macroeconomic quantities. This analysis involves the exploration of the crowding-out and crowding-in phenomena. Government borrowing to fund budget deficits, which are a consequence of escalated expenditures, can marginalize private sector investments via two primary mechanisms. Firstly, savings intended for investment purposes may be diverted to finance these deficits. Secondly, the state's increasing demand for loanable funds elevates interest rates, subsequently raising investment costs for the private sector. Additionally, the state's subsidization of specific sectors or companies can distort competitive dynamics, potentially reducing private sector activity. Within the defense industry, such a distortion is feasible in scenarios where the state maintains a sectoral monopoly. Moreover, the absence of technological advancement resulting from the expenditures might lead to a crowding-out effect, thereby adversely affecting economic growth. Another crucial aspect is the "opportunity cost" of defense expenditures. The allocation of resources to the defense industry implies the forfeiture of potentially more productive uses in the private sector. Consequently, resources channeled into the defense sector may result in the depletion of those that could have been utilized more effectively elsewhere (Yıldırım et al., 2005).

Leontief & Duchin (1983) posited that a gradual reduction in defense expenditures across various economies might enhance total production and per capita consumption by reallocating resources to more effective domains. Concurrently, the concept of the crowding-in effect suggests that infrastructure investments, such as roads, highways, and electricity, along with public expenditures on health and education, could complement private sector investments, thereby augmenting their marginal productivity. The literature, predominantly grounded in time series and regression analyses, indicates that the interaction between private investment and public capital accumulation can manifest bidirectionally (Bahal et al., 2018). A study by Afonso & Aubyn (2008), employing VAR analysis and utilizing annual data from 14 EU countries, the US, Canada, and Japan, assessed the macroeconomic impacts of public and private investments. Their findings revealed that both public and private sector investments positively influence total output. The discourse on defense expenditures also falls within this analytical framework. The level of defense spending is often contingent upon a country's geopolitical position and perceived risks. Additionally, investments in the defense industry can influence voter decisions, impacting the allocation of defense spending in state budgets. Public investments in the defense sector may affect private sector investments, particularly through subcontractors engaged in this industry. Thus, it can be argued that defense expenditures and the defense industry, influencing numerous sub-sectors, have the potential to stimulate other areas of economic activity (Zülfüoğlu, 2021).

The interaction between defense expenditures and economic growth is complex, involving various macroeconomic aspects such as inflation, employment, resource distribution, R&D, industrialization, and balance of payments. The relationship between defense industry investments and inflation hinges on a country’s economic strength and the financing methods of expenditures. The method of financing plays a crucial role in determining the impact on inflation. Financing defense expenditures through increased tax rates, while attempting to offset budget deficits from other expenditure items, could potentially induce future inflationary pressures. However, studies exploring the relationship between inflation and defense investments, such as those by Kaya (2006), have not consistently found a direct correlation between these variables. As reported by the Defense and Aerospace Industry Manufacturers Association (SASAD, 2022), the Turkish defense industry employs 81,132 individuals. The distribution of these employees includes 48% in production, 26% in product/technology development, 25% in administrative and support roles, and 1% in managerial positions.

Extensive research has been undertaken to explore the impact of defense industry investments on employment. Szymanski (1973) asserted that defense investment expenditures positively affect employment, although non-defense expenditures and investments have an even more substantial impact on growth. In the study conducted by Chester (1978), which focused on the period from 1960 to 1970, it was disclosed that in Germany and Japan, modest levels of defense spending led to declines in unemployment, whereas in the US and England, defense expenditures resulted in increased unemployment rates. Furthermore, in the study by Çelik (1999), encompassing the years 1980-1995 in Turkey, employed a simple regression analysis between defense spending and unemployment. This study unveiled a contrary relationship, indicating that contrary to popular belief, the employment-increasing effect of defense spending was not as pronounced. Okur (1992) highlighted that the creation of employment opportunities for civilian personnel in naval, land, and air force factories, which are integral to the defense sector, had positive effects in mitigating unemployment.

Considering employment data, the qualified workforce in product and technology development and the year-over-year increase in employees indicate continued investment in the defense industry. National investments in the defense industry are expected to positively influence employment, especially if production is realized and products are exported. Alternatively, imports for defense industry product supplies and outsourcing labor may adversely affect employment (Dabağer, 2005). Investments in the defense industry can stimulate other investments through a crowding-out effect. The activation of idle resources in the country can create effective demand in military and industrial fields, coupled with other investments. The generation of domestic demand between investments and other industrial sectors positively influences the country's economic development (Karakuş, 2006).

The allocation of resources for defense expenditures, constituting a significant portion of public expenditures

and Gross National Product (GNP) in many countries, restricts their availability for alternative economic development investments. Prioritizing defense investment expenditures, even at the expense of economic development, underscores the essential nature of national independence and defense, reflecting Adam Smith's assertion that "defense is more important than wealth" (Giray, 2004). The influence of defense industry investments, R&D, and technological advancements operates in a bidirectional, direct, and indirect manner. The direct effect manifests in countries that have developed their defense industry through indigenous means and R&D, placing them among the capitals benefiting from advanced technology. The indirect effect is observed through the transfer of advanced technologies to various industrial sectors, enhancing competition and scientific research. Both scenarios positively contribute to a country's economy (Yokuş, 2016). Advanced technology is extensively utilized in designing defense industry products like weapon systems, necessitating substantial investments in a sector heavily reliant on technology (Table 3). Supporting these investments with R&D endeavors facilitates the localization of advanced technology in the defense industry (Karakuş, 2006).

Countries prioritizing R&D studies and investments gain dual benefits by selling their defense industry products internationally: they secure foreign currency inflow and generate resources for further advanced technology investments. Conversely, economies with low levels of R&D investment suffer due to reliance on defense industry imports (Kaya, 2006). In Turkey, recent challenges with imported technological products, including foreign exchange-related price increases, have spurred a shift towards a market driven by R&D and innovation. These challenges have prompted companies to intensify their R&D activities and collaborate with universities. To encourage R&D investment, the government has offered financial support, tax exemptions, and reduced bureaucracy. Organizations like the Small and Medium Enterprises Development and Support Administration (KOSGEB), the Scientific and Technological Research Council of Turkey (TÜBİTAK), and the Turkish Technology Development Foundation (TTGV) play pivotal roles in promoting R&D activities by providing tax exemptions, training, consultancy, and financial project support.

When examining the impact of defense industry investments on the balance of payments over short and long periods, distinct outcomes emerge. In the short term, as the establishment of production facilities requires time, an initial negative impact on the economy is observed. However, in the long term, as production reaches full capacity utilization, these investments begin to contribute positively to reducing the current account deficit. The degree of impact on the economic structures of countries varies based on their developmental level. Developed countries experience a lesser short-term negative impact on the balance of payments from defense industry investments, while developing countries feel greater economic pressure (Canbay, 2010).

Beyond the attainment of political, diplomatic, and military might, defense expenditures exert an influence that fortifies a nation's economic infrastructure and institutional framework. Owing to its capital-intensive nature, defense investment not only escalates a nation's foreign exchange-generating activities but also makes significant contributions to technological advancement. Particularly for developing countries grappling with chronic current account deficits, defense expenditures offer a potential remedy. To mitigate the impact of imports in defense investments and curb foreign exchange outflows, developing nations often resort to "offset" practices. These practices aim to reduce or entirely eliminate potential current account deficits in the balance of payments. An instance of offset implementation can be observed in the 2002 project executed by Turkey's Undersecretariat for Defense Industries. This project involved acquiring four Airborne Early Warning Control Aircraft (AWACS) from Boeing, an American corporation, necessitating an offset commitment of $570 million.

Investments in the defense industry, categorized under positive externalities, yield benefits such as bolstering the national industry, generating spare parts for weapon systems, enhancing sub-industries, fostering production-oriented partnerships, and cultivating a skilled workforce (Gürsoy, 2019). An examination of countries' development levels underscores the significance they place on their industries. Most developed nations are producers of weapons and defense systems. Japan serves as a prime example, where post-World War I investments in the defense sector facilitated its ascent to the ranks of developed Western countries. This rise is attributed to Japan's focus on strengthening its defense industry, encapsulated in the principle of "developing a prosperous nation and a robust military and industry while supporting companies" (Derya, 2015).

The primary objective in establishing and developing the defense industry encompasses not only military and political policies but also aims to catalyze comprehensive industrial development across various sectors in Turkey. Despite this, as previously discussed, investments in the defense industry manifest both positive and negative economic impacts on the country. A failure to create market opportunities for the products leads to resource wastage. The qualified workforce engaged in this sector becomes limited in its application to other industrial areas. The advanced technology requisite of the sector necessitates ongoing expenditures in R&D, thereby constraining resource allocation to other industrial domains (Çınar, 2002).

The discourse surrounding the economic impact of defense expenditures highlights their role in stimulating demand and fostering technological advancement. The synergistic potential between the regulatory and planning prowess of the state and the innovative capabilities of the private sector is underscored. This is particularly relevant when considering the defense industry and the nations that substantially invest in this domain. The realization of desired outcomes in technology and economic growth is contingent upon fulfilling a multitude of conditions.

Defense spending directed towards projects with high potential yields, which the free market may fail to undertake due to various market failures like externalities, asymmetric information, economies of scale, monopoly issues, or challenges in effective price discrimination, could potentially stimulate economic growth. However, the preponderance of literature suggests a predominantly negative impact of defense spending on growth. Two primary factors contribute to this effect: firstly, certain military technologies are exclusively applicable to the defense sector, thus limiting their stimulatory influence on the private sector. Technologies such as missile systems, jet engine production, and armored warfare equipment exemplify this limitation. Secondly, the degree of information sharing and transfer in technologies usable by the private sector is crucial. Inadequate technology transfer, often due to security and confidentiality concerns, weakens the potential stimulatory impact on economic growth and development. Consequently, debates persist regarding the predominant effect, with differing perspectives and data sets continuing to fuel discussions on this complex issue (Zülfüoğlu, 2021).

## 4. Literature

In the realm of academic discourse, the multifaceted impacts of inelastic defense expenditures on military, political, economic, and financial structures have been extensively studied. Empirical research on the effects of escalating defense expenditures predominantly concentrates on economic growth, yielding diverse outcomes contingent on the methodology employed and the chosen sample.

In the seminal work of Benoit, an analysis was conducted on the data from 44 developing countries spanning the period 1950-1965, revealing a positive correlation between the augmentation of defense expenditures and economic growth in these nations (Benoit, 1973). This study posited that defense spending not only fulfills basic civilian needs such as shelter, food, and clothing but also catalyzes economic growth by contributing to the development of infrastructure like roads, airports, bridges, and hospitals, as well as enhancing vocational education and health services (Türk, 2007). Post-Benoit's research, scholarly discourse bifurcated into two predominant perspectives concerning the efficacy of defense spending. From the supply-side theoretical stance, defense expenditures are perceived as instigators of a technological spillover effect. This effect ostensibly fosters positive externalities on infrastructure and human capital, thereby yielding a favorable impact on growth. In contrast, the demand-side approach posits that defense spending diverts resources from more productive avenues, engendering a crowding-out effect (Yıldırım et al., 2005). The consensus between these divergent viewpoints hinges on the necessity of determining an optimal level for defense expenditures and enhancing their effectiveness. This consensus underscores the importance of balancing defense spending with other economic priorities to maximize overall economic well-being and growth.

Subsequent studies have emerged supporting the Benoit hypothesis. Notable among these are the works of Brumm (1997), MacNair et al. (1995), and Murdoch et al. (1997). Sandler & Hartley (1995), in their research, elucidated the Benoit hypothesis through the lenses of supply and demand. It was posited that public infrastructure investments, such as transportation networks for defense purposes, would galvanize the private sector into investment and activity on the supply side. Simultaneously, enhanced national defense would bolster a country’s reliability and deter potential adversaries, as considered from the demand perspective (Lai et al., 2002).

The determination of an optimal level for defense expenditures in a country remains a pivotal yet complex issue in economic discourse. When conceptualizing defense as a public good, the optimal expenditure level is theoretically achieved when the aggregate of marginal benefits aligns with marginal costs, in line with the principles of collective consumption. Furthermore, the theory of deterrence posits a singular level of service, which is the absence of attack as a result of adequate defense. This perspective raises pivotal questions about the relationship between defense spending and global safety, including the implications of high or low defense budgets on the frequency of wars and the overall security of the world (Bilişli, 2011; Giray, 2004; MccGwire, 1985). MacNair et al. (1995) approached the optimal defense expenditure from the vantage point of public service provision, proposing that equilibrium is attained where the marginal benefit derived from defense spending equals its marginal cost. Crucially, the determination of a country's optimal defense spending level is profoundly influenced by its risk level. Accurately assessing a nation's security needs is essential, with factors such as economic development status, economic policies, strategic objectives, foreign relations, and resource constraints playing a significant role in this assessment (Altun, 1998).

Durgun & Timur (2017) analyzed the data of Turkey's per capita real GDP and real defense expenditures from 1970-2015, observing indicators supportive of the Military Keynesian Approach, although definitive causality was not established. Erbaykal (2007) studied Turkey's data from 1970-2005 and identified a negative correlation between defense expenditures and economic growth, indicating the neoclassical approach's validity. However, causality tests revealed a positive impact of defense spending on economic growth. Canbay (2010) investigated Turkey's defense expenditures and economic growth from 1950-2008, concluding that defense spending had a short-term negative and a long-term positive effect on economic growth during different periods. Türk (2007) examined the relationship between defense expenditure to GDP ratio and real national income in Turkey from 1970-2005, uncovering a long-term, slightly positive correlation between the variables. Giray (2004) compared

Turkey's defense, education, and health expenditures from 1980-2000, finding a positive relationship between defense and education spending and a negative one with health expenditures. The study noted that Turkey's defense spending, approximately 5% of GDP, was relatively high compared to NATO countries, attributed to Turkey's geopolitical position.

Kaya (2006) analyzed Turkey's defense expenditures from 1980-2004, assessing their effects on inflation, technological development, economic growth, and industry. The study observed that during Turkey's economic crises (1994, 1999, 2001), defense spending negatively impacted inflation and growth. Karakuş (2006) investigated the relationship between defense expenditures and national income in Turkey, Spain, Portugal, and Greece from 1988-2004. It was found that an increase in national income corresponded with heightened defense expenditures. Particularly in Turkey, rising national income was associated with increased procurement of weapon systems, resulting in substantial foreign currency outflows. Esgin (2010) compared the economic development impacts of arms exporting and importing countries using data spanning 1993-2005. The study identified positive effects on the economic growth of arms-exporting countries, in contrast to negative effects on arms-importing nations. For Turkey, periods of high imports adversely affected economic growth, but the shift from importation to production in recent years mitigated this negative impact. Başar & Künü (2012) examined the influence of defense expenditures on the economic growth of 36 countries, including Turkey, during 1997-2004. Their findings suggested that increased defense spending reduced economic growth rates.

Canbay & Mercan (2017) explored the impact of Turkey's defense expenditures and current account balance on economic growth from 1986-2016. The research posited that defense industry spending and investments might initially cause a current account deficit, yet could contribute positively in the long term by enhancing Turkey's presence in the international arms systems market. Gürsoy (2019) focused on the G-7 countries, analyzing data from 1970-2017. The study concluded that increases in defense expenditures had a positive, albeit weak, effect on economic growth in both short and long terms. Bayraktar (2019) scrutinized Turkey's data between 1990-2017 to assess the effects of defense expenditures on macroeconomic variables such as GDP, balance of payments, unemployment, and inflation. The study found a short-term negative causality between defense expenditures and GDP growth. Altay (2020) researched the top 15 defense-spending countries, including Turkey, to examine the impact of defense expenditures on economic growth. The findings indicated that defense spending adversely affected economies with trade deficits in the defense sector, corroborating the neo-classical approach. Conversely, countries with defense trade surpluses experienced a positive impact, aligning with the military Keynesian approach. Asiloğulları (2020) focused on the nexus between Turkey's defense expenditures and inflation from 1960-2017. It was observed that increased defense spending exerted an inflationary influence.

Canbay (2020) analyzed both short-term and long-term effects of Turkey's defense and R&D expenditures on economic growth between 1990 and 2017. Results showed that a 1% increase in defense spending decreased economic growth by 0.1% in the short term and 0.08% in the long term, whereas a 1% rise in R&D expenditures led to a 0.87% short-term and 2% long-term increase in economic growth. Canbay &Mercan (2020) concentrated on the influence of Turkey's defense expenditures, particularly arms imports, on economic growth from 1990 to 2017. The study found no statistically significant relationship in the short term, but identified a negative long-term impact of arms imports on economic growth. Ertekin (2020) examined data from 22 selected OECD countries between 2000-2017, assessing the impact of defense spending on budget deficits. The analysis revealed that defense expenditures constitute a considerable portion of public spending, with a 1% increase in defense spending leading to a roughly 0.43% increase in the budget deficit. In the study of Doğan (2018), an investigation into the Group of Eight (G-8) countries from 2000 to 2016 failed to identify a definitive positive or negative correlation between defense expenditures and economic growth. Tests specific to Turkey also indicated no causality between these variables. Karlıdağ (2018) explored the impact of defense spending on economic growth across five regions (Africa, the Americas, Asia-Pacific, Europe, and the Middle East). The study found that Europe exhibited the highest elasticity between economic growth and defense expenditures, whereas the Middle East showed the lowest. Birol (2010) analyzed the period from 1963 to 2006 in Turkey, identifying a negative correlation between defense expenditures and economic growth from 1963-1989. For the years 1990-2006, however, no significant relationship was discerned.

A synthesis of studies within the relevant literature suggests that while defense investment expenditures tend to positively impact the economy in developed countries, they have a detrimental effect on developing countries reliant on imports for their defense needs. In the context of developed nations, these positive effects are generally perceived as catalysts for economic development. Empirical research pertaining to Turkey indicates a negative relationship between defense expenditures and economic growth, supporting the neoclassical argument that increases in public defense spending adversely affect growth. Consequently, Turkey confronts a dilemma: either to enhance defense spending at the expense of growth or to curtail defense expenditures to stimulate economic expansion. Addressing this dilemma necessitates strategies in the defense industry that maximize potential contributions to economic growth while minimizing threats.

The study by Öksüz & Öztürk (2019) examines the influence of Turkey's defense industry on the broader industrial sector since the initiation of domestic development activities in 1996, focusing on data from 1997

onwards. This research highlights the increasing significance of the defense industry within Turkey's industrial sector, as evidenced by its growing contribution to turnover, exports, and employment. The positive impact of this trend on industrialization is underscored, with increased employment enhancing the skilled labor force and boosting national income and economic expansion through heightened turnover and exports. This growth is posited to foster broader economic development and welfare. The study also undertakes a strengths-weaknesses-opportunities-threats (SWOT) analysis, identifying strengths such as state, public, and corporate support for national projects, along with an emphasis on R&D. It notes a progressive increase in R&D funding and project support. However, the Turkish defense sector faces several challenges, including uncertainty in international state strategies and policies, reliance on foreign technology for critical components, and the impact of international embargoes limiting new entrants to the defense sector. The sector also confronts threats from increased asymmetric warfare, potential cyber, chemical, radioactive, nuclear, and biological attacks, escalating information security concerns, and the ongoing issue of brain drain.

## 5. Methodology

This study aims to examine the impact of Turkey's defense expenditures on GDP for the period spanning 1974 to 2021. The primary objective is to ascertain the existence and direction of a relationship between defense expenditures and GDP during this period. The hypotheses are as follows: $H_0$ posits no relationship between GDP and defense expenditures, while $H_1$ asserts the presence of such a relationship. Annual data on Turkey's defense expenditures and GDP from 1974 to 2021 form the basis of this analysis. Control variables such as technology policy and education policy are not included to maintain focus on defense expenditures. An inherent limitation of this analysis lies in the lack of detailed data on defense expenditures and the absence of a universally accepted definition of these expenditures. Furthermore, the study does not delve into sectoral connections and effects at a theoretical level, as such an examination requires country-specific input-output analyses, exceeding the scope of the current methodology.

This analysis aims to explore the correlation between national defense expenditure levels and GDP within a broad framework. The study utilizes defense expenditure data from the SIPRI, encompassing a wide range of military-related spending. According to SIPRI (2021), this includes outlays for armed forces, defense ministries, and other government bodies engaged in defense projects, as well as paramilitary forces equipped for military operations and expenditures on military space activities. The components of these expenditures consist of personnel costs (including military and civilian salaries, pensions, and social services), operations and maintenance, procurement, military research and development, and military infrastructure, such as bases and military aid. Notably, current expenses associated with past military activities, like civil defense, veterans' benefits, demobilization, conversion, and arms destruction, are excluded from SIPRI's definition (SIPRI, 2021). Therefore, incorporating both state budget defense expenditures and spending by other state institutions on defense projects in the econometric analysis is anticipated to provide a comprehensive overview of the economic growth pathways discussed at a theoretical level.

In time series analysis, a crucial aspect for accurate forecasting is the stationarity of the series. Stationarity implies that the stochastic process remains constant over time. A series that does not exhibit stationarity, that is, where the stochastic process varies over time, cannot be accurately modeled with simple algebraic expressions based on its past states. Stationary series, on the other hand, can be modeled with constant coefficients, based on their historical values. In cases where a parameter of the series is explained by its past values, but shows a consistent increasing or decreasing trend, it is termed a stochastic trend. In contrast, a deterministic trend is observed when changes in a parameter are linked to the time variable, with the dependent variable tending to increase or decrease depending on the coefficient’s sign, assuming the coefficient of the time variable is nonzero.

In the realm of non-stationary time series analysis, it is imperative to ascertain the presence of a trend within the series initially. When encountering a time series imbued with a trend, the foremost step involves extricating the series from this trend before proceeding to test its stationarity. In instances where a deterministic trend is identified within the time series, stationarization is achieved through regression against the time or trend variable. This process ensures that the residuals derived from the regression are devoid of any trend. Conversely, in the presence of a stochastic trend within the series, stationarity is attained by differencing the series, as delineated by Gujarati (2016). A fundamental premise in establishing econometric models, particularly when analyzing economic data-generated time series, is the stationary nature of the series, signifying the absence of unit roots. The pioneering unit root test, developed by Dickey and Fuller in 1979, is instrumental in examining the presence of a first-order unit root and assessing the significance of a trend in a time series. This test is a critical tool in determining the stationarity of economic time series and is vital for the reliability of econometric model predictions. The methodical examination of unit roots is crucial in ensuring the robustness and accuracy of time series analyses in economic research.

During the development of their unit root test, Dickey & Fuller (1979) formulated three distinct models: one without a constant or trend, representing stability and lack of trend; another with a constant but no trend; and a

third model incorporating both a constant and a trend. Tau test statistics were derived for these models and employed in hypothesis testing. The Dickey-Fuller test assumes that error terms are statistically independent and exhibit constant variance, hence are not subject to autocorrelation. To address the frequent issue of autocorrelation in error terms, the Augmented Dickey-Fuller (ADF) test was introduced in 1981. This enhancement to the Dickey-Fuller (DF) test involved the inclusion of lagged values in the model, effectively adjusting for autocorrelation. The Phillips-Perron unit root test, developed later, accommodates weakly dependent and heterogeneously distributed error terms, as noted by Enders & Lee (2017). Phillips & Perron (1988) demonstrated that the limit distributions of their test and the DF test are congruent, allowing for a non-parametric unit root test using the same critical values as the DF test. The Phillips-Perron test excels in series with a trend, particularly when the moving average processes are positive. However, for series exhibiting negative moving average (MA) processes, the ADF test is more suited. In the Fourier Augmented Dickey-Fuller (FADF) model, the fundamental hypothesis of a unit root, $H0$: $\alpha 1=0$, is tested against an alternative hypothesis $H1$: $\alpha 1\neq 0$. The established equation examines the relationship between variables, and details regarding these variables are provided in Table 4 of the study. This comprehensive approach ensures a robust analysis of the series, accommodating various statistical nuances present in economic data.

$$LGDP_t = \alpha_0 + \alpha_1 LME + \mu_t \quad (1)$$

The study incorporates two primary variables: LGDP and LME. LGDP, representing the natural logarithm of GDP, serves as the dependent variable, whereas LME, the natural logarithm of the ratio of military expenditures to GDP, functions as the independent variable. The parameters $\alpha_0$ and $\alpha_1$ denote the estimation coefficients, with $\mu_t$ symbolizing the error term. Data for LGDP, derived from the World Bank database, reflects constant 2015 US dollars, ensuring temporal consistency. LME data, sourced from the SIPRI database, captures the ratio of defense expenditures to GDP, providing a comprehensive view of military spending in relation to the national economy. Econometric analysis in this study employs Eviews 10 software. The analytical process commences with the assessment of unit roots in the series using both the Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) tests. Subsequently, the ARDL bounds test, as developed by Pesaran et al. (2001), is applied to discern any cointegration relationships between the variables. The final phase involves applying the Toda-Yamamoto causality test to ascertain the directional causality between the variables.

**Table 4.** Variables used in the study

| Variable Name | Short Name in the Study | Period | Source |
|---|---|---|---|
| GDP (Constant 2015 US$) | LGDP | 1974-2021 | World Bank |
| Military expenditures (% of GDP) | LME | annual data | SIPRI |

## 6. Results

### 6.1 Stationarity Analysis, Unit Root Test and Results

The initial stage of the econometric analysis involved examining the presence of unit roots in the data. The necessity of this step arises from the potential for spurious regression if non-stationarity exists in the time series data, due to underlying trends and tendencies. Özata (2015) highlights the importance of determining the existence of unit roots in the data under consideration. For the datasets employed in this model, both the ADF and PP unit root tests were utilized. The findings of these tests are systematically presented in Table 5.

According to the ADF and PP test results, the GDP variable exhibited non-stationarity across all models (constant, constant with trend, and without constant or trend). However, upon first differencing, the variable attained stationarity at a 1% significance level in all models. Regarding the military expenditures (ME) variable, the ADF and PP tests indicated stationarity at the 10% and 5% significance levels, respectively, in both constant and trend models. Moreover, first differencing resulted in stationarity at the 1% significance level across all models. The differing stationarity levels of these series, and their transition to stationarity upon first differencing, suggest the applicability of the ARDL bounds test.

### 6.2 ARDL Bounds Testing and Findings

The cointegration relationship within the model was investigated using the ARDL bounds test, as developed by Pesaran et al. (2001). This test differs from the Engle & Granger (1987) and Johansen cointegration tests in that it can be applied without requiring the variables to have the same degree of stationarity. This feature allows for easier cointegration testing on datasets that exhibit stationarity at varying levels or at level values (Polat & Gemici, 2017).

**Table 5.** Unit root test results

| Variables | Level/First Difference | ADF Fixed | ADF Fixed & Trend | ADF No Fixed or Trend | PP Fixed | PP Fixed & Trend | PP No Fixed or Trend |
|---|---|---|---|---|---|---|---|
| GDP | Level | 0.3519 | -2.5161 | 7.2487 | 0.6184 | -2.625 | 8.5696 |
| | Possibility | 0.9786 | 0.3194 | 1.0000 | 0.9888 | 0.2716 | 1.0000 |
| | First difference | -6.5265 | -6.5128 | -1.7657 | -6.5457 | -6.7317 | -3.6217 |
| | Possibility | 0.000*** | 0.000*** | 0.0736* | 0.000*** | 0.000*** | 0.0006*** |
| ME | Level | | -3.3398 | -0.7719 | -1.1517 | -3.5381 | -0.7875 |
| | possibility | | 0.0724* | 0.3765 | 0.6874 | 0.0468** | 0.3696 |
| | First difference | | -7.9075 | -7.9223 | -8.0587 | -8.0001 | -7.8887 |
| | Possibility | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** |

| Variables | | ADF Fixed Coefficient Probability | ADF Fixed & Trend Coefficient/ Probability | PP Fixed Coefficient/ Probability | PP Fixed & Trend Coefficient/ Probability |
|---|---|---|---|---|---|
| **LGDP** | I (0) | 0.3519 / 0.9786 | -2.5161 / 0.3194 | 0.6184 / 0.9888 | -2.625 / 0.2716 |
| | I (1) | -6.5265 / 0.0*** | -6.5128 / 0.0*** | -6.5457 / 0.0*** | -6.7317 / 0.0*** |
| **LME** | I (0) | -1.1393 / 0.6925 | -3.3398 / 0.0724* | -1.1517 / 0.6874 | -3.5381 / 0.0468** |
| | I (1) | -8.0308 / 0.0*** | -7.9075 / 0.0*** | -8.0587 / 0.0*** | -8.0001 / 0.0*** |

Note: *** (1%), ** (5%), * (10%) indicates stationarity levels at the significance level.

To ascertain the cointegration relationship between variables, the F-test for the lags of first differences of the dependent and independent variables was conducted. An F statistic value exceeding the critical value outlined by Pesaran et al. (2001) indicates the presence of a cointegration relationship between the variables. Conversely, an F statistic lower than the critical upper value or falling between the level and first difference suggests the absence of cointegration. When the F statistic surpasses the critical upper value, an ARDL model is constructed to delineate long- and short-term relationships, as shown in Eq. (2).

$$\Delta LGDP = \beta_0 + \sum_{i=1}^{p} \beta_{1i} \Delta LGDP_{t-i} + \sum_{i=0}^{q} \beta_{2i} \Delta LME_{t-i} + \mu_{1t} \quad (2)$$

where, $p$ and $q$ signify appropriate lag numbers. Post-determination of long-term coefficients in the model, descriptive test statistics regarding the model's adequacy are presented in Table 6.

**Table 6.** Descriptive statistics

| Variables | LGDP | LME |
|---|---|---|
| Average | 26.676480 | 1.128906 |
| Hydrangea | 26.685590 | 1.206836 |
| Maximum | 27.754160 | 1.633048 |
| Minimum | 25.692330 | 0.594899 |
| Standard deviation | 0.601669 | 0.290524 |
| Jarque-Bera | 2.778367 | 3.447001 |
| Possibility | 0.249279 | 0.178440 |
| Correlation matrix | -0.832250 | -0.832250 |
| Number of observations | 48 | 48 |
| **Correlation Matrix** | | |
| **Variable** | **LGDP** | **LME** |
| LGDP | 1 | - 0.83225 |
| LME | -0.83225 | 1 |

Table 6 details descriptive statistics, including the mean, median, maximum, minimum, standard deviation, and correlation matrix values for the variables LGDP and LME, based on 48 observations. The Jarque-Bera test and probability values indicate a normal distribution of the datasets. The correlation matrix reveals a strong negative relationship between LGDP and LME. An ARDL bounds test is to be conducted among non-stationary variables at equivalent levels to assess cointegration. Initially, a long-term relationship between the dependent variable LGDP and the independent variable LME is tested by constructing an Error Correction Model (ECM) (Uluyol et al., 2014). The ARDL model's maximum lag lengths are set at 10, with the Akaike Information Criterion (AIC) determining the ARDL (6,8) model. The F-statistic from the ARDL (6,8) model and the critical values are exhibited in Table 7.

**Table 7.** F statistics and critical values

| Model | K | M | F Statistics | Severity Level | Lower Limit | Top Limit |
|---|---|---|---|---|---|---|
| ARDL (6,8) | 1 | 10 | 6.175297* | %1 | 7.625 | 8.825 |
| | | | | %5 | 5.26 | **6.16** |
| | | | | %10 | 4.235 | 5.00 |

Note: * indicates significance at the 5% level, *K* represents the number of explanatory variables, *M* denotes the maximum lag number.

There are two hypotheses, Ho (no cointegration relationship exists between the variables) and H1 (a cointegration relationship exists between the variables).

In the analysis conducted using the ARDL model (6, 8), the calculated F-statistic surpassed the critical upper threshold at the 5% significance level. This finding substantiates the presence of a long-term cointegration relationship between the variables LGDP and LME. Consequently, the null hypothesis, positing the absence of such a relationship, has been refuted. Descriptive tests, results of which are detailed in Table 8, were employed to assess autocorrelation, changing variance, normality, and model specification errors. The $R^2$ and adjusted $R^2$ values, as indicated in the table, elucidate the model's explanatory power, with the F-statistic and associated probability values affirming the model's significance at the 5% level. The Durbin-Watson d-test yielded a value of 2.105037, and the probability value for the Breusch-Godfrey ($X^2_{BG}$) test exceeded 5%, suggesting the absence of autocorrelation within the series. The Jarque-Bera ($X^2_{JB}$) test's probability value, also surpassing 5%, indicates a normal distribution of the series. Similarly, the Breusch-Pagan-Godfrey ($X^2_{BPG}$) test's probability value being above 5% implies no changing variance issues. Additionally, the $X^2_{Ramsey\ RESET}$ test's probability value exceeding 5% denotes the absence of model specification errors in the regression. The results derived from these descriptive tests reinforce the reliability of the model. Following the validation of the descriptive test outcomes and the identification of the cointegration relationship, the study presents estimates for both long and short-term coefficients in Table 9.

**Table 8.** Descriptive statistics

| Test Name | Value | Test Name | Value | Possibility |
|---|---|---|---|---|
| $R^2$ | 0.592115 | $X^2_{BG}$ | 0.3508 | (0.1626) |
| Corrected $R^2$ | 0.363699 | $X^2_{JB}$ | 0.8420 | (0.6563) |
| F statictics (possibility) | 2.592267 (0.0183) | $X^2_{BPG}$ | 22.0991 | (0.1052) |
| Durbin-Watson test | 2.105037 | $X^2_{Ramsey\ RESET}$ | 0.4294 | (0.5188) |

**Table 9.** ARDL bounds test results

| Long-Term Coefficients | | | | |
|---|---|---|---|---|
| **Variables** | **Coefficient** | **Standard deviation** | **t-statistics** | **Possibility** |
| LNME | -2.790336 | 0.463303 | -6.022706 | 0.0000*** |
| C | 2.370436 | 0.824654 | 2.874461 | 0.0083*** |
| **Short-Term Coefficients** | | | | |
| **Variables** | **Coefficient** | **Standard deviation** | **t-statistics** | **Possibility** |
| D (LME) | -0.196771 | 0.06191 | -3.178329 | 0.0040*** |
| D (LME (-5)) | 0.169475 | 0.067665 | 2.504624 | 0.0195** |
| D (LME (-6)) | 0.148163 | 0.070048 | 2.115166 | 0.0450** |
| CointEq (-1)* | -0.075559 | 0.021066 | -3.586809 | 0.0015*** |
| C | 2.370436 | 0.639129 | 3.708856 | 0.0011*** |

Table 9 presents the cointegration analysis between LGDP and LME, establishing a significant relationship at the 1% level in both short and long-term assessments. The coefficients indicate a negative correlation between defense expenditures and LGDP over the long term. Contrarily, in the short term, an elevation in defense expenditures, particularly at the 5th and 6th lag levels, is observed to positively influence LGDP. The short-term error correction coefficient stands at -0.075559, significant at the 1% level. This coefficient denotes that any deviation between LGDP and LME in the long-term is rectified by approximately 7.56% in the subsequent period. The robustness of the ARDL (6,8) model against structural breaks is scrutinized using Cumulative Sum (CUSUM) and CUSUMQ graphs. These graphs are illustrated in Figure 2. Examination of these graphs reveals that the specified critical boundaries at the 5% significance level are not exceeded, thereby indicating consistent coefficients.

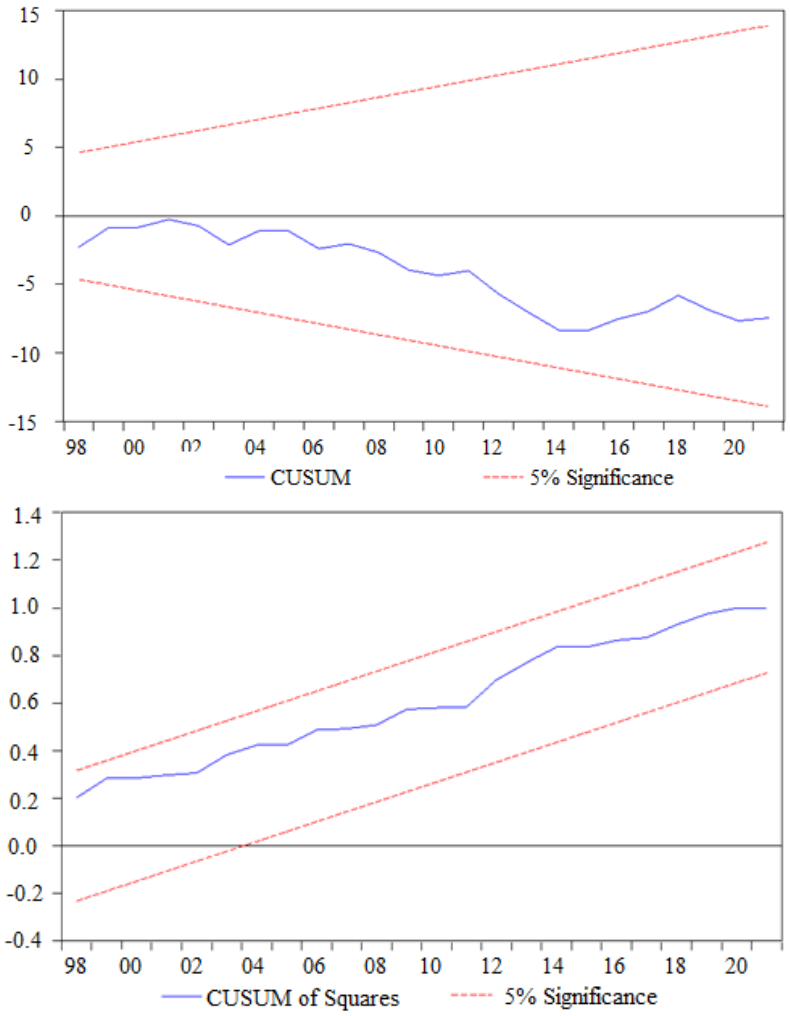


**Figure 2.** CUSUM/CUSUMQ graphs

### 6.3 Toda-Yamamoto Causality Test and Results

The causality between GDP and defense expenditures within this study is analyzed using the Toda & Yamamoto (1995) causality test framework. This test is selected for its unique advantage of not necessitating the examination of series' stationarity levels or the presence of cointegration relationships, thus offering a distinct approach compared to traditional causality tests like those proposed by Granger (1969) and Engle & Granger (1987). The Toda-Yamamoto test's efficacy hinges on accurately setting the delay length and understanding the series' maximum integration degrees (Erbaykal, 2007).

The model for this causality test, designated as VAR ($k+dmax$), incorporates lag lengths ($k$) and the maximum integration degrees of the variables ($dmax$):

$$LGDP_t = \sum_{i=1}^{k+d\max} \alpha_{1i} LGDP_{ti} + \sum_{i=1}^{k+d\max} \beta_{1i} LME_{ti} + \mu_{1t} \quad (3)$$

In Eq. (3), the null hypothesis ($i \leq k$), denoted as ($\beta_{1i}$=0), is tested. A rejection of this hypothesis implies a causal relationship where defense expenditures impact GDP. Conversely, the absence of rejection suggests no causality from defense expenditures to GDP. The subsequent equation of the model is articulated as follows:

$$LME_t = \sum_{i=1}^{k+d\max} \alpha_{2i} LME_{ti} + \sum_{i=1}^{k+d\max} \beta_{2i} LGDP_{ti} + \mu_{2t} \quad (4)$$

Eq. (4) tests the null hypothesis ($i \leq k$), denoted as ($\beta_{2i}$=0). Rejection of this hypothesis indicates that GDP causally influences defense expenditures, while non-rejection signifies the absence of such causality. For

determining *k+dmax* in the Toda-Yamamoto test, the initial step involves ascertaining the maximum integration degree. Referencing the ADF and PP unit root test results (Table 5), both LGDP and LME series are observed to attain stationarity at first difference, which suggests (*dmax*=1) or a maximum integration degree of 1. Table 10 elucidates the selection process for the appropriate number of lag lengths (*k*) within the model.

**Table 10.** Number of appropriate lag lengths

| Number of Lags | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -16.67074 | NA | 0.00801 | 0.84867 | 0.92977 | 0.878746 |
| 1 | **120.8055** | **256.2057*** | **1.86e-05*** | **-5.218432*** | **-4.975133*** | **-5.128205*** |
| 2 | 122.8451 | 3.615727 | 2.03E-05 | -5.129324 | -4.723827 | -4.978946 |
| 3 | 124.0891 | 2.092053 | 2.31E-05 | -5.004048 | -4.436351 | -4.793519 |
| 4 | 125.5181 | 2.273432 | 2.62E-05 | -4.887185 | -4.157289 | -4.616505 |

Note: * indicates the optimal lag order determined by the criterion.

The lag length for the Vector Autoregression (VAR) model, denoted as *k+dmax*, was established at 2, considering the optimal lag length of *k*=1 and the maximum integration degree of 1. The Seemingly Unrelated Regression (SUR) method was employed to address potential interrelation of equation residuals. The significance of the coefficients in the resultant model was assessed through the MWALD test, with the findings presented in Table 11.

**Table 11.** Toda-Yamamoto causality test results

| Basic Hypothesis | $x^2$ | Possibility |
|---|---|---|
| $H_0$: Defense spending is not the cause of GDP. | 3.570921 | 0.0587** |
| $H_1$: GDP is not the cause of defense spending. | 4.470751 | 0.0344* |

The results presented in Table 11 indicate a significant causal relationship between defense expenditures and GDP. Specifically, causality is detected from defense expenditures to GDP at the 10% significance level, and conversely, from GDP to defense expenditures at the 5% significance level. This implies a one-way causal relationship flowing from GDP to defense expenditures. The hypothesis "$H_0$: Defense spending is not the cause of GDP" is rejected at the 5% level (with a probability value of 0.0587), as detailed in Table 11. Conversely, the hypothesis "$H_1$: GDP is not the cause of defense expenditures" is accepted, evidenced by a probability value lower than 5%. These findings corroborate prior research conducted by Has & Çınar (2022).

### 6.4 Evaluation and Recommendations

This study focuses on the enduring nature of defense expenditures and their consequential impacts on the Turkish economy, examining the period from 1974 to 2021. The selection of this specific timeframe is anchored in historical events that underscored the imperative for Turkey to shift towards self-reliance in its defense industry. Post-World War II, Turkey, navigating demands from Russia over territorial concessions, established its defense forces primarily through US' grants and aid. However, the US-imposed arms embargo during the 1974 Cyprus Peace Operation highlighted the detrimental effects of reliance on imported defense systems for Turkey.

In this analysis, the relationship between GDP and the ratio of military expenditures to GDP within the specified period in Turkey is scrutinized. The model employs natural logarithms, designating GDP as the dependent variable and the ratio of military expenditures to GDP as the independent variable. The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests were applied to confirm the stationarity of these variables. The results indicate that the dependent variable is stationary at the first difference both at the 5% and 1% levels, while the independent variable achieves stationarity at the 5% level. Post-confirmation of stationarity, long- and short-term cointegration tests were conducted using the ARDL bounds test, as formulated by Pesaran et al. (2001). The chosen model, ARDL (6,8), is determined based on a maximum lag length of 10. The F-statistic value derived from this model surpasses the critical upper bound at the 5% significance level, thereby suggesting a long-term cointegration between GDP and military expenditures. Subsequent to this determination, various tests were conducted to assess autocorrelation, changing variance, normality, and model specification errors. The results from these diagnostic tests affirm the robustness and reliability of the model under consideration.

Utilizing the CUSUM and CUSUMQ tests for detecting structural breaks in the model, it was observed that the critical boundaries at the 5% significance level were not exceeded. This finding suggests a consistent relationship between the variables. Analysis of the long-term and short-term coefficient data reveals a negative correlation between defense expenditures and GDP, corroborating the findings of prior research by Erbaykal (2007) and Akcan (2019). The study further explores causality between these variables using the Toda & Yamamoto (1995) causality test. For this test, the determination of the lag length (*k*) and the maximum cointegration degree (*dmax*)

was crucial to establish the Vector Autoregression (VAR) model (*k+dmax*). The selected lag length, as detailed in Table 10, was (1), with the maximum cointegration degree also being (1), thereby setting the VAR model lag at (2). The Modified Wald (MWALD) test was conducted to evaluate the significance of the coefficients within this model. The results, as presented in Table 11, indicate causality at a 10% significance level from defense expenditures to GDP and at a 5% significance level from GDP to defense expenditures. These insights align with the research findings of Has & Çınar (2022), further enriching the discourse in this field.

The findings from the ARDL bounds test and Toda-Yamamoto causality test in this study indicate a negative correlation between defense expenditures and GDP, resonating with the Neo-Classical approach. This approach posits an economic exclusion effect, where increased public expenditure, inclusive of defense spending, necessitates market borrowing. This borrowing escalates market interest rates, consequently elevating investment costs due to these heightened rates. Historically, Turkey's protracted encounters with terrorism, particularly in its eastern and southeastern regions, have necessitated substantial allocations for defense in the national budget. This allocation has inadvertently resulted in delays in other critical sectors such as education and health. Despite the econometric analysis revealing a negative relationship between GDP and defense expenditures for the period 1974-2021, Turkey's geopolitical position underscores the indispensability of defense spending.

Given the geopolitical landscape, including ongoing conflicts in Syria, refugee crises, territorial disputes over oil and gas reserves in the Mediterranean, and anti-terrorism efforts, there is a compelling case for Turkey to escalate its defense spending. This necessity stems from both security considerations and policy imperatives. The overarching objective is to transform Turkey from a defense importer to an exporter, signifying a pivotal shift in its defense strategy. While immediate imports of defense systems may necessitate increased borrowing, the continuation of defense spending is deemed critical for mitigating risks and realizing strategic objectives. The long-term aspiration is to cultivate a robust, autonomous, and domestically-driven defense industry. The growth in private sector investment in Turkey's defense sector is commendable. However, it is crucial that this does not detract from the public sector's prominent role in this domain. Enhancing public-private partnerships in the defense industry should be pursued, with careful supervision and regulation of the private sector, to mitigate any potential risks.

Data analysis indicates that Turkey's strategic implementation of policies in defense, particularly focusing on domestic industry development and exportation of defense systems and equipment, possesses significant potential for positive economic contribution in the long term. Recent trends underscore the capacity-enhancing and income-generating impacts that partnerships between the private and public sectors can yield within the country's economic development framework. Notably, public investments, especially in the defense industry, have been observed to guide the private sector by generating positive externalities stemming from R&D efforts. This synergy fosters stimulation across various sectors and segments, contributing to holistic economic development. Investments in the defense industry, when strategically planned to mitigate exclusion effects and underpinned by long-term visions, can enhance the quality and quantity of skilled labor and technical expertise. These advancements are anticipated to exert beneficial impacts on numerous latent sectoral metrics. While a short-term negative correlation between military spending and economic growth is evident, this dynamic is likely to shift positively over time due to the underlying stability and support the defense sector provides to the economy. For instance, R&D activities are critical in propelling the development of the defense industry, enhancing the utilization of existing and dormant resources. The continuous improvement of current technologies ensures that domestically produced defense products align with international standards, thus elevating their competitiveness globally and potentially boosting employment in the export sector. Another pivotal aspect of national defense is cybersecurity. Addressing and investing in cybersecurity concerns is paramount in today's digitally driven world, as these directly correlate with national security. This investment priority is not exclusive to Turkey but is a global imperative.

Future academic endeavors should explore the relationships between defense expenditures and other macroeconomic indicators, such as technology and employment. Additionally, sector-specific cost-benefit analyses of defense industry investments post-2002, with distinctions between public and private contributions, could yield valuable insights for the field.

## Data Availability

The data used to support the research findings are available from the corresponding author upon request.

## Conflicts of Interest

The authors declare no conflict of interest.

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