IJCEAS

International Journal of Contemporary Economics and Administrative Sciences
ISSN: 1925 – 4423
Volume: X, Issue: 2, Year: 2020, pp. 319-334

DEFENSE EXPENDITURES AND INFLATION RELATIONSHIP: 1990-2018 NATO COUNTRIES CASE

Professor Dr. Ekrem GÜL[1]
Asst. Prof. Dr. Mustafa TORUSDAĞ[2]

Received: 31.12.2019, Accepted: 11.09.2020
DOI Number: 10.5281/ zenodo.4429765

Abstract

Although it is seen in the literature that defense expenditures are associated with various macroeconomic variables, it can be foreseen that there is no consensus on the relationship between defense expenditures and inflation. The aim of this study is to investigate the relationship between defense spending and inflation in NATO countries for the period 1990-2018 examined with, bootstrap panel causality analysis developed by Kónya (2006). The analysis results indicate that there is a one-way causality relationship from inflation to defense spending in the United States, Czech Republic, Estonia, Croatia, England and Latvia.

Key words: Defense Expenditures, Inflation, NATO, Kónya (2006) Causality Test
JEL Code: H56, E31, C23

1. Introduction

The relationship between defense expenditures and inflation, although this relation attracted the attention of scientists and policy makers in the post-World War II period, there has been little empirical evidence in the economic literature since the 1990s. Occured between the years 1938-1975 World War II, the Korean and Vietnam wars have led to an increase in defense spending in many countries, thus increasing the overall demand during the post-war reconstruction period. Therefore, defense spending was believed to be inflationary (Melman 1985; Starr et al. 1984; Xu, Su and Tao, 2018: 1). Due to the existence of internal and external threats, countries are spending high levels of defense in order to maintain their

[1] Prof. PhD, Sakarya University, Faculty of Political Sciences, Department of Economics, egul@sakarya.edu.tr, Orcid Id: 0000-0002-2607-9066.

[2] Assist Prof., PhD, Van Yüzüncü Yıl University, Faculty of Economics and Administrative Sciences, Department of Economics, mustafatorusdag@yyu.edu.tr, Orcid Id: 0000-0002-8839-0562.

national security and sovereignty as a deterrent force. The main factors that determine the level of defense expenditures are the geopolitical position of the countries, wars, changes in the population ratios, problems related to foreign policy, arms race with neighboring and rival countries (Collier and Hoeffler, 2002: 4; Krugman, 2005: 522; Karakurt et al., 2018: 154-156).

Although defense expenditures are associated with many macroeconomic variables, there is no common consensus in the literature due to the lack of a theoretical model of the relationship between inflation and inflation. As defense expenditures can affect inflation, inflation can affect defense expenditures. There are two-way causality between defense expenditures and inflation, and there are various views in the literature that there is no relationship between defense expenditures and inflation (Günana, 2004: 19). With the help of developed econometric methods, the relationship between defense expenditures and inflation can be examined without the need for theoretical models (Karakurt et al., 2018: 154-156).

The study consists of three parts. In the first part of the study, the concepts of defense expenditures and inflation are defined according to international institutions and the theoretical framework of the subject is shaped. In the second part, the relationship between defense expenditures and inflation is explained. Later in the literature department of defense spending and inflation, as well as studies that examined the relationship of previously been presented literature review of empirical studies conducted on the subject in Turkey and other countries. In the third part, in the econometric analysis section, the bootstrap panel causality test developed by Kónya (2006) after the homogeneity of the variables were tested with the data of 1990-2018 period for 25 NATO countries. For the cross-sectional dependence, Breusch and Pagan (1980), Pesaran and Yamagata (2008) and Swamy tests were applied. The number of studies examining the relationship between defense expenditures and inflation is quite low in the literature. Therefore, in this study, the relationship between defense expenditures and inflation, Kónya (2006), II. generation panel causality tests were applied. In addition, the fact that there are no studies for NATO countries after a detailed literature review in the literature on this subject reinforces the idea that the study will contribute to the literature as an original study.

2. Definition of Military Expenditures and Inflation Notions

According to Ojo (2000), the notion of inflation is defined as the continuous and permanent increase in prices of goods and services in general. Inflation rate is measured as a percentage change in producer, consumer and wholesale price index. According to Essien (2005), the consumer price index (CPI) measures the average price of a representative basket of goods and services purchased by consumers. According to various economic schools, inflation theories explain the causes of inflation with different assumptions. In the classical and neoclassical approach based on the quantity theory of money, the increase in money supply increases the general level of prices at the same rate. The struggle against inflation is associated with monetary policy. According to the Keynesian model, which explains the

inflation due to excessive demand pressure, it is stated that it is caused by excessive deficits and excessive increase in public expenditures. It is aimed to reduce aggregate demand by combating inflation and using fiscal policy tools. In the Neo-Keynesian approach, which explains inflation with the Philips curve, the main cause of inflation is demand-side shocks. In this approach, monetary wages are assumed to result from delayed adaptation to changes in prices and aggregate demand. In the monetary approach, the concept of inflation is explained by the expanded Philips Curve model. According to this approach, besides the fact that inflation is seen as a monetary phenomenon, the increase in money supply reduces the real growth rate and unemployment rate in the economy in the short term. In the long run, this real effect disappears and only inflation increases. The structuralist approach explains inflation based on cost-push inflation theory. According to this approach, inflation is expressed as a supply-side situation that changes the profit expectations by increasing the unit costs of the private sector. According to the rational expectations approach, assuming that the economic units have full information, it is accepted that if the monetary authorities inform the monetary expansion, they will expect the increase in prices and adjust themselves to the expectations. In case of unexpected monetary expansion, it will have an impact on real output and employment. According to the new classical approach, negative supply shocks are suggested to cause inflation. In the new keynesian model, it is stated that a possible demand shock due to the determination of monetary wages through long-term contracts will not have the effect of inflation immediately and will be gradual (Akçacı Karapınar and Kocağ, 2013: 3).

According to the Neo-Keynesian, there are three types of inflation. First, the increase in money supply is due to the increase in public expenditures. Demand inflation, when total demand exceeds the current supply capacity. The second is cost-pull inflation. It is due to the increase in costs. It is also known as inflation caused by supply shocks. It is due to the decrease in the total supply resulting from the increase in costs (Thomas, 2006). The third is structural inflation, commonly known as the type of inflation resulting from changes in monetary policy. There are various types of inflation depending on the intensity and continuity of the price increase. Hyperinflation ranging from 50 percent to 100 percent, accelerating three-digit percentage point annual price increases, chronic inflation at 15-30 percent and 5 consecutive years, and high inflation at 30-50 per year. There is also moderate inflation in the general price range of 5 percent to 25-30 percent and low inflation in the range of 1-2 percent to 5 percent. In inflation rates below zero, it is defined as the deflation of a country (Piana, 2001).

The notion of defense spending is defined differently by international organizations such as the North Atlantic Treaty Organization (NATO) and the United Nations (UN). According to NATO, which was established in 1950, all current and capital expenditures of the armed forces, military R&D, training and equipment expenses of military personnel, military operation expenses, pensions of civil personnel working in military institutions, execution of state institutions and space projects operating in defense projects. It consists of expenditures made for the purpose (NATO, 2010).

The UN defines the definition of defense expenditure based on the definition of the Stockholm International Peace Research Institute (SIPRI). According to SIPRI (2010), defense expenditures, all current and capital expenditures of the armed forces, including peacekeeping, as well as personnel expenditures for military operations and military purposes, military and civil pension salaries, Social services expenditures for military personnel and their families, maintenance, procurement, military research and development, military construction and military assistance (military expenditure of the donor country). Excluded military expenditures consist of civilian defense expenditures, veteran aid, mobilization expenditures, transformation of arms production facilities and current expenditures for military activities such as weapon destruction (www.sipri.org). According to UN military experts, it is difficult to make a common definition around the world due to the lack of detailed information on military expenditures.

3. The Relationship Between Military Expenditures and Inflation

Defense expenditures have different effects on various economic variables. Besides economic indicators, important variables such as foreign trade, balance of payments, inflation and employment are examined under the effect of defense expenditures (Kaya, 2013: 17-38; Doğdu, 2018: 117). Defense spending has an inflationary effect in economies with less supply in terms of total supply, leading to higher investment and growth, leading to increased profitability. However, an expectation that inflation will increase will increase consumption and reduce savings. This reduce in savings will lead to lower investments and a decrease in growth potential (Ali and Ather, 2014: 29). According to the view that, defense expenditures are inflationary, it is suggested that military expenditures lead to inflation (Dumas, 1977; Melman, 1978; Thurow, 1981; Franko, 1982). This is because defense spending is interpreted to be inefficient, incur additional purchasing power and unproductive, unlike other forms of economic activity (including public spending in different areas). Melman (1978) argues that, due to the small number of firms providing military service activities, firms will act with cost maximization and in this context, the increase in costs will increase prices and have an inflationary effect.

Schultze (1981), states that too much military spending will lead to bottlenecks and shortages and will affect the productivity of the industry. The effect of defense expenditures on the general price level can be expressed by the change in total demand and total supply. On the demand side, the rapid increases in defense spending will cause inflation and accelerate the increase in nominal demand unless they are offset by tax increases or nominal monetary growth decreases. Kaufman (1972) and Capra (1981) argue that inflation is a strong factor in increasing defense spending. Inflation increases have an impact on costs and cost overruns. The larger defense budget advocates emphasize the need for an increase in defense spending in order to compensate for inflation and maintain the targeted level of defense spending (Günana, 2004: 23, 24, 27).

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Hamilton (1977) and Stein (1980) argue that defense spending is inflationary, increase in defense spending and war costs are more likely to be preferred than the increase in inflation rather than tax increases (Starr et al., 1984: 106). The demand shock caused by the increase in aggregate demand leads to demand inflation or the supply shock caused by the decline in aggregate supply leads to increased input costs and cost inflation (Akçacı et al., 2013: 3). According to Benoit, particularly in developing countries, defense spending will have a stimulating effect on demand and inflation resulting from the increase in demand will be seen. According to Benoit, high level of defense spending will lead to a low level of inflation in the economy and this situation is due to the increase in demand due to defense expenditures. This means that inflation resulting in the use of the country's current production capacity (Benoit, 1978: 271-280; Türk, 2007: 44).

4. Literature Review

Benoit emphasized the importance of inflation in the relationship between defense spending and economic growth and stated that the increase in defense spending in countries other than hyperinflation would result in inflation and that there was a positive relationship between defense burden and inflation. The abandonment of tight fiscal policies for financing defense expenditures resulted in higher inflation, while the defense level in countries with moderate inflation would increase economic growth due to the use of unproductive resources (Benoit, 1978: 278).

Starr et al. (1984), 1943-1989 period in the United States, United Kingdom, France and Germany with impact-response and variance decomposition methods and causality tests examined the study, the United Kingdom and the United States concluded that there is no relationship between defense spending and inflation, It is concluded that there is a two-way causality in France and Germany.

Vitaliano (1984) concluded that there was no causal relationship between defense spending and inflation. Nourzad (1987) reconsidered the work of Vitaliano (1984) using the expected inflation rate and concluded that defense spending positively affected inflation.

Looney (1989), in his study examining the arms-producing countries and non-arms-producing countries separately, concluded that defense spending in arms-producing countries caused cost inflation, while increasing defense spending in arms-producing and non-arms-producing countries increased demand and led to inflation in the economy.

Kinsella (1990) examined the 1943-1989 period for the United States and concluded that there was no relationship between defense spending and inflation. In addition, Kinsella (1990: 296) stated that the pressure on the general level of prices to increase due to excessive capacity utilization and increasing tax rates due to the increase in demand for national resources during wartime has been explained

by the high level of defense expenditures having an inflationary effect (Karakurt et al., 2018: 159, 160).

Baek (1991) also examined the period 1956-1989 for the United States and concluded that the increase in inflation rate affected defense spending. Payne and Ross (1992) concluded that there was no causal relationship between defense spending and inflation.

Sahu et al. (1994) examined the effect of defense spending and non-defense public spending on inflation for the UK in the 1960-1989 period in a closed economy with the Philips curve and IS-LM model, which increased expectations. They concluded that defense spending had an inflationary effect.

Günar (2004) examined for the 1950-2001 period and defense expenditure and Turkey have been unable to determine the short and long term cointegration relationship between variables between inflation and has concluded that there is bidirectional causality.

Tzeng et al. (2008) examined the relationship between defense expenditures and inflation with the internal monetary growth model. They concluded that the effect of the increase in defense spending on inflation was uncertain.

Özsoy (2008), their study examined the 1970-2004 period for Turkey, defense spending and have concluded that there is cointegration and causality between inflation in the long term.

Özsoy and Silk (2010), the 1980-206 period, Turkey, Egypt, Israel and the studies they examined for Jordan, Egypt and Israel on the one-way correlation was found in other countries, inflation in defense spending were not detected any causal relationship.

Lin (2012) examined the effect of increasing defense expenditures on inflation with the internal growth model and concluded that if defense expenditures were financed by money and other public expenditures were financed by taxes, the increase in defense expenditures would lead to a decrease in inflation and an increase in economic growth.

Aiyedogbon et al. (2012) found no relationship between defense spending and inflation in their study of Nigeria for 1980-2010 period.

Silk (2014), Turkey and Israel for defense spending and inflation thin relations, defense spending in the short term is unidirectional causality inflation has identified for Turkey.

Hung-Pin et al. (2016) examined the period of 1955-2010 for China, Japan, South Korea and Taiwan. In the long run, the rise in defense spending has led to low inflation in China and Japan, while it has led to low inflation in Taiwan.

Xu et al. (2018) examined the 1953-2014 period with Wavelet analysis for China. They concluded that defense spending did not have an inflationary effect in China but that defense spending reduced the growth during peace periods.

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Karakurt et al. (2018), working in the 1966-2016 period examined the Maki (2012) structural break cointegration test and Toda Yamamoto causality test for Turkey in defense spending and inflation in the long term have concluded that there is unidirectional causality. When the literature is examined, it is seen that the relationship between defense expenditures and inflation varies from one country to another and no common consensus can be reached.

5. Econometric Analysis

In this study, Breusch and Pagan (1980) horizontal cross-sectional dependence, using Pesaran and Yamagata (2008) Swamy test, using defense expenditure and inflation data for 25 NATO countries (except Albania, Bulgaria, Iceland and Montenegro) in the 1990-2018 period. bootstrap panel developed by Kónya (2006). Annual data on defense expenditure/GDP ratio were obtained from SIPRI (Stockholm International Peace Research Institute) and annual inflation data from World Bank Data. Econometric analyzes were analyzed using Gauss 10 econometric program.

In the study examining 25 NATO countries, the econometric models established are as follows:

$$\text{Inf} = \beta_0 + \beta_1 \text{Defence} + u_i \quad (1)$$

$$\text{Defence} = \beta_0 + \beta_1 \text{Inf} + u_i \quad (2)$$

Equation 1 expresses the effect of change in defense expenditures on inflation. The variable β_0 in the model represents the constant term, β_1 variable represents the defense expenditure variables. u_i represents the error term for the model. In the model, while defense expenditures are taken as the independent variable, the inflation variable is taken as the dependent variable.

Equation 2 expresses the effect of change in inflation on defence expenditure. The variable β_0 in the model represents the constant term, β_1 variable represents the inflation variables. u_i represents the error term for the model. In the model, while inflation are taken as the independent variable, the defence expenditure variable is taken as the dependent variable.

Table 1. Horizontal Section Dependence Test Results of Variables

Variables:	**Defence Expenditures**		**Inflation**	
Tests	**Statistic**	**P-Value**	**Statistic**	**P-Value**
CDLm1 (Breusch, Pagan 1980)	1320.676**	0.000	627.696**	0.000
CDLm2 (Pesaran, 2004 CDlm)	41.669**	0.000	13.378**	0.000
CDLm (Pesaran, 2004 CD)	17.330**	0.000	3.378**	0.000
Bias-adjusted CD test	-3.309	1.000	0.072	0.471

Note: ***, **, * indicate significance levels of 10%, 5% and 1%, respectively.

In the Breusch and Pagan (1980) study, where the cross-sectional dependence is considered, the test statistic is as follows (Pesaran et al., 2008; Şahin, 2018: 290):

$$LM = T\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\bar{P}\,y, \chi^2\, N(N-1)/2 \quad (1)$$

The test statistics developed by Pesaran (2004) are as follows (Pesaran et al. 2008):

$$CD = \sqrt{2T/N(N-1)}\left(\sum_{\mathrm{i}=1}^{N-1}\sum_{J=i+1}^{N}\bar{P}y\right) \quad (2)$$

Pesaran et al. (2008) developed CDLMadj tests, based on this variance and average LM statistic was used and LM test was developed.

$$LM(\rho)adj = \frac{\sqrt{\frac{2}{\rho(2N-\rho-1)}}\sum_{s=1}^{p}\sum_{j=1}^{N-s}(T-k)\bar{\rho}^2{}_{i,i\div s}}{\sigma_{Ti,i\div s}}N(0,1) \quad (3)$$

The hypotheses of the test are as follows. The null hypothesis states that there is no horizontal cross-sectional dependence; The alternative hypothesis states that there is a cross-sectional dependence.

Table 1 indicate that cross-sectional dependence test results of the inflation and defense expenditures variables. CDLm1 (Breausch, Pagan 1980), CDLm2 (Pesaran, 2004 CDlm) and Bias-adjusted CD tests are important for interpreting the cross-sectional dependence when T>N. According to CDLm1 (Breausch, Pagan 1980), CDLm2 (Pesaran, 2004 CDlm) cross-sectional dependence test tests, the 'no cross-sectional dependence' hypothesis H_0 was rejected at 5% significance level, so there was a cross-sectional dependence on defense expenditures and inflation variables.

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Table 2. Testing for Homogeneity in Models

Tests	Model 1		Model 2	
	Y: Inflation X: Defence Expenditure		Y: Defence Expenditure X: Inflation	
	Test Stat.	Prob.	Test Stat.	Prob.
Delta_tilde	0.239	0.405	3.745***	0.000
Delta_tilde_adj	0.253	0.400	3.955***	0.000

Note: ***, **, * express heterogeneity according to significance levels of 10%, 5% and 1%, respectively.

Pesaran and Yamagata (2008) developed the Swamy test. In the test, it is checked whether the slope coefficients differ between the horizontal sections. The null hypothesis of this test is homogeneity; the alternative hypothesis expresses heterogeneity (Şahin, 2018: 290). The homogeneity or heterogeneity of coefficients in panel data studies is an important step in determining cointegration and causality analyzes. Homogeneity, all countries/regions and so on. while expressing the slope coefficients calculated for units such as βi's are equal to β, which is a single slope coefficient; in heterogeneity, at least one of the units βi's is different.

Pesaran and Yamagata (2008) developed two statistics to test homogeneity. These are ($\tilde{\Delta}$) and ($\tilde{\Delta}adj$) statistics (Gül and İnal, 2017: 75). 'Variables are homogeneous' according to the results of the delta-tilde ($\tilde{\Delta}$) ve telda-tilde-adj ($\tilde{\Delta}adj$) homogeneity tests given in Table 3, in which the homogeneity results of the study are given, the hypothesis of H_0 is rejected %5 and %10 significance level in the second model. The βi slope coefficients of the variables used in the model are heterogeneous. In the first model, where the inflation variable is taken as a dependent variable, the hypothesis Ho could not be rejected because the P - probability - value is greater than 0.05, ie the first model is not heterogeneous and homogeneous.

Many causality tests are used in panel data studies. Since the cross-sectional units are heterogeneous units that are affected by each other, Kónya (2006) panel causality test method, which gives effective results under horizontal cross-section dependence and heterogeneity, can be applied only for the second model. In the Kónya (2006) approach, the cross-sectional dependence is tested using the SUR estimation method and the direction of causality is tested using the Wald test statistics. Konya (2006) bootstrap panel causality test was used in the study and Table 4 shows the findings related to the analysis. After determining the presence of cross-sectional dependence and country-specific heterogeneity, it is appropriate to use the panel causality method proposed by Kónya (2006), which explains both horizontal cross-sectional dependence and slope heterogeneity (Menyah et al., 2014: 391).

Table 3. Horizontal Section Dependence Result in Model

	Statistics	**P-value**
LM (Breusch, Pagan 1980)	7631.973***	0.000
CDlm (Pesaran, 2004 CDlm)	299.327***	0.000
CD (Pesaran, 2004 CD)	87.158***	0.000
LMadj (Pesaran et al. 2008)	-2.193	0.986

Note: ***, **, * indicate significance levels of 10%, 5% and 1%, respectively.

As can be seen in table 3, the horizontal model dependency test results are seen in the second model, where defense expenditures are taken as dependent variables. According to LM (Breausch, Pagan 1980), CDLm (Pesaran, 2004 CDlm) and CD (Pesaran, 2004 CD) horizontal cross-sectional dependence tests, there is no cross-sectional dependence test according to H_0 hypothesis, there is a horizontal cross-sectional dependence in the model at a significance level of 10 percent.

Kónya (2006) The following equations are estimated according to the panel causality test approach (Kónya, 2006: 981):

$$y_{i,t} = \propto_{1,1} + \sum_{i=1}^{ly1} \beta_{1,1,i}\, y_{1,t-i} + \sum_{i=1}^{lx1} \gamma_{1,1,i}\, \chi_{k,1,t-1} + \mathcal{E}_{1,1,t}$$

$$y_{2,t} = \propto_{1,2} + \sum_{i=1}^{ly1} \beta_{1,2,i}\, y_{2,t-i} + \sum_{i=1}^{lx1} \gamma_{1,2,i}\, \chi_{k,2,t-1} + \mathcal{E}_{1,2,t} \quad (4)$$

$$y_{N,t} = \propto_{1,N} + \sum_{i=1}^{ly1} \beta_{1,N,i}\, y_{N,t-i} + \sum_{i=1}^{lx1} \gamma_{1,N,i}\, \chi_{k,N,t-i} + \mathcal{E}_{1,N,t}$$

and

$$\varkappa_{k,1,t} = \propto_{2,1} + \sum_{i=1}^{ly2} \beta_{2,1,i}\, y_{1,t-i} + \sum_{i=1}^{lx2} \gamma_{2,1,i}\, \chi_{k,1,t-1} + \varepsilon_{2,1,t}$$

$$\varkappa_{k,2,t} = \propto_{2,2} + \sum_{i=1}^{ly2} \beta_{2,2,i}\, y_{2,t-i} + \sum_{i=1}^{lx2} \gamma_{2,2,i}\, \chi_{k,2,t-1} + \varepsilon_{2,2,t} \quad (5)$$

$$\varkappa_{k,N,t} = \propto_{2,N} + \sum_{i=1}^{ly2} \beta_{2,N,i}\, y_{N,t-i} + \sum_{i=1}^{lx2} \gamma_{2,N,i}\, \chi_{k,N,t-i} + \varepsilon_{2,N,t}$$

The variables y and x are the number of horizontal cross-sectional units (i = 1,2, ..., N), the time period t (t = 1,2, ..., T), and the delay length l, mly and mlx,

respectively. Refers to the delay lengths for y and x. Causality relationship and direction Wald statistics are obtained by comparing the critical values specific to the horizontal cross-section unit obtained by bootstrap method. If the Wald statistics are higher than the bootstrap critical values, the null hypothesis that no causality exists is rejected (Şahin, 2018: 291).

In the equations, y is the real GDP, x is the economic complexity index, N is the number of observations (j = 1, ..., N) and t (t = 1, ..., T) is the period. This test is based on country-specific bootsrap critical values, the Wald test and the Apparently Unrelated Regression (SUR) estimation. This approach has two advantages. First, it does not require a single hypothesis for the entire panel. Therefore, it is possible to carry out a causality test separately for each panel. In other words, the panel is not assumed to be homogeneous. Second, it does not require pre-tests such as cointegration and unit root tests. According to this approach, it is possible to obtain the bootstrap critical value for each country separately (Kónya, 2006: 979). In the study, Akaike information criterion which is foreseen in Kónya (2006) study was taken into consideration as lag length (Yıldız and Akbulut, Yıldız, 2019: 335, 336).

The panel data approach developed by Kónya (2006) is based on Wald statistics with seemingly unrelated regressions (SUR) and country-specific bootstrap critical values. This test has 2 advantages. First, it does not require common hypotheses for all of the horizontal cross-section units forming the panel. By allowing simultaneous correlation between the horizontal section units, the panel allows the use of extra information provided by the data. Second, it does not require any pre-testing except the proper delay structure. In this approach, as the causality test results are critically dependent on the delay structure, the number of delays must be determined before proceeding to estimate. There is no simple rule to decide the maximum number of delays. However, in this test, the optimal lag length is assumed to be between 1-4 to minimize the Akaike Information Criterion and the Schwartz Criterion (Konya, 2006, 979-982).

As a result, according to this test, Wald statistics are compared with the critical values obtained for each horizontal section unit obtained by bootstrap method in order to determine causality relationship. When it is found that the Wald statistic for any horizontal section unit is greater than the bootstrap critical value, it is said that there is a causality relationship between the variables, or vice versa (Altıner and Yavuz, 2019: 942).

Table 4. Kónya (2006) Bootstrap Panel Causality Test Results

H_0: Inflation is not a Cause for Defense Expenditures H_1: Inflation is the Cause of Defense Expenditures					
Countries	**Wald Stat.**	**Bootstrap Prob. Value**	**Critical Value**		
			%1	**%5**	**%10**
Germany	76.897	0.199	442.079	197.33	134.68
Belgium	11.247	0.543	299.584	146.93	97.856
United States	29.962***	0.099	184.096	53.479	29.583
Czech Republic	112.390***	0.082	363.629	154.59	98.669
Denmark	13.121	0.512	294.518	159.15	110.77
Estonia	619.480***	0.004	363.554	159.59	111.22
France	10.742	0.465	196.751	103.47	62.506
Croatia	113.394***	0.093	440.270	180.94	102.23
Netherlands	14.803	0.587	516.503	222.48	151.70
Italy	16.841	0.413	195.033	112.34	69.807
Spain	17.149	0.674	365.602	212.41	144.03
Canada	1.293	0.839	222.827	113.94	81.167
Latvia	68.629***	0.124	251.701	105.69	76.222
Lithuania	4.707	0.805	445.070	246.31	146.93
Luxembourg	3.862	0.680	209.997	120.79	77.267
Norway	91.672	0.371	854.686	446.05	304.07
Hungary	16.593	0.778	680.228	395.32	299.66
Poland	0.014	0.992	437.392	191.83	131.36
Portugal	36.933	0.363	409.315	223.82	139.59
Romania	0.466	0.810	111.086	49.051	30.793
Slovakia	33.060	0.351	374.434	180.51	112.90
Slovenia	1.023	0.723	134.852	57.847	33.493
Turkey	35.287	0.255	256.579	124.74	81.273
Greece	5.037	0.644	262.879	123.78	80.013
England	323.819***	0.063	625.138	350.53	259.46
Panel Fisher statistics value : 58.930 Panel Fisher probability value : 0.181					

Note: ***, **, * represent 10%, 5% and 1% significance levels of the null hypothesis, respectively. Critical values were obtained with 1000 boostrap cycles and Akaike: 1 lag length.

According to Table 4, for the United States, the Czech Republic, Estonia, Croatia, Latvia and the England, the hypothesis H_0 was rejected and the H_1 hypothesis was accepted as defense expenditure not the cause of inflation at a level of significance of 10%. It is concluded that there is a one-way causality relationship from inflation to defense expenditures for this countries. Statistically significant relationship was not found for other NATO countries. According to the Panel Fisher probability value, H_0 hypothesis 'defense expenditures that are not the cause of inflation was rejected at %10 significance level and H_1 hypothesis was accepted at

10% significance level. When the panel is evaluated in general, it was not determined that there was a one-way causality relationship from inflation to defense spending for 25 NATO member countries.

6. Results

The aim of this study is to examine the relationship between inflation and defense expenditures in 25 NATO member countries for the period 1990-2018. Clearly, the relationship between defense spending and inflation has a very complex relationship. The direction and size of the relationship varies from country to country. As a result of the Kónya (2006) Boostrap Panel causality analysis, it was concluded that there is a one-way causality relationship from inflation to defense expenditures in 25 NATO member countries in the England, Czech Republic, Estonia, Croatia, the United Kingdom and Latvia. In addition, when the panel was examined, a one-way causality relationship was not found for 25 NATO member countries from inflation to defense expenditures. The analysis results of Özsoy (2008), Özsoy ve İpek (2010), Vitaliano (1984), Payne ve Ross (1992) coincide with the analysis results of our study.

The method of financing defense expenditures and the economic conditions are shaped depending on the strength of the national currencies of the countries. Increased inflation decreases the purchasing power for defense expenditures. Therefore, countries may have to increase their nominal expenditures in order to maintain their real level of defense expenditures. In countries where the countries are in disagreement and alliance, a possible inflation may affect the defense expenditures of the countries. Inflation is an important factor due to the increase in the cost of defense expenditures. According to the advocates of more budget devotion to defense expenditures, they emphasize the importance of the increase in defense expenditures in order to eliminate the inflation increase and maintain the targeted defense expenditure level.

Macroeconomic variables such as exchange rates, inflation and interest rates can affect each other in various ways. Exchange rate is an important factor in explaining inflationary effects in open economies. The change in the exchange rate changes the prices of the inputs subject to export and import and affects the prices of final goods. One of the most important factors leading to an increase in public expenditures is the decline in the value of money. This is the case in countries where inflation is valid. Among the reasons for the increase in public expenditures of the NATO countries discussed in the study, it can be concluded that as a result of the decrease in the value of the national currency of the countries, these countries increase their defense expenditures by increasing their costs.

As a policy proposal, it can be stated that NATO countries should follow effective policies in the fight against inflation. Therefore, they are advised to follow anti-inflation policies by controlling exchange rate and interest rate variables. It can be commented that it is not possible to stabilize the exchange rate in the struggle against inflation and to control interest rates as a more effective tool.

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