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The Relationship Between Defense Expenditures and Economic Growth: The Case of Türkiye[1]

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Abstract
This study aims to determine the impact of defense expenditures on economic growth in Türkiye for 1996-2022. Economic growth and defense are vital for the welfare and security of countries. Therefore, a three-stage time series method was employed to determine the impact of defense expenditures on economic growth in Türkiye. In the first stage, the stationarity levels of the variables were investigated using the Augmented Dickey-Fuller (ADF) unit root test and the Phillips-Perron (PP) unit root test. In the second stage, long-run relationships between the variables were examined using Johansen cointegration analysis. In the final stage, the long-run coefficients between the variables were estimated using the Fully Modified Ordinary Least Squares (FMOLS), Dynamic Ordinary Least Squares (DOLS), and Canonical Cointegration Regression (CCR) methods. The findings obtained from the analysis can be summarized as follows: i) According to the ADF and PP unit root test results, all variables contain unit roots at level values and become stationary when their first differences are taken. ii) The trace and maximum eigenvalue tests indicate two cointegration equations between the variables in the Johansen cointegration analysis. iii) According to the FMOLS, DOLS, and CCR methods, it was found that a 1 unit increase in the share of defense expenditures reduces economic growth by approximately 0.0776%.

Savunma Harcamaları Ekonomik Büyüme İlişkisi: Türkiye Örneği
Öz
Bu çalışma 1996-2022 döneminde Türkiye'de savunma harcamalarının ekonomik büyümeye olan etkisini tespit etmeyi amaçlamaktadır. Ülkelerin refahı ve güvenliği için ekonomik büyüme ve savunma hayati bir öneme sahiptir. Bu nedenle Türkiye'de savunma harcamalarının ekonomik büyümeye etkisinin tespiti için üç aşamalı zaman serisi yöntemine başvurulmuştur. İlk aşamada değişkenlerin durağanlık düzeyleri Augmented Dickey-Fuller (ADF) birim kök testi ve Phillips-Perron (PP) birim kök testiyle araştırılmıştır. İkinci aşamada değişkenler arasındaki uzun dönemli ilişkilerin varlığı Johansen eşbütünleşme analiziyle araştırılmıştır. Son aşamada değişkenler arasındaki uzun dönemli katsayılar Tam Düzeltilmiş En Küçük Kareler Yöntemi (FMOLS), Dinamik En Küçük Kareler Yöntemi (DOLS) ve Kanonik Koentegrasyon Regresyonu (CCR) yöntemleriyle tahmin edilmiştir. Analiz sonucunda elde edilen bulgular şu şekilde özetlenebilir: i) ADF ve PP birim kök test sonuçlarına göre tüm değişkenlerin düzey değerlerde birim kök içerdiği ve değişkenlerin birinci farkları alındığında durağan hale geldiği tespit edilmiştir. ii) Johansen eşbütünleşme analizinde, iz testi ve maksimum özdeğer testi değişkenler arasında 2 eşbütünleşme denkleminin olduğunu göstermektedir. iii) FMOLS, DOLS ve CCR yöntemlerine göre savunma harcamaları payındaki 1 birimlik artışın, ekonomik büyümeyi yaklaşık olarak %0.0776 azalttığı tespit edilmiştir.

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1. Introduction

Defense, one of humanity's most fundamental needs, is an essential element that has persisted and evolved since the existence of humankind. It has instinctively emerged in every period. In Maslow's hierarchy of needs, the need for safety (defense) ranks second after physical needs such as hunger and thirst. People have developed various defense methods to ensure their safety and maintain it. Although these methods have evolved according to the conditions of the time, humanity has consistently worked on defense strategies. With the emergence of the modern state concept, the need to defend complex structures with defined borders has formed the basis of today's defense trend. States have established and continuously developed defense systems to protect their territories, people, and interests (Yağtu, 2019: 1; Özçelik and Önder, 2016, 37).

Underdeveloped countries import defense materials and formulate policies to meet their defense needs. This situation interacts with the political stances of developed countries. Developed countries act to meet their own needs in the defense sector and support their foreign policies. Developing countries, on the other hand, can meet some of their defense needs with their resources while importing the rest. In today's world, states are in a race concerning defense investments. This race focuses on strengthening security and defense strategies and acquiring and developing various weapon systems to protect national interests. Therefore, international relations and security policy dynamics shape states' defense investments (Yağtu, 2019: 1).

The share of defense expenditures allocated by states is quite significant for their budgets and is often higher than the budget allocated for education and health. Defense expenditures generally reduce unemployment and increase employment in the country. The literature also includes the view that defense expenditures slow down economic growth. Defense expenditures are necessary to enhance defense power and ensure national security, in addition to the defense industry. Some studies suggest that excessive defense expenditures can negatively impact economic growth. The relationship between defense expenditure and economic growth is explained by the fact that defense expenditures can prevent the allocation of resources to different sectors, thereby reducing economic diversity and restricting growth. Despite these views, the impact of defense expenditures on economic growth is a complex issue that involves many factors. The economic and political context of each country's defense expenditures differs, making it difficult to draw general conclusions. Research on this topic should consider a country's defense policies and economic situation (Boztepe, 2021: 1).

The scientific basis for views on defense and wealth (economic growth) lies in Adam Smith's *Wealth of Nations*. Smith (1776: 605) expresses his views on defense and wealth as follows: "Defense is much more important than opulence." Additionally, Smith (1776) praises the virtues of a soldier ready to defend his country at the cost of his life, indicating that the motive of self-interest alone is not sufficient to achieve socially beneficial results (Kurz, 2023: 31).

When examining the factors that constitute a country's national defense power, it is seen that the size of the Gross Domestic Product (GDP), one of the fundamental macroeconomic indicators, is essential. In this context, examining the economic impact of defense expenditures beyond their security effect has become an important issue. Therefore, the relationship between defense expenditures and economic growth is frequently analyzed in defense literature. Some findings show that defense expenditures impact economic growth, while others claim the opposite. This relationship can be one-way or two-way, and in some cases, there may not be any causality. Therefore, multiple factors must be considered to understand the complex relationship between defense expenditures and economic growth, and each country's situation may differ. Research in this field is essential to provide more information and understand defense policies' economic impacts (Yılancı and Özcan, 2010: 22).

This study aims to empirically examine the relationship between defense expenditures and economic growth using econometric methods. Understanding this relationship is essential in evaluating the impact of defense expenditures on Türkiye's economic growth and providing information about possible policy implications. The subsequent sections of the study are organized as follows. First, a theoretical background and literature review on the subject are presented. Second, the data set, model, and econometric method are explained, and the findings are presented. In the conclusion, the findings are interpreted economically, and policy recommendations are made.

2. Theoretical Framework and Literature

Defense expenditures constitute a significant portion of a country's budget and are made to ensure internal and external security, protect the state's sovereignty, and be prepared against potential threats. Defense expenditures reflect a state's efforts to maintain its existence, independence, and national security and are generally considered one of the most critical duties of states. Governments must carefully plan the burden of defense expenditures on the budget to allocate the available economic resources to other areas optimally. The priorities and size of defense expenditures vary from country to country and depend on factors such as internal and external security threats, geopolitical position, and economic resources. Defense services play a vital role in enabling states to sustain their existence solidly and independently (Güneş, 2011: 147).

The relationship between defense expenditures and economic growth has been considered since Smith (1776; 605). There are two main views on this relationship: the "Neoclassical Approach" and the "Military Keynesian Approach."

2.1. Neoclassical Approach

According to the Neoclassical Approach, determining the optimal level of a country's defense expenditures is quite tricky. The optimal level of defense expenditures is an abstract concept dependent on many factors. Allocating too many resources to defense negatively impacts economic growth by reducing investments in other sectors. Resources allocated to defense expenditures hinder investment opportunities that support economic growth (such as infrastructure, education, and health) (Değer and Sen, 1995: 275-307).

The Neoclassical approach focuses on the adverse effects of defense expenditures on economic growth. According to the Neoclassical approach, resources are limited, and every expenditure carries an opportunity cost. Increasing defense expenditures leads to excluding these resources from investments in the civil sector and other vital projects, reducing economic growth. According to the Neoclassical approach, increasing defense expenditures causes resources to be withdrawn from highly productive areas, negatively impacting long-run growth (Looney, 1994: 36).

In the Neoclassical approach, the adverse effects of defense expenditures on economic growth are emphasized, and disarmament is considered an essential factor for economic development. It is argued that exceptionally high defense expenditures can reduce economic efficiency and hinder the more efficient use of resources. Russett (1982) states that high defense expenditures in the US negatively affect US productivity and prevent resources from being directed toward productivity growth and innovation in the civil sector. Additionally, Fontanel (1995: 572) notes that Japan's lower defense expenditures than the US positively impact economic growth and allow resources to be used more effectively in the civil sector. Disarmament or reducing defense expenditures is one of the proposed policy options to promote economic growth and help use resources more effectively.

According to the Neoclassical approach, the positive impact of Research and Development (R&D) expenditures within defense spending on economic growth is also more limited than the positive impact of private sector R&D expenditures on economic growth. In other words, defense sector technology has lower profitability than private sector technology. Technology in the defense sector is different from private sector technology due to high-security requirements. Investing in private-sector technology contributes to faster economic growth while transferring technological developments in the defense sector to the civil sector. Contributing to economic growth takes time and requires additional costs. Therefore, directing economic resources to the defense sector creates an obstacle to innovation and productivity growth in the private sector (Cappelen, 1984: 372).

However, stating that R&D activities in the defense sector do not contribute to economic growth at all would be misleading. When R&D activities in the defense sector are aimed only at final goods and services that can be sold to the state, their impact on economic efficiency growth is limited. This does not mean that the contribution of such R&D activities to the economy is always zero. Even though defense technologies are costly, they can also be applied to the civil sector. These technologies contribute to productivity growth and innovation in the civil sector. The defense industry generally has a large sub-industry and supplier network, which creates production opportunities for the private sector (Poole and Bernard, 1992: 438-452).

2.2. Military Keynesian Approach

The Military Keynesian Approach posits that defense expenditures have positive external effects on the economy. Increasing defense expenditures contribute to developing the defense industry and defense technology. This positively impacts technological infrastructure, communication networks, and transportation systems. These developments support economic growth by generating positive externalities. Additionally, defense expenditures support the accumulation of human capital by promoting the education of military personnel and specialization in engineering and technical fields. This can increase the qualified workforce and contribute to innovation and productivity in the civilian sector. This second view argues that defense expenditures can promote economic growth and positively affect the defense and civilian sectors (Ram, 1995: 253-254).

The Military Keynesian Approach suggests that increasing defense expenditures can positively impact the economy by increasing total demand and through the multiplier effect (Durgun and Timur, 2017: 129). Military Keynesian theory explains the positive effects of defense expenditures on the economy by focusing on the multiplier mechanism and positive externalities. Thanks to the positive externalities of defense expenditures, factor productivity increases. It is claimed that discoveries made during military research and development activities can benefit many industries (Nadaroğlu, 1985: 184; Durgun and Timur, 2017: 130).

There are many examples where technologies developed for military purposes later became widespread in civilian applications. Especially in electronics and transportation, many important inventions and technologies were initially developed to meet military requirements and later found wide applications in the civilian sector. Radio, radar, and microwave technologies were developed for military communication and reconnaissance during World War II. These technologies later had a significant impact on civilian applications. During wartime, transportation and logistics require fast and reliable transportation systems. This need led to the development of high-speed trains, jet aircraft, and fast ships. These technologies became widespread in civil aviation, civilian maritime transport, and mass transit systems. Technologies developed for military communication systems significantly transformed the civilian telecommunications sector. Notably, the

ARPANET project, which laid the foundation of the internet, started as a military project and laid the groundwork for the civilian internet. Military healthcare services require the development of new medical technologies for the care and treatment of wounded soldiers. These technologies were later used in the civilian healthcare sector. Military research and development activities play an essential role not only in terms of national security but also in economic and technological innovation (Nadaroğlu, 1985: 184-185).

2.3. Literature Review

There are many studies aimed at explaining the relationship between defense expenditures and economic growth. The different views and findings in the literature on the relationship between defense expenditures and economic growth demonstrate this issue's complexity and multifaceted nature. The results in the literature can vary because studies have been conducted using different methods and data sets for different countries and periods. Therefore, the impact of defense expenditures on economic growth may vary depending on the conditions and geopolitical positions of countries, the period, and the era in question. For this reason, more research is needed to understand the relationship between defense expenditures and economic growth clearly. Continuing research in this field, using different periods and methods, will help achieve more robust results and generalizations. Below is a table presenting significant studies on this topic for Türkiye and the world.

Table 1: Major Studies Examining the Relationship Between Defense Expenditures and Economic Growth

Works	Method	Countries and Periods	Findings
Benoit (1978)	Least Squares Method	44 Developing Countries, 1950-1965	Military Keynesian Approach Valid
Deger and Sen (1983)	Least Squares Method	50 Less Developed Countries, 1965-1973	Neoclassical Approach Valid
Fredericksen and Looney (1983)	Least Squares Method	37 Groups of Developed and Developing Countries, 1960-1978	Different Results According to Financial Constraints
Chowdhury (1991)	Granger Causality Test	55 Developing Countries, 1961-1987	Different Results
Abu-Bader and Abu-Qarn (2003)	Cointegration and Variance Decomposition	Egypt, Israel, and Syria, 1967-1998	Neoclassical Approach Valid
Galvin (2003)	Two-Stage Least Squares Method, Three-Stage Least Squares Method	64 Less Developed Countries, 1999	Neoclassical Approach Valid
Gökbunar and Yanıkkaya (2004)	Seemingly Unrelated Regression and Three-Stage Least Squares Method	114 Developed and Developing Countries, 1980-1997	Military Keynesian Approach Valid in Developing Countries
Cuaresma and Reitschuler (2004)	Threshold Regression Model	USA, 1929-1999	Military Keynesian Approach Valid
Görkem and Işık (2008)	Vector Autoregressive Model, Granger Causality Test	Türkiye, 1968-2006	No Relationship

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Tang (2008)	Autoregressive Distributed Lag Model	Malaysia, 1960-2006	Neoclassical Approach Valid
Wijeweera and Webb (2009)	Vector Autoregressive Model	Sri Lanka, 1976-2007	Military Keynesian Approach Partially Valid
Braşoveanu (2010)	Cluster Analysis, Quantile Analysis, Regression Analysis, and Granger Causality Test	Romania, 1998-2007	Neoclassical Approach Valid
Birol (2010)	Cointegration, Causality, and VEC Model	Türkiye, 1963-2006	Neoclassical Approach Valid
Canbay (2010)	Least Squares Method	Türkiye, 1950-2008	Uncertain
Baltacı and Hayaloğlu (2011)	Dynamic Panel Data Analysis	Fragile Five Economies, 2000-2017	Neoclassical Approach Valid
Dunne and Tian (2013)	Dynamic Panel Data Analysis	106 Countries, 1988-2010	Neoclassical Approach Valid
Chen et al. (2014)	Two-Stage Generalized Method of Moments	137 Countries, 1988-2005	Military Keynesian Approach Valid
Dash (2016)	Dynamic Panel Data Analysis, DOLS	Brazil, Russia, India, and China, 1993-2014	Military Keynesian Approach Valid
Durgun and Timur (2017)	Granger Causality Test	Türkiye, 1970-2015	No Relationship
Canbay and Mercan (2017)	Vector Error Correction Model	Türkiye, 1986-2016	Military Keynesian Approach Valid
Tarla and Boyrazlı (2023)	Autoregressive Distributed Lag Model	Türkiye, 1960-2020	Military Keynesian Approach Valid
Kara and Aksu (2024)	Vector Autoregressive Model	Türkiye, 1990-2021	Military Keynesian Approach Valid

3. Data Set and Model

In this study, the time series analysis method was employed to determine the impact of defense expenditures on economic growth using annual data from the 1996-2022 period available for Türkiye. The relationship between defense expenditures and economic growth has been attempted to be explained with the help of the following function:

$$lgdp = f(me, gfcf, rd, ll) \quad (1)$$

Here, $lgdp$ represents the natural logarithm of real gross domestic product (GDP) per capita, while me, $gfcf$, rd, and ll respectively represent the share of defense expenditures in GDP, the share of gross fixed capital formation in GDP, the share of research and development expenditures in GDP, and the natural logarithm of the labor force level. The functional form specified in Equation 1 will be estimated using a logarithmic linear econometric model shown in Equation 2 below.

$$lgdp_t = \beta_0 + \beta_1 me_t + \beta_2 gfcf_t + \beta_3 rd_t + \beta_4 ll_t + \varepsilon_t \quad (2)$$

In this study, where time series analysis will be used, t represents the time dimension, β_0 represents the constant term, β_i represents the coefficients to be estimated, and ε_t represents the white noise error term. The explanation of the variables specified in Equations 1 and 2, along with their data sources, is presented in Table 2.

Table 2: Variables and Sources

Abbreviation	Variable Name	Description	Period	Source
lgdp	Natural logarithm of real GDP per capita	Constant 2015 US Dollars	1996-2022	World Bank
gfcf	Share of gross fixed capital formation in GDP	Constant 2015 US Dollars	1996-2022	World Bank
me	Share of defense expenditures in GDP	Percentage of GDP	1996-2022	World Bank
rd	Share of research and development expenditures in GDP	Percentage of GDP	1996-2022	World Bank
ll	Natural logarithm of the labor force	Level	1996-2022	Turk Stat

As can be seen from Table 2, the data for per capita real GDP, gross fixed capital formation, military expenditures, and research and development expenditures have been obtained from the World Bank database. The labor force data has been obtained from the Turkish Statistical Institute (Turk Stat).

4. Econometric Method and Findings

Since the country subject to analysis in the study is Türkiye, time series analysis has been employed in the empirical section. The model determined in Equation 2 has been estimated using a three-stage method. In the first stage of this econometric method, the stationarity levels of the variables will be determined. In the second stage of the econometric method, long-run relationships between the variables will be investigated. In the third stage of the econometric method, if the existence of a long-run relationship among the variables is confirmed, long-run coefficient estimates will be made.

4.1. Stationarity Analysis

In econometric analyses, stationarity analysis determines whether the statistical properties of time series data change over time. In other words, it is used to ascertain whether the mean and variance of the time series change over time. Granger and Newbold (1974) noted that working with non-stationary series of the same degree may lead to the problem of spurious regression. In the case of spurious regression, the estimated results are unreliable. However, the linear combination of stationary series of the same degree mitigates the spurious regression issue by making it go away (Çifçi et al., 2018: 378; Akalin et al., 2018: 68). Therefore, at the beginning of the econometric phases, it is important to determine the stationarity and degrees of stationarity of the series. The ADF (Augmented Dickey-Fuller) and PP (Phillips-Perron) unit root test results, taking into account the autocorrelation issue and the heteroscedasticity issue (Kılıç et al., 2018: 118), are presented in the following Tables 3 and 4 for the variables subject to analysis.

Table 3 presents the variables' ADF unit root test results in both level and first differences. The second and third columns of the table show the ADF test statistics and probability values for the constant model. The fourth and fifth columns show the ADF test statistics and probability for the constant and trend model. Upon examining Table 3, it can be seen that in the level, all variables except for lgdp in the constant and trend model have unit root for both the constant model and constant-trend model, as their probability values are greater than 0.05. However, when the first differences of the variables are taken, all variables become stationary for both the constant model and the constant and trend model, as their probability values are less than 0.05. Therefore, it can be concluded that the variables have a unit root in level values, and they become stationary at the 5% significance level when their first differences are taken.

Table 3: ADF Unit Root Test Results

ADF				
	Constant Model		**Constant and Trend Model**	
Varaibles	**Test Statistics**	**Probability**	**Test Statistics**	**Probability**
gfcf	-1.599894	0.468	-2.678839	0.252
d(gfcf)	-5.107663	0.000	-5.059613	0.002
lgdp	0.417732	0.979	-5.291121	0.002
d(lgdp)	-4.667569	0.001	-4.808210	0.003
ll	0.783584	0.992	-1.754923	0.697
d(ll)	-4.284660	0.002	-4.442939	0.008
me	-1.474969	0.523	-2.242979	0.447
d(me)	-4.742388	0.000	-4.626515	0.005
rd	0.173630	0.965	-2.349827	0.394
d(rd)	-5.416874	0.000	-4.180130	0.019

Table 4 presents the results of the PP unit root test, which accounts for the issue of heteroskedasticity. According to the PP unit root test results, since the probability values for all variables are greater than the 0.05 significance level in both the constant model and the constant-trend model, it is seen that the variables are not stationary in level and have unit root. However, when the first differences of the variables are taken, the probability values are less than 0.05 for both the constant model and the constant-trend model. Therefore, the PP unit root test results support the ADF results, showing that all variables have unit root in level and become stationary at the 5% significance level when their first differences are taken.

Table 4: PP Unit Root Test Results

PP				
	Constant Model		**Constant and Trend Model**	
Variables	**Test Statistics**	**Probability**	**Test Statistics**	**Probability**
gfcf	-1.636654	0.450	-2.716170	0.238
d(gfcf)	-5.106358	0.000	-5.058452	0.002
lgdp	0.417732	0.979	-2.509276	0.321
d(lgdp)	-4.667569	0.001	-4.808210	0.003
ll	0.783584	0.991	-1.782422	0.684
d(ll)	-4.290448	0.002	-4.446765	0.008
me	-1.322790	0.603	-2.163888	0.488
d(me)	4.742388	0.000	-4.626515	0.005
rd	0.224049	0.968	-2.344092	0.397
d(rd)	-5.420257	0.000	-5.636282	0.000

4.2. Cointegration Analysis

If the variables are integrated in the same order, it is necessary to determine whether they are related in the long term. The cointegration test aims to model and estimate the long-run relationships between time series whose linear combinations are stationary in the long run, even though they are not stationary in level. The cointegration test ensures that the optimal lag lengths of the series are the same in the long term (Küçükaksoy et al., 2015: 702-703). In this study, the Johansen-Juselius (1990) cointegration test is used to examine whether the variables are related in the long run, in other words, whether they are cointegrated. Table 5 presents the Johansen-Juselius (1990) cointegration test results for the model established in Equation 2.

The Johansen-Juselius cointegration analysis is sensitive to the lag length. The analysis determined the lag length was 1 based on the Akaike, Schwarz, and Hannan-Quinn information criteria, which satisfy the VAR model stability condition. According to the Johansen-Juselius cointegration test results, both the trace statistic and the maximum eigenvalue statistic are greater than the critical value at the 5% significance level. Therefore, the null hypothesis of “there are no cointegrating vectors” is rejected, and the hypothesis of “there are at most two cointegrating vectors” is accepted.

Table 5: Johansen-Juselius Cointegration Test Results

Trace Statistic (Linear Deterministic Trend)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value (5%)	Probability
None *	0.782890	89.33302	69.81889	0.0007
At most 1 *	0.707914	51.14925	47.85613	0.0237
At most 2	0.407452	20.38160	29.79707	0.3973
At most 3	0.200070	7.298531	15.49471	0.5432
At most 4	0.066403	1.717750	3.841466	0.1900

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level. * denotes rejection of the hypothesis at the 0.05 level

Maximum Eigenvalue Values (Linear Deterministic Trend)

Hypothesized No. of CE(s)	Eigenvalue	Maximum Eigenvalue Statistic	Critical Value (5%)	Probability
None *	0.782890	38.18377	33.87687	0.0144
At most 1 *	0.707914	30.76765	27.58434	0.0188
At most 2	0.407452	13.08307	21.13162	0.4446
At most 3	0.200070	5.580781	14.26460	0.6674
At most 4	0.066403	1.717750	3.841466	0.1900

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level. * denotes rejection of the hypothesis at the 0.05 level

4.3. Long-Run Coefficient Estimation

After determining that the variables are cointegrated, it is necessary to determine the direction and magnitude of the effect of the independent variable on the dependent variable. In the time series literature, frequently used methods for estimating the cointegrating vector are FMOLS (Fully Modified Ordinary Least Squares), DOLS (Dynamic Ordinary Least Squares), and CCR (Canonical Cointegration Regression). These approaches are commonly used because they overcome issues such as autocorrelation and endogeneity that can affect traditional OLS estimates. In this study, these approaches were used to estimate the long-run coefficients. The estimation results of the model, considering Equation 2, are presented in Table 6.

Table 6: Long-Run Estimation Results

Model: $lgdp_t = \beta_0 + \beta_1 me_t + \beta_2 gfcf_t + \beta_3 ll_t + \beta_4 rd_t + \varepsilon_t$

Independent variables	FMOLS		DOLS		CCR	
	Coefficient	Probability	Coefficient	Probability	Coefficient	Probability
me	-0.076824	0.0000	-0.076134	0.0001	-0.077233	0.0000
gfcf	0.013139	0.0000	0.020618	0.0000	0.013132	0.0000
ll	0.609695	0.0000	0.810120	0.0000	0.612702	0.0000
rd	0.303016	0.0000	0.139305	0.0006	0.302217	0.0000
β_0	-1.719395	0.2451	-5.186858	0.0002	-1.768360	0.2557

Table 6 provides the estimated long-run coefficients for the model, indicating the direction and magnitude of the effect of each independent variable on $lgdp_t$. Each coefficient is accompanied by its probability, which help in assessing the statistical significance of the estimated relationships. All variables, except the constant term (β_0), are observed to have probability values less than 0.05. This indicates that all coefficients, except for the constant term, are statistically significant at the 5% significance level. The variable *me* (the share of defense expenditures in GDP) has a statistically significant negative long-run effect on the $lgdp$ (real GDP per capita). In contrast, the variables *gfcf* (the share of gross fixed capital formation in GDP)*, ll* (the labor force level) *and rd* (the share of research and development expenditures in GDP) have a statistically significant positive long-run effect.

The results from FMOLS, DOLS, and CCR show that a 1 unit increase in the variable *me* (the share of defense expenditures in GDP) leads to a 0.076% decrease in average in the $lgdp$ variable. This finding demonstrates that defense expenditures in Türkiye reduce economic growth. In other words, it suggests that the "Keynesian Military Approach" is not valid in Türkiye, while the "Neoclassical Approach" is valid. When examining other variables in the econometric model; A 1 unit increase in *gfcf* (the share of gross fixed capital formation in GDP) leads to an increase in $lgdp$ (real GDP per capita) by 0.0131% according to FMOLS, 0.0206% according to DOLS, and 0.0131% according to CCR. This finding indicates that fixed capital investments in Türkiye supported economic growth. A 1% increase in *ll* (the labor force level) increases $lgdp$ by 0.609% according to FMOLS, 0.810% according to DOLS, and 0.612% according to CCR. This finding confirms that labor force growth contributed the most to economic growth in Türkiye. Finally, A 1 unit increase in *rd* (the share of research and development expenditures in GDP) leads to an increase in $lgdp$ by 0.303% according to FMOLS, 0.139% according to DOLS, and 0.302% according to CCR. This finding shows that research and development expenditures significantly contributed to economic growth in Türkiye.

5. Conclusion

All sovereign powers must make defense expenditures to protect themselves and their citizens and to defend their existence against internal and external threats. In this regard, defense spending is a requirement. The conditions within each state, the scarce resources, production capabilities, and levels of technology vary, leading to differences in defense expenditures. These differing defense expenditures among countries significantly impact economic growth by influencing where and how scarce resources are used. The emphasis on defense spending by some states and the very low levels of spending by others indicate that there is no general perspective or practice regarding the balance between economic growth and defense expenditures. Therefore, the relationship between economic growth and defense spending remains a significant and current topic.

The Military Keynesian Approach suggests increased defense spending stimulates total demand and contributes to economic growth through the multiplier mechanism. On the other hand, the Neoclassical Approach argues that allocating investments or capital to defense rather than relatively more productive areas leads to reductions in the economy's productive capacity. The Neoclassical Approach posits that reducing defense expenditures to help allocate resources more effectively would promote economic growth. However, considering that defense spending is related to economic growth, national security, and strategic issues, such policy changes need to be carefully evaluated.

A three-stage econometric method was used in this study, which examines the relationship between defense expenditures and economic growth in Türkiye between 1996 and 2022. In the first stage, it was determined that the variables were stationary at the first level. In the second stage, a cointegration relationship was found among the variables. In the final stage, the long-run coefficients among the variables were estimated using FMOLS, DOLS, and CCR methods. The results obtained can be summarized as follows:

- An increase in the defense expenditures variable was found to decrease economic growth. This finding demonstrates that the "Military Keynesian Approach" was not valid in Türkiye during the 1996-2022 period, while the "Neoclassical Approach" was valid.
- It was determined that gross fixed capital formation increases during this period increased economic growth in Türkiye.
- The increase in the labor force level was found to increase economic growth. The most significant contribution to economic growth comes from changes in the labor force.
- It was determined that increases in research and development expenditures provided the second-largest contribution to economic growth after the labor force.

The findings of this study support the conclusion reached by Deger and Sen (1983), Abu-Bader and Abu-Qarn (2003), Galvin (2003), Tang (2008), Braşoveanu (2010), Birol (2010), Baltacı and Hayaloğlu (2011), and Dunne and Tian (2013) that the Neoclassical Approach is valid. This study found that an increase in defense expenditures in Türkiye between 1996 and 2022 decreased economic growth. Therefore, while considering the policy of reducing defense expenditures and reallocating resources to more productive areas to increase economic growth, it is crucial to consider many factors, such as Türkiye's current situation, geography, and the presence of terrorist organizations. When considering the terrorist organizations, the security of borders, and ongoing conflicts and wars in neighboring countries, reducing defense expenditures in Türkiye for economic growth may increase future defense spending in Türkiye. Smith (1776: 605) and Kurz (2023: 31) also argued that defense is much more important than wealth and that countries should sacrifice individual interests (welfare) to achieve socially beneficial outcomes when necessary.

Due to reasons such as confidentiality and protection, activities in the defense sector have quite limited effects on economic efficiency. The economic impact of defense expenditures can be very long run because technological innovations and efficiency increases in the defense sector cannot be transferred to the private sector or are only transferred in the long term. It is clear that with its existing resources, Türkiye's continued investments and technological advancements in the defense industry will contribute positively to the country in many ways in the long term. Therefore, to mitigate the negative impact of defense spending on economic growth, implementing policies that promote the dissemination of innovations and technologies developed in the defense sector to civilian sectors could lead to higher economic growth while also increasing the technological level of the defense industry by allocating more resources.

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