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Dynamic Panel Data Analysis: The Relationship Between Spendings on National Defense and Economic Growth

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Abstract

Ensuring national security and defense expenditures made for this purpose are also of great importance for the country's economy. Because providing a safe environment is an important phenomenon in the realization of economic growth. On the other hand, defense expenditures have a serious impact on economic growth, as it has a high share in the budget and is an important component of GDP. In this thesis, the effect of inflation, external debt and defense expenditures on economic growth is investigated in a dynamic panel data model for at least 15 NATO member countries. Data will is taken from the World Bank and OECD. For the selected country group in the study, dynamic panel data analysis is carried out using the data between 2007-2016.

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Introduction

Since the beginning of time, individuals seeking to establish dominance over one another have relied on the ability to wield great amounts of force. Throughout human history, the authority of the individual has been gradually superseded by the power of society. This is especially true in the shift from nomadic to established life. Eventually, when humans began to live together and share their labor, division of labor and specialization in the society were established as a result.

The military, which is generally regarded as a non-productive group in society, is always backed by other organizations in both times of war and peace, and it is always prepared to respond to threats when they arise. When the civilizations of today are researched, it is discovered that they have obtained the military might that they possess now as a result of their historical experiences. Military strength is required for societies to protect themselves from external threats. The military might of a civilization is influenced by a variety of factors, including the population, the economy, the political system, and the country's geographic location. It is difficult for societies to thrive if they do not have access to armed force at their disposal. The budget for spending in the sphere of defense in the economy of all civilizations has been set aside at this stage. It is dependent on the nations and economic aspects of the countries how much money is spent in the stated military area in relation to the rest of the economy.

While the Cold War has ended in many parts of the world and the number of wars between superpowers has decreased, operations in the field of defense have maintained their importance and expenditures in this sector have continued in many nations despite these developments. The transition from bilateral polarization to multipolarization took place between 1980 and 1998 and resulted in many developing nations, particularly in the Middle East, South Asia and North Africa, cutting back on military spending during this period of time. In this case, the financial difficulties that forced governments to restructure the priorities of public expenditures had a role in the transformation. However, over this era, nations such as the European Union, Russia, the United States, China, Israel, India, Syria, Iraq, Pakistan, and Iran have experienced a rise in the amount of money they commit to defense spending. Particularly, after 1998, nations began to raise the amount of money they set aside for defense expenditures in their national budgets.

During the three-year period from 1998 and 2001, the growth in defense spending was around 7% each year on average. The increase in military spending that occurred after 1998 was a result of economic, political, and technical advancements, particularly in the Middle East, Europe, the United States, and East Asian nations, among other places. SIPRI published a report in 2002 stating that Between 2010 and 2019, the United States, Saudi Arabia, and China were the top three countries in terms of defense spending during the previous ten years. When it comes to defense expenditures, the United States spent the most money in 2018, spending 648 billion dollars in the process. SIRPI published a report in 2019 stating that There are several studies on the impact of defense expenditures on economic growth that have been published in the literature. However, it has been seen in these research that there is no consensus on whether defense spending have a beneficial or negative impact on economic growth. The impacts of defense spending, the amount of foreign debt incurred by countries, and the inflation rate on the gross domestic product of NATO member nations were explored in this study with the use of dynamic panel data.

1. Economic growth

1.1 Theoretical foundations of economic growth

Regardless of the level of development, the main purpose of countries is to provide and maintain the economic growth and development necessary to ensure that future generations live at the highest level of prosperity. In this respect, it is important to understand the concept of economic growth well and to understand the relationship between foreign trade and growth as the subject of the study. The increase in the number of products and services produced in a country's economy is known as economic growth. Economic growth is defined as a rise in output and revenue over a period of time in both developed and developing countries. As a result, economic growth may alternatively be defined as a rise in the country's GDP per capita. Economic growth is the expansion of a country's total amount of production as measured by GDP. Per capita income rises when national income rises faster than population growth. This raises the country's standard of living. For emerging countries, economic growth is just as crucial as it is for industrialized countries. While rich nations place a premium on the notion of economic growth, emerging countries place a premium on the concept of economic development rather than growth. Economic development is a notion that encompasses not just economic growth but also economic, social, and political domains such as lowering income disparities in society, reducing unemployment, and upgrading economic and social institutions. Economic growth can take place in one of two ways. The first is to start using the economic resources that are utilized at full employment more effectively, and the second is to add additional resources to the quantity of resources that are used at full employment. Economic growth theories are primarily concerned with full employment growth. In this meaning, economic growth refers to a change in quantity rather than quality; in other words, it refers to a rise in production as a result of an increase in one or more production components.

The most important factors affecting growth in the long run can be grouped under five main headings (Piętak, 2014):

Capital - Capital, which is among the determinants of economic growth, has an important share in production increase. Saving a portion of current revenue and investing it in order to improve future production and income is how capital accumulation is done. Bringing capital and labor together allows for the creation of commodities and services. The work force in a country will not be productive if there is inadequate physical capital relative to the present labor force. As a result, capital is a necessary resource for developing countries.

Labor - Labor has a significant impact on economic development, both in terms of quality and quantity. The rise in the workforce, together with population expansion, can be considered a catalyst for economic growth. Along with the rise of the industry, population growth provides for an increase in the qualified labor. Furthermore, a rise in labor supply will have both good and negative consequences on emerging country GDP. As long as labor force expansion improves marginal productivity faster than average productivity, it will have a beneficial impact on economic growth.

Demographic changes - Demographic issues impact economic growth by modifying the employment to population ratio. Factors include the number and quality of accessible natural resources. Age structure of the population also effects employment and long-run growth.

Natural Resources - Natural resource reserves in each country varies due to the homogenous distribution of natural resources across the planet. Although a country with abundant natural resources is assumed to have a positive economic growth rate, it is unrealistic to believe that this growth is inevitable. Because it is seen that in countries with abundant natural resources, economic growth slows over time. The major economic asset of emerging countries is made up of existing natural resources and their labor. Due to their acquired money and sophisticated technical level, industrialized countries, on the other hand, place less emphasis on natural resources. However, most industrialized nations with high wealth and living standards have natural resources, and ways for economically and sensibly harnessing these resources are used.

Technological Developments - Developing countries have given importance to industrialization, especially in production, for economic growth and development in order to reach the levels of developed countries. As the importance of technical breakthroughs, research, and industrial strategies grew in tandem with industrialization in order to enhance output, the terms "economic growth" and "technological development" came to be used interchangeably. Given that people's individual and societal well-being is always improving, technological advancements are likely to continue unabated. The high degree of technical advancement in industrialized nations contributed to increased productivity and the acceleration of the economic growth process. Countries with more educated populations have expanded their labor potential and contributed to their economic success by specializing in innovative technologies.

The goal of technological inventions and improvements produced by advanced technology countries is to reduce manufacturing costs, improve quality, and develop new goods. Developed countries get an edge in international markets by creating high-quality, low-cost items in this way. Goods made before technical progress reaches other nations are exported to places where it is not available. This export will continue until the importing countries have learned and assimilated the new product's manufacturing technologies. Developing nations export standard industrial items that do not need technology, whereas industrialized countries export new non-standard products (Vidhi, 2017).

The phenomenon of growth is at the heart of the economic strategies pursued in both developed and developing countries, and it is described by an increase in production and revenue through time. Using various variables, Classical, Neo-Classical, and Modern Growth Theories provide light on the economic growth process. The capacity effect of investments is ignored by Keynesian Growth Theory, which only analyzes their influence on national income. The Harrod-Domar model likewise emphasizes investment's income-generating impacts. He claims that growth is driven internally by the economic forces that exist within the markets themselves in his Internal Growth Theory (Piętak, 2014).

In the growth process, the Neo-Classical Growth Model highlights the relevance of both labor force and physical capital accumulation. External technical progress is the source

of total factor productivity. Despite the simplicity of the Solow Growth model's external technology premise, numerous economists claimed in the 1960s that technological progress could be explained internally using economic variables. New endogenous growth models emerged after the mid-1980s, when Romer validated the endogenous technology thesis with increasing returns. The research and development sector produces knowledge and new technological designs in the first group, physical capital investments and learning-by-doing models in the second group, human capital accumulation in the third group, and public investments in the fourth group, all in the pursuit of profit in this growth model. These models all contain a variety of capital definitions as well as growing and fixed returns (Solow, 1956).

In contrast to the Mercantilists, who believed that growth could be achieved through a foreign trade surplus, Adam Smith contended, like the Physiocrats, that growth could be obtained through labor and production, but through agriculture, industry, and the service sector. According to Smith, the state is required for the development of private property law, which is the infrastructure for future prosperity, as well as safeguarding individual protection (Costinot and Donaldson, 2012).

Based on the law of increased labor and capital productivity, Adam Smith claims that there are three fundamental ingredients for growth: capital accumulation, division of labor, and automation. According to Smith, if capital accumulation does not change, output and consumption will equalize, and growth will come to a halt. He claims that international division of labor boosts growth by tying the effects of specialization and division of labor on economic growth to foreign trade.

According to Smith, economic growth comprises the application of machinery and labor division to industry. Growth will result if mechanization is applied in agriculture, industry, and the service sector, and per capita income is raised.

David Ricardo, another well-known classical economist, based his growth theory on three pillars: the bronze law of wages, declining agricultural output, and the profit-rent conflict. Wages are set at a level that allows the employee to reproduce. As output increased, the worker's pay fluctuated. However, the increased land rent offsets the higher

revenues. When output increases, the rent takes up all of the profits. When incomes are negative and capital accumulation is non-existent, this is the steady state position.

By filling up the holes in Smith's Theory of Growth, Ricardo adds the law of diminishing returns to the growth model. The rate of profit, according to Ricardo's thesis, motivates capitalists to accumulate capital. The wage cap is lifted above this amount due to the increase in the pay fund as a result of savings. Because the pace of population change is linked to the wage, an increase in the wage rate will result in a faster rate of population growth. While the pay fund remains stable, as a result of population growth, the wage rate will eventually return to its normal level, resulting in an increase in labor supply. However, if food prices rise during this time, cash salaries are projected to climb at the same rate. Despite the fact that food prices are rising as a result of lower agricultural returns, industry's fixed income does not require such a rise. Even if product prices remain constant, an increase in the cash pay rate has an impact on the profit rate on a unit of labor and capital utilized in production. When the profit ceiling is achieved, accumulation and expansion come to a standstill, and the economy enters a long-term downturn. (Dongarra et. al., 2011).

Following Keynes, the Harrod-Domar model dynamises the static Keynesian macroeconomic model, allowing for long-term growth analysis. Starting with the underemployment balance, Harrod looked for strategies to expand that would result in a full employment balance. Domar, on the other hand, was concerned with the growth rate that would assure full employment's long-term viability based on the full employment balance. Because the assumptions and conclusions of these research, which are independent of one another, are comparable, the models are discussed together. For Harrod and Domar, the most essential issue is balanced growth, and he described how nations would achieve it and how it will be sustained. Harrod and Domar used capital, production coefficient, and savings rate to try to explain economic growth. Growth has a positive link with savings and an opposing association with the capital output coefficient, according to this model. As a result, saving should be prioritized, and a portion of income should be set aside for investment. Because economic development is governed by investments, it increases when

savings are made. The key assumptions of the Harrod Growth model are (Costinot and Donaldson, 2012):

- The model uses an undelayed saving function with a constant and equal marginal average inclination to save.

- Actual savings are equivalent to planned savings.

- The amount of money invested and saved is the same. The amount of money saved is unaffected by income.

- Savings levels are unaffected by income.

The following are the Domar Growth model's economic assumptions:

- The government does not spend any money.

- The economy is isolated from the rest of the world.

- The economy is not experiencing any delays.

- There is an equilibrium level of full employment.

- The income-to-capital technology connection is fixed.

In the model, for a balanced economic growth at full employment, the current growth rate should be equal to the projected growth rate, which should be equal to the labor force growth rate. However, in this case, an unstable growth will emerge even though there is balance. The marginal propensity to save, the capital output rate, and the population growth rate are necessary for stable growth. However, in this model, these variables are determined independently. Accepting the Harrod Domar model means accepting that the economy is growing in depression and in an unstable state. In this case, it becomes impossible to explain the continuous increase in the welfare level in developed countries in this model.

Solow's first of two economic growth studies focuses on capital accumulation and implies diminishing returns on capital. Per capita income does not fluctuate and is constant in the long run, according to this concept. The second describes long-term economic growth with the help of technical advancements. Economic growth, according to the paradigm, is determined by technological advancements. The following is a list of the assumptions covered in the theory (Costinot and Donaldson, 2012):

- A production technique exists that has constant returns for the production function while declining to scale for the production factors.

- The population growth rate is constant, and the model is exogenously introduced.

- The stagnating growth rate is unaffected by the increase in the savings rate.

- Technological progress is modeled from the outside.

- Government intervention in the economy is modest.

- There is a presumption of a closed economy.

- Human capital productivity increases are not taken into consideration.

The most fundamental assumption behind Neo-Classical Growth Theory is that capital has declining returns. As a result, because physical capital additions, which are the key determinants of growth throughout the transition era, have diminishing returns, growth comes to a halt. This implies that the economic growth gap between industrialized and developing countries will narrow and convergence will occur. The convergence hypothesis is a forecast, and the catch-up process is the process through which developing countries catch up to rich countries. As a result, the convergence hypothesis predicts that poor countries would expand more quickly than rich countries and will eventually catch up.

If we look at convergence through the lens of the Solow model, we can see three reasons why poor and rich countries would eventually attain the same level of economic growth.

First, the model assumes that each country will follow its own balanced growth path throughout time. Second, the model asserts that in countries with larger capital per worker, the rate of return on capital is low. As a result, there will be a capital flow from developed to developing countries, which will enhance the developing countries' output levels and development rate, bringing them closer to the developed countries. The idea that the finest available technology is not yet being employed, particularly in poor nations, is the third justification. Over time, better technological utilization in these countries will ensure convergence.

The Solow model linked economic growth to technological advancements and the expansion of capital and labor. However, this model was deemed insufficient in terms of

the selection and study of elements affecting economic growth, prompting the development of other growth models. These new models place a greater emphasis on micro-foundations and highlight aspects other than standard development determinants. This new method, known as the Endogenous Growth Theory, explained growth by using internal variables rather than outside factors (Schilirò, 2017).

The inclusion of factors such as information, technological development, R&D activities, human capital, division of labor and specialization, economies of scale, externalities and spillover effects, infrastructure investments, and public policies into economic growth models is the most important contribution in terms of growth models in Internal Growth Theories. As a result, instead of the Solow model's declining returns assumption, the dynamics that can be generated by fixed or growing returns can be considered. In these models, there are specific requirements that must be met in order for sustainable growth to occur. Physical capital investment rate, human capital investment rate, population growth rate, public expenditure level, export rate, patent protection rate, political stability, and openness are the factors to consider. As can be seen from these circumstances, the new Internal Growth Theories believe that sustained growth is attained by activating and adapting both internal and external processes. In this instance, the state must fund human capital education as well as other elements that boost employee productivity. The new growth theory, which links economic growth to factors in the system's internal dynamics, is classified into three categories. Internal Growth Theory, which emphasizes R&D-based growth, stands out with research like Grossman and Helpman in order to ensure stable economic growth (Grossman and Helpman, 1994).

Grossman and Helpman's examination of the relationship between foreign trade performance and growth, which is based on Romer's model, accepts technical improvements as endogenous. Because technological discoveries are the product of economic units' deliberate action. The fact that international trade causes the transfer of technical information, international competition forces companies to find new and different ideas and technologies, international integration increases as a result of market growth, and foreign trade between countries with different structures causes the redistribution of

resources, according to Grossman and Helpman, are the mechanisms that affect growth in the long run (Grossman and Helpman, 1994).

In Aghion and Howitt's growth model, new inputs replace old ones in a process known as creative destruction, which ends the monopoly. This model also emphasizes the method by which vertical innovations are created. Vertical innovations realized by the competitive R&D sector are the source of growth.

1.2 Measuring Economic Growth

It is possible to express mathematically to what extent an economy has grown. Economic growth can be measured according to various criteria. We need statistical data to obtain healthy results. Among the mentioned criteria, the most used criterion is national income, in other words Gross National Product (GNP). GNP is briefly defined as the value of all final goods and services produced in a given country in a given period. Gross Domestic Product (GDP) gives us the value of domestically produced final goods and services. Accordingly, a part of the GDP may be produced by the citizens of other countries, and a part of the GNP may be produced by the citizens of the country residing in other countries. In mathematical terms:

$$GNP = GDP + Net\ external\ factor\ income$$

The most important indicator used to measure economic growth is real GDP. The reason why real GDP is used instead of nominal GDP in the measurement of economic growth is that it shows real growth. Nominal GDP is the value, in market prices, of all final goods and services produced in a country] in a year. Increases in nominal GDP result from an increase in the price level. Therefore, it can be assumed that there is an increase in nominal GDP, although in reality there is a decrease in the quantity of goods and services.

The economic growth rate is synonymous with the growth rate in real GDP. Real GDP expresses the value of final goods and services produced in a country in a given period over the prices of a basic year. Therefore, real GDP is a value adjusted for price increases

due to inflation. The value obtained by dividing the increase in real GDP by the base year and multiplying by 100 is called the gross growth rate and is expressed as follows:

$$g_t = \frac{RealGDP_t - RealGDP_{t-1}}{RealGDP_{t-1}} x100$$

In the formula t is the period for which the growth rate will be calculated; g_t is the growth rate at period t; $RealGDP_t$ represents the real GDP value in period t and $RealGDP_{t-1}$ represents the real GDP value in period t-1.

The gross growth rate is an indicator of the production power or the increase in the production power and does not provide information about the welfare level of the society. The net growth rate criterion is used as an indicator of the increase in the welfare level. Net growth rate is the value obtained by subtracting the population growth rate from the gross growth rate. The growth rate of the population is calculated with the help of the following formula.

$$n_t = \frac{N_t - N_{t-1}}{N_{t-1}} x100$$

In the formula, n_t is the population growth rate in the t period; N_t is the population of year t and N_{t-1} is the population of year t-1. Thus, the net growth rate (g*) can be found with the help of the following formula:

$$g_t = \left(\frac{RealGDP_t - RealGDP_{t-1}}{RealGDP_{t-1}} - \frac{N_t - N_{t-1}}{N_{t-1}}\right) x100$$

If the gross growth rate in an economy is greater than the population growth rate, if the welfare increase gross growth rate is equal to the population growth rate, the continuation of the current situation and if the gross growth rate is less than the population growth rate, welfare decline will occur. Since economic growth is basically a long-term concept, the growth rate can be measured in the long-term as well as annual increases. In this context, the long-term growth rate is calculated with the following formula.

$$g = \sqrt[n]{\left[\frac{RealGDPattheEndofthePeriod}{RealGDPattheBeginningofthePeriod}\right]} - 1$$

The n in the formula represents the number of years. On the other hand, one of the most important criteria used in the evaluation of long-term macroeconomic performance is the rate of increase in per capita income. Per capita income is calculated using the following equation.

$$GDPPerCapita_t = \frac{GDP_t}{Population_t}$$

In general, 1% or 2% growth rate differences in countries' growth rates are not considered to be very significant. However, when it comes to long-term sustainable growth, even small changes in the growth rate can lead to large differences between countries. The 70% Rule developed for this purpose makes a great contribution to the understanding of the importance of sustainable growth. The 70% Rule shows how many years the per capita income will double if a certain growth rate can be maintained. For example, in a country with an average annual growth rate of 5%, per capita income will double in 14 years. If the average annual growth rate of this country was 3.5%, per capita income would have doubled in 20 years.

1.3 Defense industry and economy

Defense spending can affect a country's external deficit in different ways. The first of these is the indirect effect of defense expenditures by putting pressure on budget revenues, increasing the government's borrowing requirement and meeting this need especially from external sources. The second is the direct effect that emerges when the country is an arms importer and the necessary payments are financed by foreign sources, based on the fact that defense expenditures are import-intensive. Military expenditures in developing countries are more import-oriented than other types of public expenditures. Therefore, the effect of military expenditures on the balance of payments is more negative (Belin and Hartley, 2019). Therefore, developing countries resort to compensatory

procedures in order to minimize the negative impact of their imports on the country's balance of payments. The main reasons why countries turn to compensatory procedures in imports of weapon systems are as follows:

· Reducing the negative impact of arms imports on the country's balance of payments;

· To increase exports;

· Helping to solve the employment problem by creating new job opportunities;

· The possibility of getting rid of foreign dependency by increasing the production capacity of the domestic defense industry;

· Avoiding unreasonable borrowings;

· Eliminate trade and exchange controls;

· Creating non-price competition;

· Reducing transaction cost;

· To provide capital transfer;

· To increase cooperation between companies for technology transfer.

The defense industry has different effects on the balance of payments in the short and long term. Investments to be made in the defense industry create a great pressure on the balance of payments in the short term until the establishment and efficient operation of production and R&D facilities. In the long run, the impact of the defense industry on the balance of payments is generally positive. Researches, especially in developing countries, have shown that investments that need foreign currency in the beginning are beneficial in closing the foreign exchange deficit of the country in the following years, unlike the first years (Rahman and Siddiqui, 2019).

A huge and sudden increase in military spending can lead to excess demand in the economy. Even in periods when unemployment is high and the general demand pressure in the economy is very low, a sudden increase in military expenditures can lead to inflationary

bottlenecks. This may be due to the inadequacy of the specialized workforce and materials required for new weapons programs, especially in developing countries.

Another aspect of military expenditures that causes inflation is the effects of weapons production activities on taxes and budget deficits. The costs of countries' increasing weapons systems and armament programs are being met by governments' increasing taxes. On the other hand, military expenditures have a share in budget deficits. Closing the budget deficits through deficit financing and increased taxes due to armament programs will accelerate the inflationary trend (Tzeng et.al., 2008).

Conversely, if a balance is established between the production of weapons and the production of other goods, and the produced weapons can be sold to other countries, inflationary pressure will decrease. However, as long as there is no export opportunity, the current supply in the economy will not be able to meet the increasing total demand by channeling the production factors to the production of weapons. The result will be inflation and a decrease in the current standard of living.

Defense can be viewed as a consumer of resources that can be devoted to national development at any level. The resources consumed by the defense are mostly measurable in monetary terms. Examples of these are real capital and capital equipment, including all kinds of industrial factories and equipment that can be used in economic activities, various manufactured goods, raw materials, raw material stocks, land, all kinds of energy and labor. The positive and negative effects of arms purchase and production activities, which constitute a significant part of defense expenditures in developing countries, are mentioned.

The most important positive effect of the defense industry in developing countries is stimulating new investments and mobilizing idle resources. In developing countries, military-oriented investments made with a rational planning that will increase the war power may not only serve the near-optimal use of resources, but also contribute to economic development by bringing new technologies into the economy. However, achieving this

positive result will be in accordance with the priority order of the said investments among the alternative investment areas of the economy.

Otherwise, on the one hand, the optimum use of resources in accordance with the economic targets will not be realized, and on the other hand, the integration opportunities of the said investments with other industrial branches will be reduced. While these negativities will slow down the economic development, the development of the defense industry will also be hindered.

One of the most important indicators of economic development is technological developments and their research and development (R&D) capacities. In order for defense industry organizations to be successful, they must have active research and development units that will allow them to maintain their assets and benefits over time. Thanks to these units, developing countries will be able to make progress in product development and technology adaptation, which they have difficulty with. However, R&D studies are extremely costly when done practically. For this reason, the primary factor for the effective execution of R&D studies is to support practice-oriented activities and to make realistic investments for this purpose (Morales-Ramos, 2002).

We can list the benefits of R&D activities, which are thought to accelerate with the development of the defense industry, to the economy as follows (Mowery, 2012):

1. More efficient use of resources;

2. Preventing brain drain and making use of investigative manpower;

3. Ensuring increases in production, quality and standardization;

4. With the widespread use of new technologies, more effective use of existing capacity together with new investments;

5. Increasing competitiveness and export opportunities in foreign markets.

However, not all technologies obtained through defense R&D activities are suitable for use in the economic and social structure. Because some of the technologies used in the

production of weapons are quite different from the technologies in other parts of the economy in terms of quality, there is little or no possibility of application in other fields. On the other hand, the transfer of newly developed defense technologies to other industries is delayed due to security needs.

When we look at the developed countries in the world, it is seen that the factor underlying this development is industrialization. Looking at the industrial backgrounds of these countries, it is understood that the defense industry has an important share in the development of these countries. For example, in Hitler's Germany after the First World War, it was observed that labor and other idle resources were mobilized with defense industry investments, and other industries were activated and developed. Likewise, defense industry activities based on the private sector played an important role in Germany's capture of developed Western countries after the Second World War. We can list the advantages that defense industry investments add to the country's industry as follows (Stuchtey, 2016):

1. It will contribute positively to the development of intermediate and investment goods industries. There are many parts, large and small, within the weapon systems. The production of these parts will both bring technology to the manufacturing industry and, as mentioned above, make positive contributions to the intermediate and investment goods industry.

2. As a result of cooperation with industrial companies, the demand for inputs will increase, however, idle capacity, congestion in production and financing difficulties will be alleviated to some extent.

3. The defense industry's sensitivity in terms of quality and standardization in the supply of parts and materials, and at the same time transferring new technology to the sub-industry in order to procure sufficient quality materials, will play an important role in increasing the quality and standardization of industrial products.

4. Qualified labor force is used extensively in the defense industry. Thus, qualified workforce will be trained. Production facilities and performances will improve.

In addition to these positive effects, the defense industry also causes some negative effects. The main negative effects are (Bellais, 2013):

1. Due to insufficient market opportunities, there is a possibility that a distorted industrial structure will form and waste resources with the development of industrial branches that produce some products that do not have much use in the civilian industry.

2. The workforce, which specializes in some areas of the defense industry, has limited or no opportunities to be used in other industries.

3. The defense industry is an industry branch in which technological obsolescence is experienced faster due to its structure. Therefore, in order to keep up with the developments in weapon systems, an increasing amount of resources will need to be allocated to Research and Development. This will limit the development of other industries.

4. It is very important that some defense industry branches have limited or completely impossible opportunities to transform into civilian production. Because in cases where the opportunity for transformation is limited or nonexistent, the fact that the buildings, institutions and established production capacity built as the defense industry cannot be used as needed for development creates an effect like a waste of resources.

1.4 The effect of defense expenditure on economic growth

The general increase in defense expenditures all over the world after the Second World War and the rapid emergence of technological developments in the defense industry, especially in recent years, reveal the importance of defense expenditures for countries. Considering that the defense expenditures of the countries are closely related to their economic power, this relationship should be examined and evaluated in terms of countries. The relationship between defense spending and economic growth is generally based on two views. According to the first view, it is very difficult for countries to determine the optimal level of defense expenditures. Because this concept is an abstract concept and is related to the level of risk perceived by countries. Allocating too much to defense will be a barrier to economic growth, while allocating too little will threaten economic growth by causing

instability or turmoil. Even if it is assumed that the optimal level of defense expenditures for countries can be determined, it is obvious that the cost of defense should be well analyzed in terms of increases or decreases in current consumption, investment or national income (Brasoveanu, 2010).

According to the second view, there are positive external effects of defense expenditures in the fields of infrastructure, technological development and human capital accumulation that concern the economy. It is necessary to investigate how the cost of change in use, which is caused by the shifting of scarce resources from areas that do not directly contribute to current consumption, investment and economic growth, will be offset by positive external benefits. The resources allocated for defense expenditures, which constitute a significant proportion of both total public expenditures and GNP in many countries, are drawn from alternative areas of use, which can be extremely important for growth (Galvin, 2002).

From this point of view, it can be said that defense expenditures are realized at the expense of the activities that will accelerate the development and economic growth of the country. On the other hand, defense is an indispensable service in protecting the existence and independence of the country. This view is supported by Adam Smith's statement Defense is more important than wealth. There are two important theoretical approaches that reveal the effects of defense expenditures on economic growth. One of them is the Military Keynesian Approach Theory and the other is the Neoclassical Approach Theory. Military Keynesian Approach Theory explains the effect of defense expenditures on economic growth within the framework of supply-side factors based on positive externalities. According to this approach, more military spending could have a significant multiplier effect. The demand created by defense expenditures increases capacity utilization, that is, it stimulates investments and increases the level of output. As a result, there is an increase in the rate of return on capital, investments and growth.

Considering the basis of the positive effect put forward within the framework of this view, the first concept that emerged was factor productivity. Having positive externalities

in defense expenditures can also have a positive effect on factor productivity. These externalities include modernization, stability and discipline, as well as all non-numerical factors such as training of military personnel, technical methods proliferating through infrastructure creation and military research and development, and the military's support for internal security services. New technologies emerging as a result of research and development activities will spread to the whole society in a short time. As a matter of fact, almost all of the inventions in the fields of electronics and transportation were realized for the first time for military reasons. This situation has revealed the concept of dual use of technology. The potential for synergies that can be created between defense and commercial applications, thanks to technological knowledge, requires focusing on this concept.

However, the dual use of technology includes not only dual use, but also referring to a technology with a large number of potential users in the military and civilian field. A high-tech defense sector has significant effects, especially on the manufacturing industry. In fact, in the USA, which has a defense sector dominated by high technology, it is argued that the Pentagon determines the industrial policy of the country.

In his study, Saal (1998) reached the conclusion that manufacturing industries directly related to defense had a higher total factor productivity and that technological changes in the field of defense were an important factor affecting the development of the manufacturing industry in the United States during both the 1973-79 and 1980-86 periods. Eshag (1983) stated that in industrialized countries, contractions can be seen in production due to the lack of effective demand during peace periods, and in such periods, defense expenditures may encourage economic activities and cause a revival in production. At the same time, it is widely supported that defense expenditures, by controlling excessive economic growth, actually ensure a stable structure of economic growth.

Military Keynesian Approach Theory tried to reveal the relationship between defense expenditures and economic growth within the framework of all these factors. The second approach that tries to explain the relationship between defense expenditures and

economic growth is the Neoclassical Approach Theory. The basic view of this approach is that defense expenditures create negative externalities and explain this relationship with demand-side factors. The main point on which this view is based is the thesis that defense expenditures move scarce resources away from direct productive investments and human capital accumulation. In this case, defense expenditures cause a high opportunity cost by shifting the resources to be used in development projects with high growth rates to other areas. As a result, they reduce not only non-defense public spending, but also private sector spending associated with public spending (Dunne, 2011).

In this approach, disarmament is seen as the main factor of development. As a matter of fact, among the reasons for the decrease in productivity in the US economy compared to the Japanese economy, the high defense expenditure burden is counted. Reducing defense spending can have a positive impact on budget savings, and as a result these savings can either be used to meet alternative public spending demands (health and education) or be passed on to citizens in the form of lower taxation. If defense expenditures include the production of weapons, which requires a heavy industrial base, the strategy of import substitution industrialization becomes stronger, which hinders the promotion of exports and the development of sectors such as agriculture. Such a strategy often has negative consequences for economic growth in developing countries.

Although there are costs for the expenditures made for defense, which is a full public service, there is no market price for these services. The realization of these services requires the financing of the civilian sector. This means that defense expenditures will be financed through taxes. This situation may disrupt the tax structure in the economy and reduce the amount of consumption and/or investment. As a result, the growth rate will fall or slow down. This decline or slowdown in growth has to be balanced with the benefits that defense can have on growth.

In the field of defense, qualified workforce such as experts, scientists and engineers are generally employed. This, in turn, will reduce the supply of human capital for other areas of the economy. In addition, the demand for highly qualified labor in the field of

defense may reduce the marginal product of capital in other sectors. On the other hand, importing some of the weapons, which is an important item in defense expenditures, creates serious deficits on the scarce foreign exchange resources of developing countries.

The fact that research-development expenditures, which are included in the defense expenditures group and have a positive contribution to efficiency, are against civilian expenditures in this regard, will have a negative effect on economic growth. This result is based on the view that military technology has lower profitability than civilian technology. In addition, if the inventions that emerged as a result of research and development activities in the field of defense are only for final goods and services that can be sold to the state, it can be said that their contribution to productivity increase in general may be zero. All the factors that are tried to be explained here form the basis of the Neoclassical Approach Theory.

There are different opinions in the literature regarding the relationship between defense expenditures and inflation, that defense expenditures directly affect inflation or that there is no relationship between the two variables. Benoit (1978) states that high defense expenditures cause low inflation and the inflationary effect stimulates defense expenditures and causes excess demand, which leads to a capacity utilization above the current production capacities of countries. Those who claim that there is a negative relationship between defense expenditures and inflation explain this situation with the effect of weapons production on tax and budget deficits. Gun production causes an increase in costs. Therefore, it leads to an increase in tax rates of countries and their borrowing from the market. In addition, the cost inflation that these expenditures will cause causes demand inflation.

Scientists examining the field of modernization of defense expenditures talk about three negative effects of defense expenditures, namely income change, productivity and investment effect: While the income change effect is explained by the decrease in the GDP of military expenditures, the negative effect of military expenditures in terms of efficiency is the effect of the public sector productivity level. growth is slower than that of the private

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sector. The investment effect of defense expenditures is that it causes a decrease in civilian investments as much as the volume of defense expenditures.

As the level of defense expenditures of countries increases, governments will go to increase taxes or borrow from the markets. Thus, defense expenditures will lead to the disappearance of the amount that will go to investments. In addition, the cost inflation caused by these expenditures will also have an impact on the psychology and economic behavior of the consumer group, which has a low tendency to save.

2. Defense spending

2.1 Definition of defense spending

The concept of defense expresses the state and attitude of protecting the independence and indivisible integrity of the state against the attacks and actions of other states or non-state actors. Although the concept of defense is not a direct end-consumer and producer service, it is one of the complementary or intermediate consumer services that are produced to create a deterrent effect against foreign attacks from countries and to protect other goods and services from external attacks, and whose demands increase according to the economic course. The concept of defense has a very broad structure, as well as having a semantically active and passive character. While it reflects an active character in terms of resisting an attack as a result of an attack, it reflects a passive character in terms of self-protection. The meaning of defense is also attributed to the struggle to justify a thought, a situation or an attitude. In order to fulfill these services, states have to balance their economic power with their defense needs and plan their defense organizations accordingly. Determining the defense need of a state primarily depends on military and strategic analysis (Heo, 2010).

However, the concept of defense generally emerges as a defense situation in which a country is in a defensive position against international interventions in cases that will adversely affect its national borders and national interests. The investments made by the state in line with the defense requirement are the investments made to protect the territorial integrity. For this reason, states are turning to defense investments against a threat that may arise against the integrity of the country by waiving a part of the national income obtained in order to increase national welfare (Heo and Ye, 2016).

Defense spending is defined in two senses, broadly and narrowly. In the narrow sense, defense expenditures consist of payments related to all military and civilian personnel allocated to the defense of the country, expenses incurred in maintenance and repair activities along with the production and purchase of all kinds of tools and equipment

related to soldiers, construction activities such as buildings, research and development expenditures. Expenditures made to military-like forces, civil defense, civilian enterprises that can adapt their arms production activities in a short time during the extraordinary period, expenditures made with the activities of stockpiling compulsory foodstuffs and raw materials, and foreign military aids constitute defense expenditures in a broad sense (Payne, 2019).

Countries aim to avoid the costs of defense expenditures and to be independent within their sovereign borders. In the absence of a universally binding and verifiable agreement for the elimination of war and defense spending, the best option is to resort to war and resolve disputes based on their countries history and government policies. As a result, this policy brings with it an endless defense tendency. Especially after the Second World War, weapon technology developed gradually and accordingly, the military expenditures of the countries increased. Because it has become the basic policy of every country to ensure its existence in the international arena and to be prepared and resistant to possible threats. This brings about continuous development and change in the defense industry. This means a struggle for existence for all countries. This is the most fundamental factor in the emergence of the defense industry. Since the security of the country will be the most basic requirement for those who govern the country, a rational management policy will pass through maximizing the defense systems. For this reason, they allocate very serious budgets to the development of defense systems. However, allocating more budget to the defense field may naturally lead to cutbacks in other fields (Seiglie et. al., 1997).

Especially after the Second World War, weapon technology developed gradually and accordingly, the military expenditures of the countries increased. Because it has become the basic policy of every country to ensure its existence in the international arena and to be prepared and resistant to possible threats. This brings about continuous development and change in the defense industry. This means a struggle for existence for all countries. This is the most fundamental factor in the emergence of the defense industry. Since the security of the country will be the most basic requirement for those who govern

the country, a rational management policy will pass through maximizing the defense systems. For this reason, they allocate very serious budgets to the development of defense systems. However, allocating more budget to the defense field may naturally lead to cutbacks in other fields (Ram, 2019).

The cold war is a state of tension between the countries that started between the USSR and the USA after the world became two poles after World War II and continued until the dissolution of the USSR. In this period, the world has become two poles fighting each other fiercely. What makes the period important is that it is known by both parties how the countries, which are the leaders of the poles, have nuclear weapons and use them on each other to cause horror in the world. This situation creates a state of forced peace in the world. This situation, which we call forced peace, is the absence of war between the countries that were the superpowers of the time, rather than an environment of peace and trust (Westad, 2017).

The two-block situation that has occurred in the world since the Cold War period has brought an arms race and the level of armament has reached the highest level. The most important indicator of this is the year 1987, when defense expenditures reached the highest level. In the period when the Soviet Bloc began to disintegrate, a slight decrease is observed in defense expenditures. This decline did not last long, but started to increase again after 1998. In the post-cold war period, the world is no longer bipolar, many states and therefore many leadership candidates have emerged. This means that the competitive environment has increased even more. The world has now become global. This globality also brings differences in terms of military. Because the threat is no longer one-dimensional. This change also means the deterioration of the forced peace that manifested itself during the cold war period. The end of the forced peace period has also changed the disarmament policy of the countries. Thus, the budget allocated by countries for defense expenditures also varies. The reason for the decrease in defense expenditures in the post-Cold War period, that is, until 1998, is due to the start of the nuclear disarmament movement rather than the countries' self-confidence (Westad, 2017)..

The events of September 11 and the invasion of Iraq by the USA in 2003 were effective in the increasing momentum of defense expenditures in this period. The characteristics of the defense industry are important for us to understand this issue (Kurc and Bitzinger, 2018).

• The defense industry is an area that can only be worked with high technology. For this reason, the country's effectiveness in the defense industry shows the competitiveness level of that country, its production capacity, and its level in R&D studies.

• The national security of the country is possible only with the outputs of the defense industry.

The fact that these outputs are wrapped with advanced and high technology is the most important indicator of the security policy.

• There is a need for qualified workforce in the defense industry. Because the industry requires advanced technology, it is imperative to work with experts in the field.

• It is obligatory to work with special and sensitive production techniques. The smallest mistake to be made during the production phase can cause great losses to the country.

• Since the state is the only buyer of the defense industry, even if there are many sellers, it is meaningful to work with limited capacity in order not to experience capacity problems in production.

• Since the defense industry can reveal the strategic plans of the producing country, confidentiality and security should be among the basic principles.

• The defense industry requires large amounts of capital. It is imperative that the country be allocated higher capital compared to other areas in which it produces and works.

• It is one of the most critical sectors in the international arena.

• Producing a new technology in the defense industry requires more time than other industries.

The defense industry should not be considered only as a military issue. If there is no solid industrial ecosystem in the country, it cannot be expected to have a solid defense industry. Because feeding the defense industry with competencies in fields such as transportation, communication, communication and agriculture will create its sustainability. If it does not operate in these areas and is not applied to the field of technology, the cost of the defense industry will increase and it will become unsustainable. In this respect, it is essential to nurture the economic cycle with other areas. If the country does not have competence in other areas, it will bring the society to a state of paralysis, even if the investments made only in defense systems come to the forefront as weapons and military power. In this respect, policy makers should consider the defense industry as a whole with other branches of industry (Hatemi-J et. al., 2018).

In addition, the fact that the defense industry is so important is of great importance not only with its deterrent effect, but also with the technological developments of the countries. With all this, the strength of the defense industry will strengthen the country not only on the battlefield but also at the table in strategic terms.

2.2 Factors affecting the defense expenditures of countries

While determining the defense expenditures of the countries, many factors such as geopolitical, economic, historical, cultural, demographic and political are important. In addition to these factors, the level of development of countries has also been a factor affecting the choice of defense expenditures. Because it is obvious that economically developed countries that have completed their industrialization spend more on defense than underdeveloped countries. The level of defense expenditures has undoubtedly been the most important work area for all governments. Because spending more or less than necessary can be a problem for the country. Investing in this area that is not fit for purpose and more than necessary may cause insufficient investments in other areas of need of the country. At the same time, under-investment will prevent the development of this field and cause the country to lag behind in the competitive environment. This may cause the country to become open to threats from outside (Navarro-Galera et. al., 2013).

Economic Factors - The issue of how much a country should allocate to defense expenditures is a topic that remains up-to-date. Since the economic and social elements of each country differ, the threats they receive also differ. The created threat perception causes countries to tend to defense expenditures within their existing resources. The national income and economic size of the countries are the main factors in the determination and supply of the resources that countries will provide defense (Tian et. al., 2017).

Political Factors - When we look at the political factors affecting defense expenditures; The size of the defense expenditures of the surrounding countries, the necessity of the geopolitical position, the effect of the arms race, the effects of the military alliances involved, the threat or threats on the country and the elements of the political regime applied in the country. In many countries, military expenditures act in line with the internal dynamics of the state, regardless of economic conditions, and are based on a political logic. Due to the economic conditions of the state, the economic environment in the country may put pressure on military expenditures over time. Regardless of the economic conditions, strategic plans and programs should be continued and a softening environment in internal and external security should be prevented. emerging threat perceptions should be considered important (Dune, 2000). After the housing crisis in the USA, which greatly affected other countries, there was a 1% increase in the revenues of the world's one hundred largest arms manufacturers. This situation practically supports the above-mentioned interpretation (SIPRI, 2016).

There are some academic attempts to distinguish between the military policies of countries within the scope of political attitudes. Although this distinction is tried to be made as military and non-military, the type of government can greatly affect military expenditures. Researches show that military governments make military expenditures at a higher rate. There are also large differences in military expenditures among countries with different levels of development. The probability of weapons production in developing countries is relatively less than in developed countries, but in any case, it will continue to be an industrial complex with vested interests in maintaining and raising military

expenditures involving civil servants, industrialists, and employees engaged in weapons production (Dune, 2000).

Geopolitical Position - Geopolitics, which is also a science, means the study of geographical factors and their effects on power relations in international politics. The concept of geopolitics has a great importance for international organizations and companies as well as for states in today's international relations. The importance of geography in terms of the benefits it provides or can provide to states pushes states to act in accordance with political purposes on geography. The wealth of resources in the geography directs the states to the geography for profit. The geography where political or military alliances are established is of geopolitical importance for states. The geopolitical importance of today's Middle East geography clearly reflects this (Deudney, 2006).

While the geopolitical position can bring the states into an endless defense struggle, it can also ensure that a policy that allows less investment in defense is followed. Most of today's Middle East struggles arise for geopolitical reasons. The example of Syria is the closest and clearest example of this. The importance given to defense expenditures and investments in regions where threat perception is intense is progressing in the same direction. The defense budgets determined in regions with high geopolitical importance are increasing in the same direction and in parallel with the national economies. After the September 11 attacks, there is a change in the security perceptions along with the main problems of the countries. The control of energy resources, which is the main argument of gaining power, is the main theme of today's international relations (Zhao et. al., 2017).

Participation in Military Alliances - Participation in military alliances can create positive and negative situations for states. In times of intense conflict, states seek to form alliances. States that are under the threat of attack collectively or by a stronger state seek to enter into a common defense alliance with other states they meet on a common ground (Wood, 2017). Apart from conflict situations, states can enter into military alliance. The lack of resources in the field of defense pushes states to form alliances. Countries with advanced defense technology can establish military alliances to improve trade relations.

Countries with developed defense industry can shift industrial production to countries with alliances and high labor potential. While production costs are minimized, countries with high workforce potential reduce unemployment rates with the defense industry investment, and at the same time, they can specialize in the defense products they produce.

The cost of joining military alliances may differ in terms of alliance members. Countries cannot benefit at the same rate in the production of a unit cost of the military alliance and may differ in the benefits of the defense service. The cost of joining a military alliance is not the same for every country. The costs of the alliance elements such as weapon power, intelligence, law enforcement to fight, logistics, etc. differ.

Social and Demographic Indicators and Historical Relations - Countries have different political policies, are governed by different regimes, contain various religions, have different levels of economic and technological development, differences in their geographical locations, defense treaties, historical border disputes, have different population densities. military spending level of neighboring countries, terrorism, etc. Such effects play an important role in determining the defense expenditure level of countries. The existence of all these reasons has an encouraging role for countries to spend on defense.

Domestic Threats, Combating Terrorism and Terrorist Organizations - Defense expenditures constitute a large part of the public expenditures of the states fighting terrorism. Therefore, the expenditures allocated to defense constitute an obstacle for the resources planned to be used in alternative areas for the development goals of the countries. Although it is claimed that defense expenditures cause an increase in demand for the production of materials used to ensure security, increase workforce opportunities and contribute to the development of the country, it is not possible to sustain these positive effects in the long term.

Increase in Defense Expenditures of Neighboring Countries - The sustainability of the existence of states against other states draws attention to the importance of military power. It expresses the necessity of countries to be constantly vigilant against each other

and the importance of the need for defense. As a compulsory need, defense expenditures are not only a political tool, but also a requirement of the classical state understanding in order to protect the sovereignty of states. In case of a neighboring country to a country that increases its defense expenditures, the other country will have to increase its defense expenditures. The increase in defense expenditures of neighboring countries is seen as a threat in the current conditions. In case of possible existence of war threat, it creates a multiplier effect in defense expenditures.

Openness Indicators - In addition to the economic openness indicators, which are one of the determinants of the defense expenditures of the countries, various factors that differentiate defense expenditures, the amount of population living in the country at risk, the possibility of possible attack, the national income levels of the countries, the age profile and cultural differences of the population, and statistical differences. Factors such as life value are also decisive.

2.3 Classification of defense expenditures

Global Military Expenditures include concepts such as army structure and status, military personnel expenses, forces' capabilities, R&D activities, modernization projects, military deployments and cross-border operations. There are some differences as to which element is included in the defense expenditure item and which element is not, regarding the defense expenditures of international organizations such as the UN, NATO and IMF etc. These differences are listed in the Table (Stylianou and Stergios, 2018).

Table 1. Defense spending definitions of NATO, IMF and United Nations (UN)

Possible Defense Expenditures Items
Expenditures for Military Power and Supporters
1. Payments to soldiers and personnel
2. Payments made to technicians, bureaucrats, etc. working in or related to the armed forces

3. Medical services, tax benefits and social benefits (including relatives)
4. Payments to pensioners
5. Military schools and hospitals
6. Expenditure on arms production and import
7. Infrastructure investments, buildings, etc.
8. Maintenance and repair
9. Supply of other goods
10. Military research and development expenditures Other expenditures for defense/strategic purposes
11. Stocking of strategic goods
12. Protection of weapons and production lines
13. Weapons production subsidies/exchange subsidies
14. Military aid to other countries
15. Contributions to international organizations (UN, military alliances etc.)
16. Civil defense
Expenditures on Prior Military Forces/Activities
17. Benefits to veterans
18. Payments to war debts
Payments to Other Security Forces
19. Gendarmerie
20. Border/coast guards
21. Police
Spending on Other Accounts
22. Assistance/disaster recovery
23. UN Peacekeeping Force
Credit supply

24. Spending on Other Accounts

The expenditures of the state on defense services are the expenditures that ensure the continuation of sovereignty and national existence. Defense is traditionally recognized as a full public service. Everyone living in the country can benefit from this service without competing with each other. In other words, the defense service provides indivisible benefits in the area where the service is provided. As a result of these features, it is not possible to prevent those who do not pay a price from benefiting from this service. The defense service, which is a full public service in the traditional sense, is twofold. The first is to deter an attack against the country, and the second is to counteract the attack if it occurs. Both deterrence and countering aggression require spending on peacetime military training, equipment and supplies (Seitz et. al., 2015).

The classification made by NATO is generally adopted, although minor differences can be observed between countries regarding the classification of defense expenditures. Expenditures made are subject to a fourfold classification by NATO. These are personnel expenditures, equipment expenditures, infrastructure expenditures and other operational expenditures. Defense expenditures are divided into two as investment and consumption expenditures. While military procurement, military building constructions and research and development activities constitute the investment expenditures category, operating and maintenance expenses and personnel payments are also in the consumption expenditures category.

2.4 Levels of defense spending

Normally there are no resources that cannot be allocated when it comes to the security of the country. However, since it is essential to use the country's resources at an optimal scale, it is necessary to express these resources with a general measure and to allocate the needed resource from there. However, it is difficult to determine how much defense spending is sufficient for a state to defend itself.

It is important for all countries to determine defense expenditures at a reasonable level. Because too many resources are allocated to defense, and therefore excessive defense expenditures will delay growth. Too little resource allocation will endanger national security and threaten growth by causing instability or turmoil. Therefore, the country needs to spend on defense at an optimal scale. McGuire has a theory for how to determine the optimal level of defense spending. According to him, since defense is defined as a public good, the optimal level of defense expenditures will be as much as the sum of marginal benefits equals marginal costs (McGuire, 1995).

Apart from this, the necessity of establishing a security function in order for the country to determine its defense expenditures at an optimal level is also an advocated idea. The security function depends on the degree of risk that the country in question can accept. Determining the risk factor well and determining the adequate level of security makes it possible to maximize the benefit of the defense service within a certain budget. For this reason, it is necessary to determine the factors that affect the determination of the security need, which is stated to be not easy or possible to change in the short term and therefore they are in the nature of data. The most important of these factors is the degree of military threat, whether directed against the state itself or its allies. In addition, the economic situation and policy of the country, the strategic situation of the country, the foreign relations and policies of the country are among the factors that are effective in determining the security need (Holcner and Olejníček, 2017).

The analyzes for developed and developing countries show that the level of defense expenditures in developed countries does not depend on economic factors, whereas in developing countries, defense expenditures depend on income levels. Therefore, the share of defense expenditures in national income in developed countries fluctuates much less than in developing countries.

In economic theory, consumption expenditures are a function of disposable income, while defense expenditures are dependent on existing technology and the presence of potential enemies. While defense expenditures are especially affected by economic

variables such as education, housing, health, money supply, GNP and prices, it also affects private consumption, civilian investment and public expenditures.

On the basis of this sensitivity, it is of great importance to ensure the balance between defense expenditures and other expenditure items in developing countries and in countries located in a geographically critical region.

Defense expenditures are constantly criticized for their negative effects on the foreign trade balance. It is claimed that external deficit occurs as these expenditures in the central government budget disrupt the balance of imports and exports due to foreign dependency. Firstly, defense expenditures put pressure on the budget revenues, increasing the country's borrowing requirement and meeting this need with foreign resources has an indirect effect. Secondly, it is the direct effect that arises from the fact that defense expenditures are import-intensive and that the necessary payments are financed from external sources as a result of being an arms importer.

Especially for underdeveloped countries, the continuous renewal of defense systems and weapon technologies and their adaptation to current technology cause problems in the balance of payments. The fact that underdeveloped countries meet their defense industry needs through imports puts pressure on the balance of payments. For this reason, it is necessary to make domestic production for the deficit that will occur in the balance of payments.

In addition to all these, the reduction of capital and skilled labor transferred to the defense industry from areas that provide exports such as machinery, electricity and transportation also creates negative effects on the balance of payments. Thus, the growth rate of exports slows down and the country's commercial competitiveness against other countries decreases, resulting in a slower growing economy. In addition, the long-term and short-term effects of the defense industry may be different. Since it will be an import substitution in the short term, it will bear the risks of the import substitution industry. In the

long run, it will have positive effects. Because investments that put pressure on the balance of payments will cause the foreign exchange deficit to close in the long run.

The impact of defense expenditures on the balance of payments may differ according to the level of development of the countries. Developed countries allocate large amounts of resources to these expenditures. Although these countries export weapons to a large extent, high defense expenditures abroad may cause problems in the balance of payments. Because these countries import some of the weapons, which have a significant share in their defense expenditures, from other countries. As a result, it is clear that the scarce foreign exchange resources and the balance of payments can cause serious deficits.

The effect of defense expenditures on resource distribution, a significant portion of these expenditures for underdeveloped countries is allocated to arms purchases and arms production. Therefore, defense expenditures can affect national economies positively or negatively. These expenditures are very important in terms of ensuring the use of idle resources in developing countries. When the defense expenditures to be realized are transferred to military investments with a rational planning to increase the strength of the war, resources will be used at the most appropriate level and new technologies will be brought into the economy.

Resources consumed for defense are usually resources that can be measured in monetary terms. To give an example of this situation, real capital and capital equipment, including various manufactured goods, raw materials, raw material stocks, all kinds of industrial factories and equipment that can be used in economic activities, covers land, all kinds of energy and labor.

2.5 International Arms Trade

The arms trade is a common area that makes each country dependent on each other due to the complexity of the production methods and the high cost. While this trade takes place, serious incomes are provided to the selling countries and the buyer country is made dependent on itself. This makes the country powerful in the international arena. These

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reasons have brought the international arms trade to an important position. With such an important position in question, it has become obligatory to protect it by law. This legislation has become necessary both to protect itself from the harms of arms trade, which is carried out without responsibility, and to avoid irreparable results. The agreement of these transfers made on the basis of countries should be made at a universal level. This agreement, organized by the United Nations, was prepared by giving substance to the production of weapons and war vehicles at all levels, from small arms to large tanks and ships. The states that sign this agreement are deemed to have committed to lead international peace and to use weapons at a minimum level. At the same time, the treaty also protects countries from illegal trade. However, although this treaty imposes certain obligations on the states that are party to it, it has remained in a customary structure since it does not impose a binding provision on what to do in terms of non-compliance.

Figure 1. Amount of Arms Transfers in the World Between 1980-2019

Source: SIPRI, 2020

Table 2 Changes in Arms Imports by Countries between 2014-2019

	Importers	Exporters 2015-2019		
1	Saudi Arabia	United States	United Kingdom	France
2	India	Russia	Israel	France
3	Egypt	France	Russia	United States
4	Australia	United States	Spain	France
5	China	Russia	France	Ukraine
6	Algeria	Russia	China	Germany
7	South Korea	United States	Germany	Spain
8	UAE	United States	France	Netherlands
9	Iraq	United States	Russia	South Korea
10	Qatar	United States	France	Germany

Source: SIPRI, 2020

In the report of the Stockholm International Peace Research Institute (SIPRI) published in International Arms Transfer Trends 2019, he expressed the rate of change in the international arms trade. International arms transfers increased by 5.5% in the 2015-2019 period compared to the 2010-2014 period. In the period of 2010-2014, there was an increase of 20% compared to the period of 2005-2009 (SIPRI, 2020).

According to this table, the top five arms exporters in the world in the period covering the years 2015-2019 were the USA, Russia, France, Germany and China, respectively. Again for the same period, the world's top five importers were Saudi Arabia, India, Egypt, Australia and China, respectively. These countries, which are the top 5 importers of the world, accounted for 36% of the total arms imports in the world between 2015-2019. If we analyze country by country, it is seen that Saudi Arabia, which was in the 2nd rank in the previous period for the 2015-2019 period, increased its imports by 130% and moved to the 1st rank. Although an embargo was imposed by some countries due to

the Yemen War against Saudi Arabia, this embargo decision was not very functional and was limited under different names or completely abolished.

While India was the world's largest arms importer in the previous period, it tended to decrease the amount of imports. Egypt is also among the countries that showed an increase compared to the previous period. According to SIPRI, Egypt's increased armament is related to the military increase in Libya and Yemen and the Sinai events. It is observed that the coup management mentality in the country also shaped this increase.

Unlike other countries, Israel is a country that continues to grow both in imports and exports. It has increased by 181% compared to the previous period. Imports, which led to this huge increase, were made to the USA, Germany and Italy, respectively. Israel carries out 78% of its imports from the USA. The reason for such large imports from the USA is mainly the cash aid provided by the USA for the purchase of weapons. Israel's naval fleet, air force and F-35 type aircraft are supplied from the USA.

The majority of the world's defense budget is spent on the production and modernization of weapons. According to the data of Defense News, a US magazine that provides information on defense technologies around the world, US arms companies ranked first in exports in 2019 with a total of 559 billion US dollars in arms sales. China is in the second place with sales of 358 billion dollars. 41 US companies accounted for 47.27% of the total arms sales in 2019, 8 Chinese companies for 27.11%, and defense companies of 22 other countries made the remaining 25.26% (SIPRI, 2020).

Table 3. Top 10 Arms Producing Companies in the World in 2019 and their Arms Sales (Million USD)

N	Companies	Countries	2019 Defense Revenue (Million USD)
1	Lockheed Martin	United States	$56,606.00
2	Boeing	United States	$34,300.00

3	General Dynamics	United States	$29,512.00
4	Northrop Grumman	United States	$28,600.00
5	Raytheon Company	United States	$27,448.00
6	Aviation Industry Corporation of China	China	$25,075.38
7	BAE Systems	United Kingdom	$21,033.27
8	North Industries Group Corporation Limited	China	$14,771.60
9	L3Harris Technologies	United States	$13,916.98
10	United Technologies Corp	United States	$13,090.00

While the USA, which is the leader in arms exports, makes every effort to transfer technology to the USA and to acquire new technologies, it maintains its superiority in technology by taking all kinds of measures to prevent the technological information in its hands from leaving the country.

2.6 World defense spending

The amount of defense expenditures shows different trends according to the level of development of the states. While defense expenditures in developed countries are planned by examining them in depth from an economic point of view and from different perspectives, the need for security and defense instinct are the determinants in developing countries rather than economic reasons. One of the criteria taken into consideration when planning defense expenditures is that there are indications or intelligence that the defense expenditures of neighboring states or other states posing a threat in that geography will

increase or will increase. Countries invest in various defense expenditures for reasons such as getting stronger, having a say in the international arena, and protecting against external threats.

Defense expenditures around the world started to increase after the Second World War and reached its highest level during the Cold War period. It is seen that it has started to decline since 1987. The reason for the decrease in expenditures is the impression that the Cold War, which emerged with the disintegration of the Soviet Union, is over, and less developed countries tend to spend more on public expenditures due to financial difficulties.

With the disintegration of the USSR at the end of the 1980s, defense expenditures in the world decreased drastically. Apart from the slight increase caused by the armament of Western states due to the Second Gulf War in the 1990s, from 1987 to 1997, the year in which defense spending reached its highest level, worldwide defense expenditures decreased steadily, by a third in this decade. has fallen. After 1998, military expenditures started to rise again in the Middle East and Eastern European countries, North America and East Asia. With the end of the Cold War, the resources allocated to defense expenditures in Eastern European states were directed to other areas and a decrease in military expenditures was observed. Western Europe and NATO were also affected by this situation, and military expenditures decreased. Similarly, military expenditures in developing countries have tended to decrease.

However, the downward trend in the share allocated to military expenditures did not last long. After the September 11 attacks, the share of military expenditures in the budget increased again due to the US intervention in Afghanistan and Iraq, the Arab Spring, the developments in the Middle East, and the increase in terrorist acts.

In 2018, the total amount of military spending in the world reached 1.822 billion dollars. This amount constitutes 2.1% of the World GDP and corresponds to 239 dollars per person. NATO has limited these expenditures to 2% of GDP. The defense expenditures of the states in the Americas, which have an average economy, are equal to 1.4% of their

GDP in 2018. At the end of 2018, these averages were 1.6% in Europe, 1.7% in Africa and Oceania, and 4.4% in the Middle East states. In the same period, the USA, China, Saudi Arabia, India and France made 60% of the total defense expenditures in the world (SIPRI, 2020).

Figure 2. Total Military Expenditures in the World Between 1988-2019
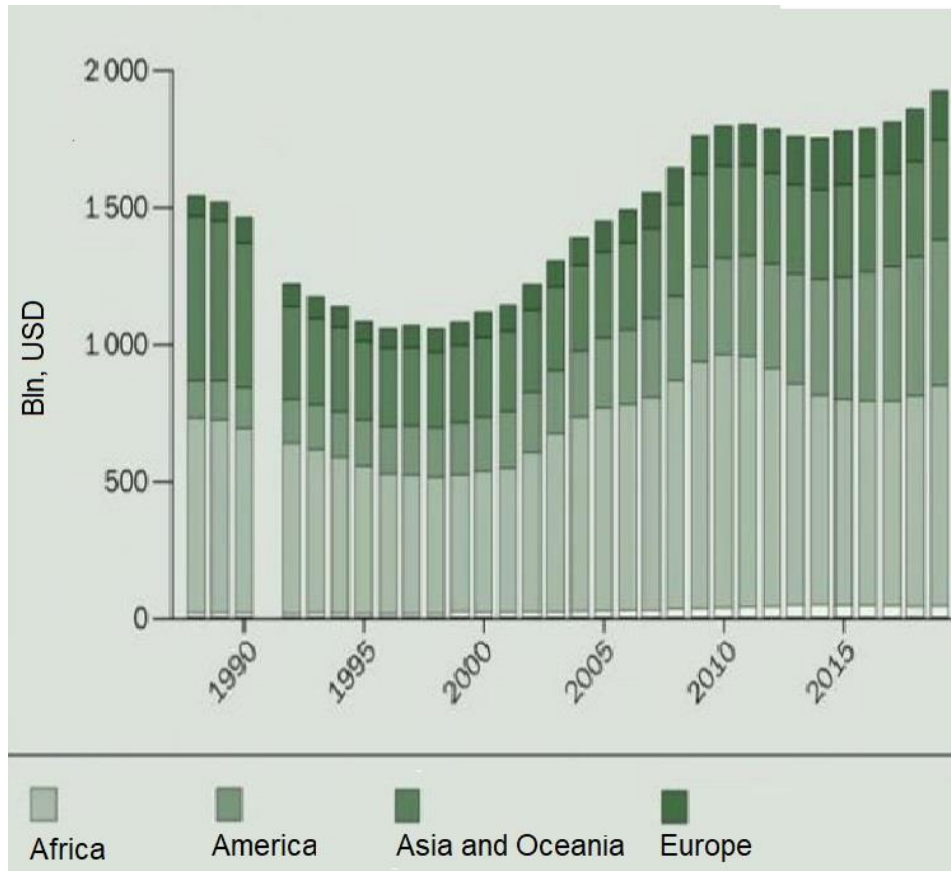
Source: SIPRI, 2020

According to the data of the Stockholm International Peace Research Institute (SIPRI), total global defense spending increased to 1917 billion dollars in 2019. The 2019 total represents a 3.6 percent increase from 2018 and the largest annual increase in spending since 2010. The top five spending countries in 2019, which accounted for 62 percent of expenditures, were the USA, China, India, Russia and Saudi Arabia. Thus, these two Asian states were among the top three in military expenditures for the first time. Global military

spending in 2019 represents 2.2 percent of global gross domestic product (GDP), which is roughly $249 per capita. (SIPRI, 2020)

US military spending increased by 5.3 percent in 2019 to $732 billion, accounting for 38 percent of global military spending. According to these data, the increase in US spending in 2019 alone is equal to all of Germany's military spending that year. (SIPRI, 2020)

In 2019, China and India were recorded as the world's second and third largest military spenders, respectively. While China's military spending increased by 5.1% in 2019 compared to 2018, reaching $261 billion, India's military spending increased by 6.8 percent to $71.1 billion. In addition to China and India, Japan (47.6 billion dollars) and South Korea (43.9 billion dollars) stand out as the largest military spenders in Asia and Oceania. Military spending in the region has been increasing every year since at least 1989 (SIPRI, 2020).

Germany's military spending increased by 10% in 2019 to $49.3 billion. This was the largest increase in spending among the 15 top military spending countries in 2019 (SIPRI, 2020). In Central Europe, sharp increases in military spending have been observed among NATO member states. For example, in Bulgaria - an increase of 127%, mainly due to payments for new warplanes, and an increase of 17% in Romania. The total military expenditure of the 29 NATO member states was US$ 1035 billion in 2019. In 2019, Russia became the world's fourth largest spender, increasing its military spending by 4.5% to $65.1 billion (SIPRI, 2020).

Armed conflict is one of the main drivers of the volatile nature of military spending in sub-Saharan Africa. For example, in the Sahel and Lake Chad regions, where many ongoing armed conflicts are experienced, military expenditures increased in Burkina Faso, Cameroon and Mali in 2019, while Chad decreased. Military spending overall increased in 2019 among Central African countries involved in the armed conflict. The Central African Republic (8.7%), the Democratic Republic of the Congo (16%) and Uganda (52%) increased military spending in 2019 (SIPRI, 2020).

Also, military spending in South America was relatively unchanged at $52.8 billion in 2019. Brazil covered 51 percent of the total military expenditures in the sub-region. Combined military spending by African states increased 1.5 percent in 2019 to an estimated $41.2 billion, the region's first increase in spending in five years. Military spending in South East Asia increased by 4.2 percent in 2019 to $40.5 billion. (SIPRI, 2020)

Table 4. Total Military Expenditures in the World Between 1988-2019

Year	Amount, bln USD	Year	Amount, bln USD	Year	Amount, bln USD
1988	1538	1999	1077	2010	1793
1989	1516	2000	1114	2011	1799
1990	1460	2001	1139	2012	1783
1991		2002	1215	2013	1756
1992	1217	2003	1301	2014	1750
1993	1170	2004	1386	2015	1776
1994	1135	2005	1446	2016	1785
1995	1080	2006	1488	2017	1807
1996	1055	2007	1551	2018	1855
1997	1066	2008	1641	2019	1922
1998	1054	2009	1757		

Source: SIPRI, 2020

Table 5. Top 10 Military Spending Countries in 2019

Ranking		Cointries	Spending 2019, bln USD	Change (%)		Spending as a share of GDP (%)		World share (%)
2018	2019			2018=2019	2010-2019	2019	2010	2019
1	1	United States	732	5.3	-15	3.4	4.9	38
2	2	China	261	5.1	85	1.9	1.9	14
4	3	India	71.1	6.8	37	2.4	2.7	3.7

5	4	Russia	65.1	4.5	30	3.9	3.6	3.4
3	5	Saudi Arabia	61.9	-16	14	8.0	8.6	3.2
6	6	France	50.1	1.6	3.5	1.9	2.0	2.6
9	7	Germany	49.3	10	15	1.3	1.3	2.6
7	8	United Kingdom	48.7	0.0	-15	1.7	2.4	2.5
8	9	Japan	47.6	-0.1	2.0	0.9	1.0	2.5
10	10	Sourh Korea	43.9	7.5	36	2.7	2.5	2.3

Source: SIPRI, 2020

The 2018 Rankings are based on updated military spending figures in the current edition of the SIPRI Military Expenditure Database. Therefore, they may differ from the 2018 rankings given in the SIPRI 2019 Yearbook and other SIPRI publications in 2019. Military spending figures as a share of GDP are based on International Monetary Fund World Economic Outlook and International Financial Statistics Database 2019 GDP estimates. (Tian et al., 2020)

3. Methodology

3.1 Panel data

Panel data analysis is the evaluation of sections of states, companies and individuals in a certain time period (Gujarati and Porter, 1999). Panel data analysis is one of the most innovative and effective methods of economics. Because the panel provides an environment for developing data predictions and theoretical results (Greene, 2003). Panel data analysis has some important advantages over time series or cross-section methods for economic research. Panel data analysis provides an opportunity to improve the efficiency of econometric measurements by estimating model parameters accurately and reliably. It offers a greater opportunity for constructing more realistic behavioral hypotheses. Panel data analysis enables to analyze the important questions of the economy that cannot be answered by time series or cross-section methods, by mixing interpersonal differences with intrapersonal dynamics (Hsiao, 2014). The main advantages of panel data analysis, which reduce the disadvantages of time series analysis by combining them with the horizontal-section analysis method, can be listed as follows:

- The estimations obtained as a result of the analyzes made with panel data provide more information and the effects that cannot be achieved with only cross-section or time series analyzes can be obtained.

- By combining cross-sectional and time-series observations of panel data analysis, it allows econometric analyzes to be performed even in cases where the number of observations is higher and the time series size is short and/or the cross-section observation is insufficient;

- The degree of freedom increases due to the increase in the number of observations;

- Reducing the multicollinearity problem, which is frequently encountered in applications with time series data;

- Allows heterogeneity to be controlled;

- Allows the reduction of problems and estimation deviations caused by neglected variables;

3.2 Panel data regression model

Two basic models are used in regressions with panel data. These approaches are the Random and Fixed Effects Model. The general representation of the panel data regression model is as follows.

$$y = \beta_{1\_x0000\_} + \beta_{2\_x0000\_} + .. \beta_{kit} x_{kit} + \alpha \qquad (1)$$

Here, i=1,2,3,...,G denotes the cross section unit and t=1,2,3,...,n denotes the time period. It is also assumed that the mean of the nonprobability error term a is constant and has zero variance. The slope from P2it to Pkit is the coefficient. They may differ for unit and time. However, while estimating the model, various assumptions are made about the slope coefficients of the model, the constant term and the error term. With the assumptions made about these, five different model estimations are made (Judge, 1982). These models are:

1. The constant and slope coefficients do not change with respect to both time and units, and the error term may represent differences with respect to time and units.

2. While the slope coefficients are constant, the constant term varies in units but may remain constant over time.

3. While the slope coefficients are constant, the constant term may change with time and units.

4. Both slope and constant coefficients may vary according to units.

5. All coefficient values can change according to both units and time.

One of the methods used to predict panel data models is the Fixed Effects Model. In the Fixed Effects Model, the differences in the behaviors between the units and the differences between the fixed terms are tried to be revealed. But the slope coefficients are

assumed to be constant. In this model, the constant term is called the group specific constant term. The definition of constant here means that the coefficient may vary according to the units, but is constant according to time. Individual effects that cannot be observed in the fixed effects model are considered to be related to the explanatory variables in the model (Green, 2003). For this reason, differences between units are modeled as parametric changes in the regression function;

$$y \;\; = \bar{\beta} + \sigma_i + ..\beta_{2\_x0000\_X_{ixt}+\beta_{kit}X_{kit}+\alpha} \tag{2}$$

i=1,2,..,G cross section unit;

time period at t=1,2,..,n;

$\bar{\beta}$ - mean constant term;

a, : Difference from the mean constant term for the ith unit

In equation (2), if there is a relationship between the data error term and the explanatory variables, FEM is used as the appropriate model. Because at this point, fixed effects estimators are unbiased, and also, fixed effects model can be preferred if the number of cross-section units is low and the number of observations is high. The fixed effects model allows unobservable individual effects to be correlated with included variables. Later, the differences between units were modeled as parametric shifts of the regression function. It can be seen that this model is valid not only for additional segments outside the sample, but also for cross-section units. For example, cross-country comparisons may also include a full set of countries for which the assumption that the model is stable is more appropriate. In cases where the individual effects are not related to the explanatory variables, the constant terms belonging to the variables; It is taken assuming that it has a random distribution relative to the units and modeling is done accordingly (Green, 2003). To represent the random error term μ_x with constant variance and zero mean, the REM would be as follows:

$$y_{xt} = \bar{\beta} + \sigma_x + ..\beta_{2ix}X_{2xt} + \beta_{kxt}X_{kxt} + \alpha_{xt} + \mu_x \tag{3}$$

x=1,2,...,G denotes the cross section unit and t=1,2,...,n denotes the time period. μ_x is the composite error term, its components are panel error term α_{xt} and individual error term μ_x. The basic assumptions of this model are that it is individual-specific and that the panel error term has a normal distribution, as well as that the individual error terms are not in themselves and are not associated with the panel error term. An important point to be emphasized here is that in panel data, if the unit size is larger than the time dimension, the random-effects model provides more efficient estimation than the fixed-effects model. If it is believed that there are cross-section units drawn randomly from the large sample, it is stated that it is more appropriate to use the random-effect model, otherwise, the fixed-effect model should not be used (Gujarati, 2011).

To choose between the random-effect and fixed-effects model, the decision is made by Hausman test statistics. In general, it is used more frequently with the fixed effect model instead of the random effect model in panel data analysis. It is effective that the fixed effects model has the desired statistical features in using it more. However, if the random effects model gives more effective results than the fixed effects model, the random effects model should be used (Baltaghi, 2013).

The null hypothesis in Hausman test statistics is expressed as uncorrelated with the explanatory variables in the unit effect model. This indicates that the random effects model is not necessary if the null hypothesis is not accepted. For this reason, effective results will be obtained by estimating with a fixed-effect model. If the null hypothesis is accepted, predictions should be made with a random effect model.

Dynamic panel data analysis however is an analysis that aims to measure the effect of the historical value of the dependent variable on the current value of this variable. Since the present behavior of individuals and institutions can be affected by their past behavior for reasons such as continuity, habit and partial adjustment, therefore, dynamic effects need to be modeled. A dynamic panel is shown in the data model equation. (Baltagi, 2005)

$$y = \delta Y_{i,t-1} + \beta X + u \qquad (4)$$

The error term is modeled as follows.

$$u = \mu_i + v \qquad (5)$$

However, there are some problems caused by using the lagged value of the dependent variable as an explanatory variable. Since it is a function of y_{it} and μ_i, so y_{it-1} is also a function of μ_i. In this case, y_{it-1} becomes associated with the error term. The fact that the lagged value of the dependent variable is associated with the error term makes the LS estimator biased and inconsistent, even if v_{it} is not serially correlated. The fixed effects estimator becomes consistent only in samples where T is very large relative to N (Baltagi, 2005).

Dynamic panel data models can be examined in three groups: autoregressive, distributed-delay, and autoregressive, distributed-delayed panel data models. Autoregressive models from dynamic panel data models are emphasized below:

$$Y_t = \propto + \sum_{i=1}^{n} \alpha_i Y_{t-i} + u_t \qquad (6)$$

In the Equation, if the dependent variable Y contains values from the past - Y_{t-1}, Y_{t-2}, - it is an autoregressive model. If it is a dynamic model with m delay in which the lagged values of the independent variable are included as independent variables:

$$Y_t = \propto + \sum_{i=0}^{m} \alpha_i X_{t-i} + u_t \qquad (7)$$

If a dynamic model with n and m lags, in which the lagged values of both dependent and independent variables are included as independent variables, respectively, is an autoregressive distributed lagged model:

$$Y_t = \propto + \sum_{i=1}^{n} \alpha_i Y_{t-i} + \sum_{i=0}^{m} \alpha_i X_{t-i} + u_t \qquad (8)$$

3.3 Panel unit root tests

The Im, Peseran and Shin panel unit root test allows the coefficients to be heterogeneous by removing the basic assumption that the autoregressive coefficient of the cross-section units must be homogeneous (Baltaghi,2005).

In the IPS unit root test, the heterogeneous coefficient $Y_{i,t-1}$ is taken into account, and a test process is followed by considering the unit root test statistics average of the series belonging to all units. The hypotheses for the Im, Pesaran and Shin panel unit root test are as follows;

$H0$: $\rho = 0$ (not all series are stationary and all series contain unit root)

$H1$: $\rho < 0$ (all series are stationary and contain unit root of some units)

IPS panel unit root test analysis is based on the following model:

$$Y = (1 - \theta_i)\mu_i + \theta_i Y_{i,t-1} + \varepsilon_x \qquad (9)$$

4. Application

4.1 Purpose of the research

In the thesis, it is aimed to determine the effect of defense expenditures on economic growth with dynamic panel data model. For this purpose, the data of NATO member countries between the years 2007-2016 were taken into consideration and, in addition to the defense expenditures variable, the variables of external debt and inflation rate, which have the most impact on economic growth, were added to the model and predictions were made with the dynamic panel data model.

4.2 Literature review

Previous studies examining the relationship between defense expenditures and economic growth date back to the work of Benoit (1973), who first addressed this issue. After this study, which revealed the empirical results that defense expenditures positively affect economic growth in developing countries, a wide literature emerged as a result of econometric analyzes such as panel data or time series of studies in terms of different growth models in different countries or country groups samples. However, when this literature is interpreted collectively, the results show that it is far from establishing a consensus.

Studies show how important defense expenditures are for national economies. This topic, which is updated almost every year, gives different results.

Benoit (1973) examined the relationship between defense expenditures and economic growth for 44 developing countries by considering the 1950-1965 period. Growth rates, investment rates, foreign aid revenues and some other exact values of 44 countries for the period under consideration are correlated. According to the results obtained, the relationship between defense expenditures and economic growth is positive. In addition, it has been revealed that there is a positive relationship between defense expenditures and the growth of civilian production per capita.

Landau (1996) investigated the relationship between the growth rate of production per capita and the share of military expenditures in national production in 17 developed OECD countries for the 1950-1990 period. In the study, an equation was established by using the growth rate, labor force, natural resources, physical capital, human capital, technology and productivity variables. At lower levels of military spending, the patriotic effect will dominate, and higher military spending will be valued by faster growth. Beyond a certain share of spending, the pentagon effect will dominate and growth will slow as military spending increases. He determined that there is a non-linear relationship between defense expenditures and growth for developed countries in the industry.

Khiui and Mahmood (1997) discussed the relationship between military spending and economic growth for Pakistan. In the study about the situation of Pakistan between 1972-1995, the relationship was tried to be found with the Gragner causality test. As a result, the study revealed that there is a negative relationship between defense expenditures and economic growth. In addition, the study shows that Pakistan's defense expenditures are positively affected by India's defense expenditures.

Bayoumi et al (1998) investigated the impact of worldwide military spending in developing countries for the period 1987-1989. In the study, defense expenditures, arms exports, arms imports, government consumption, private consumption, private investment, total demand, real GDP, real exports, real imports and exchange rates were compared and tried to reach a conclusion for the period in question. It is concluded that the reduction in military expenditures will cause an increase in civilian economic activities in the short run. Reducing military spending will have positive effects on individuals in developing countries.

Dunne et al. (2000) examined the issue of defense expenditures and economic growth for South African countries. He carried out his research on the basis of supply and demand models. In this study, the years of 1991-1997 were targeted. They concluded that there is a negative effect between military expenditures and economic growth, albeit at a low rate.

Batchelor, et al. (2000) discussed the 1964-1995 period for South Africa, the relationship between defense expenditures and economic growth with a neo-classical model. GDP growth, GDP per capita, fixed capital investments, exports, inflation and employment data are used in the study. In the study, an attempt was made to improve the model by allowing the data to determine the dynamic structure of the model through the ARDL model. Researchers have determined that while defense expenditures have a positive effect in total, they have a significant negative effect for the manufacturing sector. This could result in an improvement in economic performance, with the impact of cuts in domestic military contracts on the manufacturing industry in South Africa from 1989 to the present.

Dakurah et al. (2001) analyzed the relationship between defense expenditures and growth for 62 developing countries using the annual data for the period 1975-1995, using the Granger Causality method. As a result of their analysis, they determined that there is a one-way causality relationship from defense expenditures to economic growth or from economic growth to defense expenditures in 23 countries. The researchers, who determined that there was a two-way relationship between the two variables for the 7 countries covered in the study, concluded that there was no relationship between the two variables in the other countries.

Kollias et al. (2004) examined the relationship between defense expenditures and growth for 15 European Union (EU) countries, using the data on defense expenditures and economic growth rates for the 1961-2000 period, using ADF and PP unit root tests, cointegration and causality analysis. Although there is no uniform result for 15 countries, he concluded that there is a bidirectional causality relationship. A relationship from defense expenditures to economic growth was found in 7 of 15 countries, and from economic growth to defense in the others.

Al-Jarrah (2005) examined the relationship between defense expenditures and economic growth in oil-rich countries with the example of Saudi Arabia. They conducted research between 1970-2003. Johansen cointegration test and Gragner causality test were

applied. Bidirectional causality was found between defense expenditures and economic growth.

Yakovlev (2007) examined arms trade, military expenditures and economic growth. Between 1965 and 2000, 28 countries were analyzed by panel data analysis. They said that if a country is an arms exporter, it will be less harmful to growth. That is, it was found that higher military expenditures and net arms exports separately led to lower economic growth, while higher military expenditures were less damaging to growth.

Hirnissa et al. (2009) conducted research on the relationship between military expenditures and economic growth in the Association of Southeast Asian Countries. In this study, there is a long-term relationship between military expenditures and economic growth in Indonesia, Thailand and Singapore from the 5 member countries of the union. For Singapore, causality is bidirectional. In Indonesia and Thailand, the situation is seen as unidirectional from military expenditures to economic growth. For the remaining 2 countries, Malaysia and the Philippines, no significant relationship was observed between economic growth and military expenditures.

d'Agostino et al. (2010) examined the effect of military spending on economic growth. In this study, the subject was analyzed through the Feder-Ram model and the Solow growth model. They evaluated the period of 1960-1997 with 28 countries they discussed. The results of this study show that military expenditures have positive effects on economic growth.

Al-Yousif (2010) presented the relationship between defense expenditures and economic growth with empirical evidence through Gulf region countries. In the study, the period of 1975-1998 was chosen as the target. The causal relationship between defense expenditures and economic growth was investigated with the Gragner causality test. The results show that the relationship between the two variables cannot be generalized across all countries.

Anyanwu et al. (2011) discussed the relationship between defense expenditures and economic growth for Nigeria with the Vector Error Correction model. In addition to these two variables, exchange rate, inflation rate, lending rate, gross capital rate, unemployment are also included. The result shows that there is a long-run relationship for all variables.

Malizard (2011) examined the causality relationship between economic growth and military expenditures through the example of France. The data obtained in the study support the previous studies. Bidirectional causality was found between defense expenditures and GDP. Defense has little positive impact on the economy.

Dunne and Nikolaidou (2012) studied the relationship between defense expenditures and economic growth on the member states of the European Union. In this study, the years between 1961 and 2007 were targeted. In the study prepared by using panel data analysis and time series methods, the findings are that military expenditures do not support economic growth in this region.

Chang et al. (2013) investigated whether military spending is necessary for economic growth in China and G7 Countries. In the study, which was studied between the period of 1988-2010, both in-country and cross-country panel data analyzes were made. For Italy, France and Germany, there is a neutral relationship for economic growth and military spending. Military spending negatively affects economic growth for Canada and the UK. There is a unidirectional causality running from economic growth to military spending in China. The results support that the relationship between military spending and economic growth differs from country to country.

Chen et al. (2013) examined the relationship between defense burden and GDP for 137 countries by using Panel Data Analysis using data from the period between 1988 and 2005. According to the results of the analysis, there is a short-term causality running from CB to RY in low-middle and high-income countries. A short-run bidirectional causality relationship from RY to CB was found in Asia and Europe. As a result, they could not obtain a result that could be valid for all countries.

Carusa and Domizio (2015) investigated military expenditures in the USA and European countries mutually for the period of 1988-2013 with Panel Data Analysis. In the study, 20 European countries were included in the analysis by using the variables of defense expenditures, the military expenditure of the USA and the average military expenditure of European countries. In the analysis part of the study, FMOLS and DOLS, which are unit root tests and cointegration estimators, were used. According to the results obtained, a long-term relationship was found between the variables. While the US military expenditures affect the dependent variable positively, the average military expenditure of European countries affects negatively.

Dunne and Nikolaidou (2015) analyzed the relationship between military expenditures and economic growth. In his studies, he discussed the defense expenditures and economic growth data of the 3 poorest countries of the EU, Greece, Portugal and Spain. Gragner Causality Test and VAR analysis were performed in the research targeting the years 1960-2002, but no general empirical results were found between military expenditures and economic growth for these small economies.

Augier et al. (2015) examined the relationship between defense spending and economic growth through the example of China between 1952 and 2012. Feder-Ram model and Solow growth models were used in the study. According to the results of the Feder-Ram model, defense expenditures affected economic growth weakly. The results of the Solow model are that a 1% increase in defense expenditures increases the economic growth rate by 0.15-0.19%.

Dash et al. (2016) made an empirical analysis between defense expenditures and economic growth in BRIC economies. These countries examined the years between 1993 and 2014. The panel investigated the issue with cointegration and Gragner causality tests. First, it was found that there is a long-run relationship between defense expenditures and economic growth. As a result of the Gragner causality test, a long-term bidirectional causality was found.

Phiri (2017) examined the effect of military expenditures on economic growth through the example of South Africa. The LSTR model was used in the study using data from 1988-2015, and the results show that there is an inverted U-shaped relationship between military expenditures and economic growth. The study shows that South Africa is spending too much on defense and that the government should shift this excessive defense spending to different sectors that will affect economic growth more.

Churchill and Yew (2018) presented the effect of military expenditures on growth in an empirical synthesis. They made a literature study by taking 272 observation samples from 48 studies. The results are that military expenditures affect growth more in developed countries and this effect is positive.

Ortiz et al. (2018) examined the effect of the increase in defense expenditures on the growth rate of real production in 126 countries using the GDP growth rate and the growth rate of military expenditures for the years 1980-2016 with Panel Data Analysis. The countries to be analyzed were divided into four groups as upper income, upper middle income, lower middle income and low income countries. Co-integration and causality analysis were performed for the panel data used in the empirical part of the study.

As a result, it has been shown that military expenditures and real production have long-term and short-term equilibrium relations in different income groups. According to the causality result, it has been determined that there is a one-way relationship from real production to military expenditures in high-income countries. In low-income countries, no causal relationship was found in both directions. In upper-middle-income and lower-middle-income countries, there is a direct relationship from military expenditures to real output. The political implication from this study is that middle-low and low-income countries should include more productive activities to increase economic growth in the long run.

4.3 Data set and model

In this study, countries whose data can be accessed via OECD and World Bank from 30 NATO countries, which make up more than half of the world's defense expenditures, were selected. These countries are Germany, Australia, Belgium, Denmark, Finland, France, Netherlands, Ireland, Spain, Switzerland, Italy, Luxembourg, Norway, Portugal and Greece. For this purpose, the annual data of the 15 countries selected in the analysis for the period 2007-2016 were used. The data and variable definitions used in the study are summarized in Table 6.

Table 6. Data and variables

Abbreviation	Meaning	Unit	
GDP	Gross domestic product	Billions, USD	OECD
DEBT	Yearly general debt of countries	Billions, USD	OECD
INF	Yearly inflation rate	%	OECD
DEF	Yearly defence spending	Billions, USD	World Bank, SIPRI

The model is the following:

$$GDP_{jt} = \alpha + \beta_1 DEBT_{jt} + \beta_2 DEF_{jt} + \beta_3 INF_{jt} + \varepsilon_{it}$$

GDPt - Natural logarithm of the level of Gross Domestic Product

INFjt - Annual inflation rate of states (%)

DEFjt - the natural logarithm of defense expenditures,

DEBjt - the natural logarithm of the external debt of States

εjt - the Error Term.

Descriptive statistics values made by taking the logarithm of the data used in the study are shown in Table 7.

Table 7. Descriptive statistics

| Values	GDP	INF	DEBT	DEF
average	1.073822	1.62672	1.76432	0.946454
standard deviation	0.30816	0.22649	0.49785	0.33528
N of obs	150	150	150	150

Descriptive statistics of dependent and independent variables for all panel are given in Table 7. As can be seen from the table, the number of observations for all variables is 150, since there are not missing values. The mean value of the dependent variable, the gross domestic product, is 1.073822, and its standard deviation is 0.30816. The average value of external debt, which is the independent variable, is 1.76432 and its standard deviation is 0.49785. The average value of the inflation rate, which is the independent variable, is 1.62672 and its standard deviation is 0.22649. The average value of defense expenditures, which is the independent variable, is 0.946454, and its standard deviation is 0.33528. Graphs of the variables are given. The graphs of the series of the variables according to countries and years are given in Figure 3 for the GDP variable, Figure 4 for the INF variable, Figure 5 for the DEBT variable, and Figure 6 for the DEF variable.
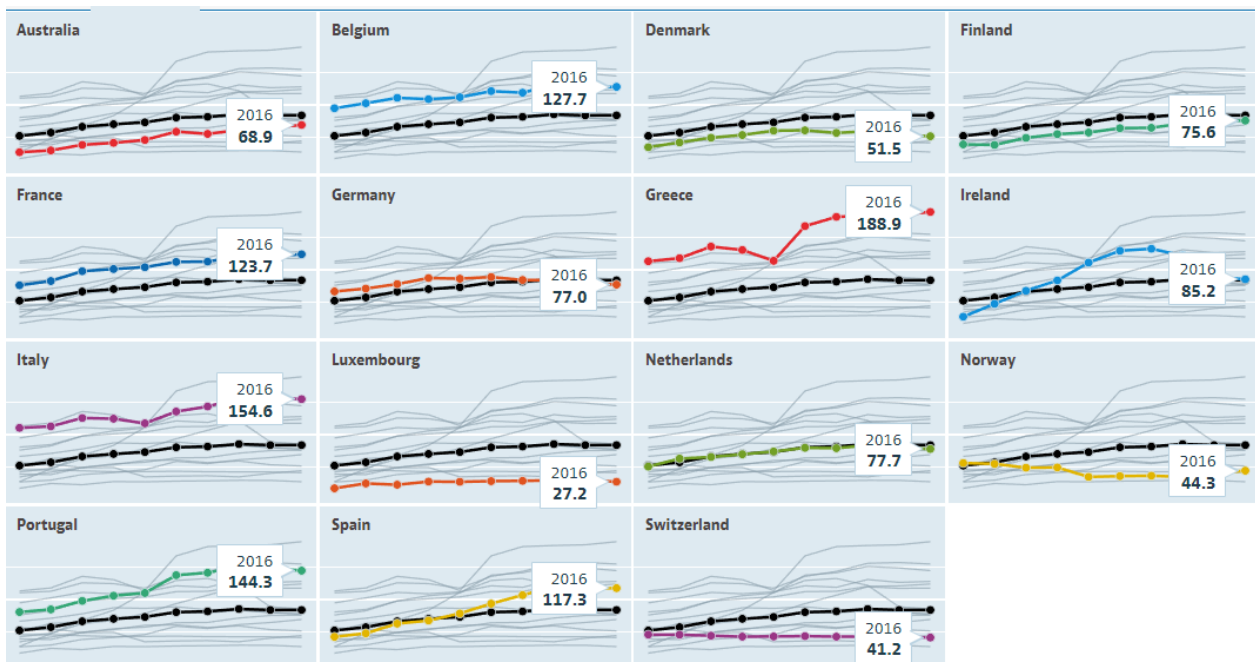
Figure 3. GDP
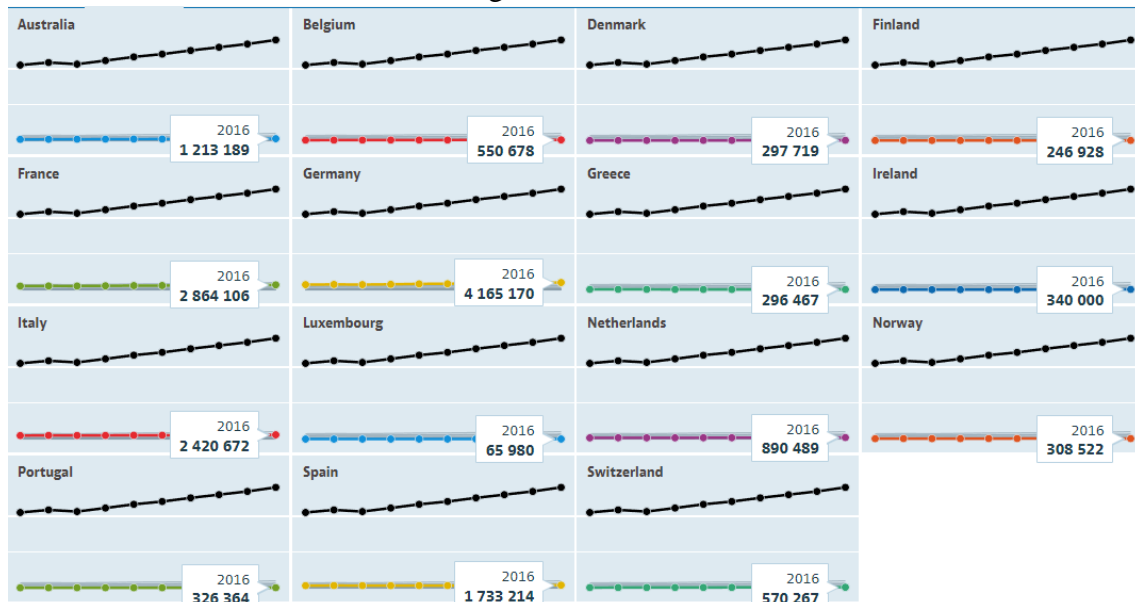
Source: OECD, databank
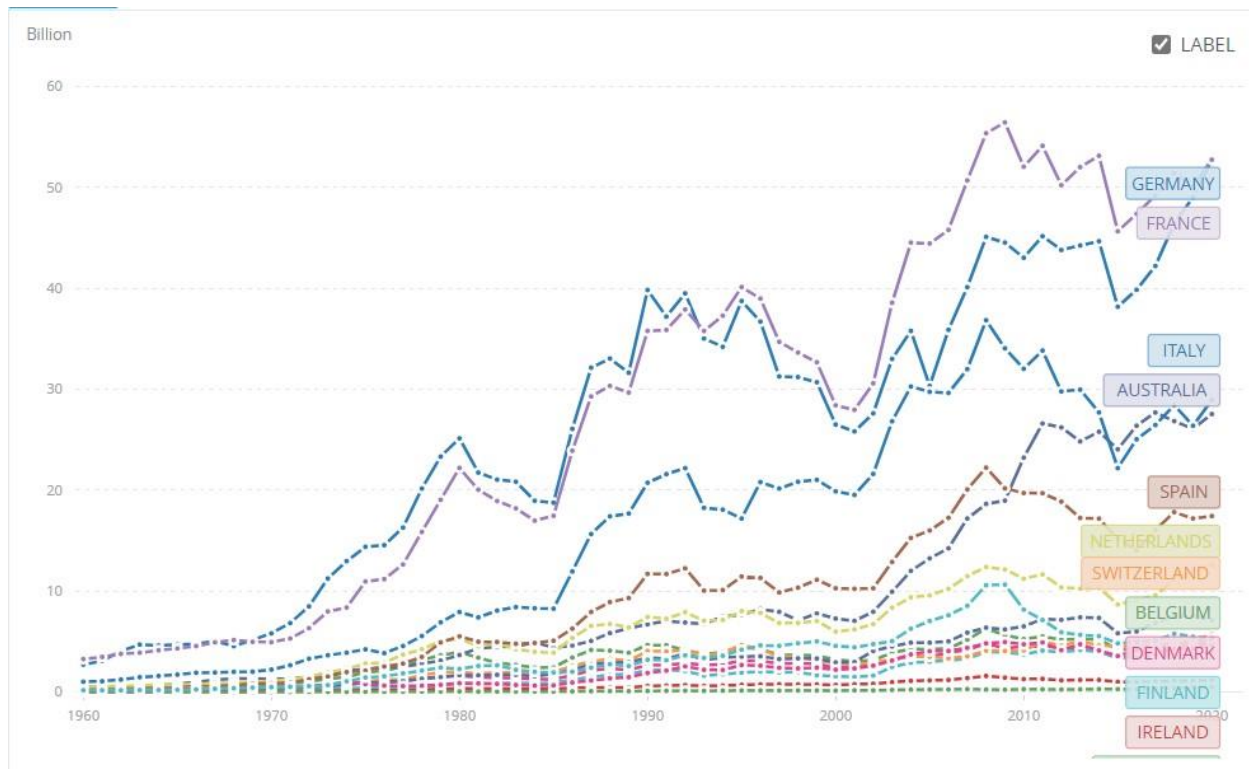
Figure 4. Inflation
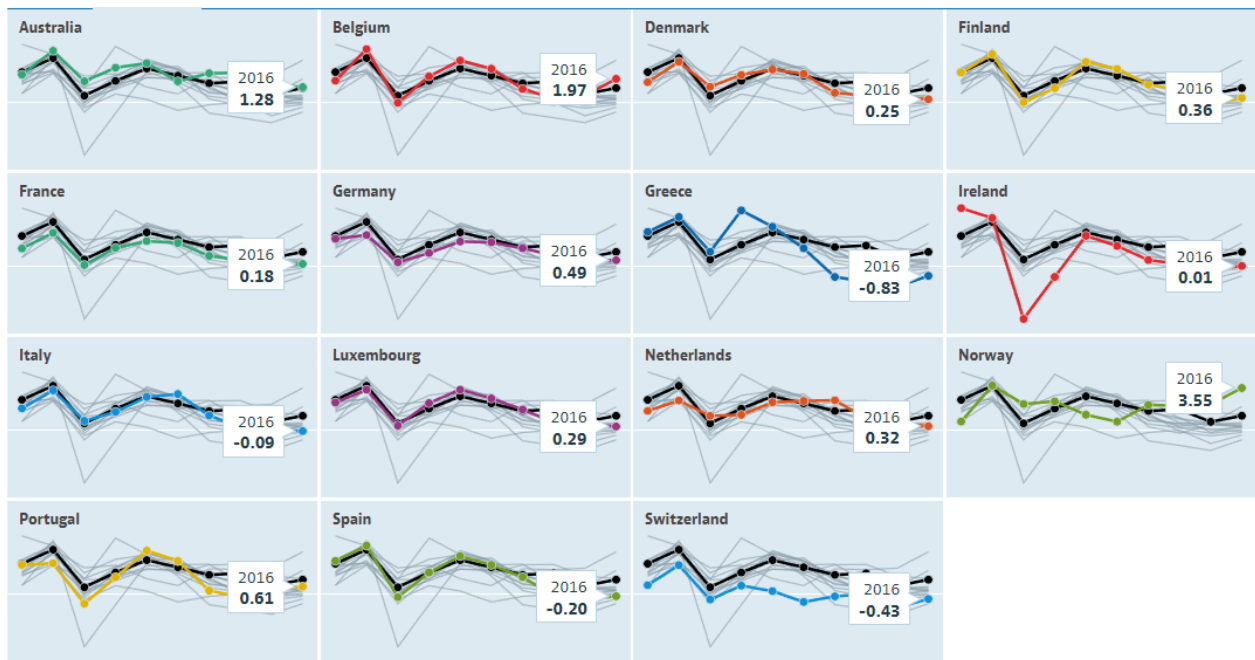
Source: OECD, databank

Figure 5. Debt

Source: OECD, databank

Figure 6. Defence spendings

Source: WorldBank, Databank

4.4 Results and interpretation

In order to investigate the estimation of the model by using the variables of gross national product, foreign debt, inflation and defense expenditures in the model, first of all, it is necessary to investigate whether the data belonging to these variables are stationary. The analysis starts with unit root tests, in which the stationarity of the variables is investigated. The CD test, which is a cross-sectional dependency test, was used to decide which of the unit root tests to use in order to understand whether the series are stationary in the analysis.

For this purpose:

H_0: No cross-sectional dependence (p=0)

H_1: There is cross-section dependency (p≠0)

CD test results of the data tested under the hypothesis are given in Table 8.

Table 8. CD test results

Variables	CD test	P-value	Correlation	Absolute value
GDP	16.10	0.001	0.456	0.664
DEBT	9.08	0.001	0.232	0.688
INF	19.14	0.001	0.552	0.586
DEF	2.25	0.025	0.066	0.450

According to Table 8, the null hyphotesis is not rejected at a significance level 0.01 for all variables according to the CD test statistics of GDP, DEBT, INF and DEF variables used in the analysis was rejected. The correlation coefficients are 0.45, 0.23, 0.55, 0.07, respectively. Therefore, performing the Im, Pesaran and Shin (CIPS) unit root test to test the stationarity of the said variables will provide more accurate results.

Table 9. Unit root test results

Variables	t-bar	cv10	cv5	cv1	Z(t-bar)	P value
GDP	-2.384	-2.150	-2.290	-2.560	-2.068	0.019
DEBT	-1.134	-2.150	-2.290	-2.560	1.665	0.952
INF	-3.140	-2.150	-2.290	-2.560	-4.329	0.000
DEF	-1.086	-2.150	-2.290	-2.560	1.804	0.964

Since the t-bar statistic is higher than the critical values given at 90% (cv10), 95% (cv5) and 99% (cv1) confidence levels, the H_0 hypothesis was rejected. Therefore, before estimating the dynamic panel model, The Hausman test statistic in Table 10 is used to choose between the fixed-effects model and the random-effects model. Here, it was concluded that the value of Hausman test statistic was 0.09 and it was statistically significant. This shows that random effects are included in the model and the random effects estimator gives more consistent results.

Table 10. Random effects model and hausman test results

GDP	Coefficient	Standard error	z	P>(t)	Confidence interval	
INF	-0.0002673	0.0012115	-0.21	0.824	-0.0026431	0.0021065
DEBT	0.0000934	0.0000816	1.13	0.254	-0.0000669	0.002534
DEF	0.0001810	0.0014000	0.12	0.897	-0.0025633	0.0029252
_cons	1.074	0.006525	170	0.000	1.059735	1.084266
Wald chi2(3)=1,78,				Value 150		
Prob>chi2=0,6204				Group 15		
Hausman tes chi2(3)=0.09, Prob>chi2=0.9928						

According to the random effects model, defense expenditures and inflation (INF) and countries' debts (DEBT) are statistically insignificant. The coefficient of defense expenditures (DEF) and the inflation rate of countries (INF) was positive. In other words, the effect of defense expenditures and inflation rate on growth is positive for the country groups and the period. But it is not possible to say for the variable of the external debt of the states (DEBT), because its contribution to economic growth is negative.

Conclusion

The link between defense spending and economic growth has been studied using many methodologies and approaches, but no universally applicable conclusion has been reached. The impacts of each variable on economic development were evaluated in this study, which included defense expenditures for the 15 NATO nations from 2007 to 2016, as well as inflation rates and foreign debt stock, which play the most important role in economic growth. The unit root test was used to determine if the data was stationary or not, and it was discovered that the data of the variables were stationary at the level. To construct predictions with stationary variables, the random effects model, which is one of the dynamic panel data models, was utilized.

The effect of defense expenditures and external debt on growth is positive for the country groups and period. However, the effect of the inflation rate on the economy in the selected country groups was negative. In many studies conducted with developed and developing countries in the literature, the effect of defense expenditures on economic growth has been found to be positive. However, in studies conducted with underdeveloped countries, the effect of defense expenditures on economic growth was negative. The reason for this can be counted as the changing countries and time intervals and different methodological approaches in these studies. In this study, defense spending can help the development of the country, especially in developed countries (such as Germany, Australia, Belgium, France, Netherlands) when the 15 selected NATO member countries are considered. Because defense expenditures create employment in many areas such as the production and marketing of weapons, tanks, warplanes, unmanned aerial vehicles, etc., and contribute to the country's economy with the export of these vehicles. In the literature, there are studies in which the inflation rate has positive effects as well as negative effects. In this study, however, the effect of the inflation rate on the economic growth of the selected countries was negative.

Inflation produces negative future expectations, which has a detrimental impact on investments and growth. High inflation rate causes high inflation variability and the resulting uncertainty causes economic units to not fully perceive the signals in the market. As a result, incorrect market signals have a detrimental impact on investments and growth, and excessive inflation creates uncertainty. Producers have a hard time deciding pricing, while customers have a hard time keeping up with price fluctuations. Banks charge higher interest rates on loans. In a high-inflation economy, all items' prices fluctuate often and unexpectedly, making it impossible to tell if one thing is cheaper or more costly than another. While inflation has significant economic implications, it also has a severe impact on social life. Inflation wreaks havoc on the poorest members of society. It leads to a rise in poverty and a worsening of economic distribution. Those who have the ability to save can improve their wealth by taking advantage of high interest rates while inflation is high. People with low income, on the other hand, do not have this option and must borrow money at higher interest rates, causing the income distribution to steadily worsen. In a high-inflation climate, confidence decreases and anxieties grow as the future becomes more unclear. The worsening of income distribution lowers the youthful population's optimistic aspirations for the future.

As the value of money falls in the face of rising inflation, so does confidence in the national currency. As a result, while spending and saving, people may prefer to utilize the money of other countries rather than the currency of their own. The majority of studies in the literature on the link between external debt and economic development are based on the debt surplus hypothesis. Because the nation group under discussion includes both developed countries, the effect of foreign debt stock on the economy was shown to be favorable in this study. Developed countries should pay attention to the fact that the conditions of the foreign debts they receive are suitable for their economic structure and that they do not disturb their economic balance in the long run. These countries should resort to external borrowing to finance their development investments, not to finance their current expenditures.

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