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Investigating the Nexus Between Militarization and Inflation in Turkey

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Abstract: The importance of military expenditure in terms of establishing national security constitutes the main excuse for public expenditures made by states in this field. Yet, a special importance should be attached to military expenditure in terms of ensuring the efficiency of the public sectors of developing countries and rational use of resources. In fact, there is no consensus about the effect of these types of expenditures on the economy in general or the trade-offs they cause. Therefore, their effects on major macroeconomic variables and efficiency in resource allocation, production, and distribution deserve to be comprehensively addressed. To this end, this study aims to investigate the long-term effect of militarization on inflation in Turkey. By incorporating the annual data from the period 1970 to 2020 and employing the combined approach to cointegration suggested by Bayer and Hanck (2013), the presence of long-term interplay between militarization and inflation can be analyzed. After detecting the presence of cointegration, the findings of the long run model reveal that inflation is spurred by military expenditure and arms imports besides the other determinants of inflation.

Keywords: Bayer-Hanck Cointegration Test; inflation; militarization; Turkish economy.

JEL classification: C32; E31; H41; H56.

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1. INTRODUCTION

The inflationary aspect of military services is one of the core topics in the terrain of defense economics. In one of the pioneering attempts, [Schultze \(1981\)](#) argues that there are two main mechanisms by which military outlays might potentially affect inflation. The first mechanism works through an aggregate demand channel. By accelerating government expenditures, military spending would induce inflationary pressures, which are associated with upswings in aggregated demand unless contractionary fiscal and monetary policy tools are enabled. The second mechanism is associated with the supply side, in which limitations on capacity utilization and cost increases associated with the defense industry ([Nourzad, 1987](#); [Sahu et al., 1995](#)). According to [Vitaliano \(1984\)](#), these price rigidities mainly stem from the monopolistic and monopsonistic characteristics of the defense sector and the demand for high-skilled labor by the defense sector itself. Thus, output expansion in the defense sector would lead to price upswings, which might result in unanticipated inflationary pressures in the overall economy ([Sahu et al., 1995](#)). However, overall security of the country is a crucial issue in sustaining more stable macroeconomic conditions. That is why countries are inclined to militarize not only for political reasons but also in order to maintain a more stable economic environment. Nevertheless, rising militarization in terms of military outlays tends to have adverse effects on the economy. Besides the misallocation of resources, rising military expenditure can potentially put pressure on governments' budgets.

As one of the most crucial elements of macroeconomic stability, inflation plays a key role in the economy, particularly for developing countries. In this respect, the Turkish economy displays a good experimental laboratory for researchers and policymakers to the extent that inflation was one of the major issues for decades until the adoption of an inflation targeting regime after the financial crisis of 2001. Before achieving a relatively stable price level in the aftermath of the adoption of the inflation-targeting strategy, the structural changes in the economy inevitably lead to financial crashes, which mostly resulted in high inflation. One of the major reasons for the price instability stems from the excessive amount of budget deficits that occurred during the 1970s and the financial crashes in 1994 and 2001. Accordingly, these financial crashes had a distorting effect on the investment climate and adverse effects on the economy.

In the 1970s, Turkey experienced some major political concerns. For example, the outbreak of internal tensions and disputes over Cyprus resulted in an arms embargo on Turkey. Besides these political concerns, macroeconomic instabilities were also observed. In this context, one of the major macroeconomic concerns was the unanticipated increase in overall prices. That period was characterized by the implementation of the import-substitute development strategy, market failures, and price controls in the overall economy. The implementation of the import-substitute strategy is characterized by the extensive imports of raw materials and intermediate goods. However, this situation deteriorated the terms of trade with the emergence of oil price shock and thus accelerated the current account deficit. In addition, the five-year development plan's intensive implementation of public investment programs exacerbated the fiscal balances. With the presence of two oil price shocks, imbalances in aggregate supply and demand induced higher inflation rates ([The Central Bank of Turkey, 2002](#)). In the early years of the 1980s, Turkey embarked on an export-led development strategy and financial liberalization that was introduced by most of the developing countries. However, the presence of uncontrollable capital movements and implementation of expansionary monetary and fiscal policies under the fixed exchange rate

regime distorted the internal and external balances of the Turkish economy. The devastating effects of those inefficient economic policies lead to three consecutive financial crashes in 1994, 2000, and 2001 that resulted in the historically highest levels of inflation. To that end, price inflation, as measured by changes in the consumer price index, was around 60-65 percent in the second part of the 1980s. In the early 1990s, inflation rates increased to 70 percent on average, and in 1994 it reached 106.3 percent, the highest recorded. During the post-crisis period (after 1994), it ranged from around 80-90 percent on average (Cizre-Sakallioglu & Yeldan, 2000). In the aftermath of the financial crash in 2001, Turkey switched its monetary strategy from nominal exchange rate targeting to inflation targeting due to the failure of the disinflation program adopted in 1999 based on the crawling peg regime under the auspices of the International Monetary Fund (IMF) (Alici & Ucal, 2015). Based on the public declaration of specific target points or range of inflation and requiring the independence of the central bank and fiscal discipline, it was implemented implicitly over the period of 2002 to 2005, with explicit implementation of this policy by 2006. In this context, efficient and decisive implementation of this strategy (even implicitly) caused inflation to fall sharply to the single digit level in 2004, which had not been experienced since 1970 (Kara, 2018).

In the historical perspective, militarization is one of the most widely discussed issues with various aspects to consider, some of which are specific to Turkey. Turkey is the nation that formed the first regular army as a result of six thousand years of Turkish history, and the more recent wars that it fought as a newly established state can be pointed to as reasons for militarization. Furthermore, historical antagonism with its neighbors, in particular the tensions with Greece due to disputes over Cyprus and the continental shelf on the islands that are located off the Aegean Sea coast are often indicated as some of the major reasons that military spending in Turkey consistently increases. This rivalry in terms of militarization between Turkey and Greece has been the focus of many studies. However, the studies evaluating this issue in a comparative context are relatively scant. Among these, the most prominent ones are those by Georgiou et al. (1996) and Kollias and Makrydakis (1997). Georgiou et al. (1996) attempted to find the economic impacts of Greece and Turkey's military expenditures by employing diagnostic tests and the Granger causality test. Due to the tensions between these countries, the fact that both countries accelerate their defense expenditure against a possible military threat from the other raises the consideration of the results of this study. In light of this study, Kollias and Makrydakis (1997) conducted a similar study by focusing on the increase in military spending to the extent that it is associated with the arms race between the two countries.

Another reason generally given as a cause of militarization in Turkey is terrorism and terrorist activities. Efforts to prevent the activities of left-political oriented terrorist organizations, which were the most active terrorist groups, resulted in military coups and tight government regimes. This situation accelerated militarization in Turkey and led to an exponential increase in military spending. The Kurdistan Workers' Party (PKK) and its variations, which claim to be the Kurdish nationalist movement, replaced these organizations, which lost momentum in the 1980s. The pro-militarization attitude of the people was reinforced as the PKK still exists and continues its activities against the people. In addition to the resources spent on military operations, the purchase of weapons and ammunition, as well as R&D activities in this field are high cost items. Hence, when terrorism is a concern, the importance of militarization and spending is based on national security and defense.

Apart from the discussions regarding the militarization process, Turkey is one of the oldest members of the North Atlantic Treaty Organization (NATO), which acts as a major military and regional power with significant human and logistics resources around the world. In this context, Turkey allocates a significant share of its budgetary resources in the defense sector as a major ally of the NATO alliance. According to the Stockholm International Peace and Research Institute (SIPRI) ([Stockholm International Peace and Research Institute, 2021](#)), Turkey is the 16th largest military spender in the world with 17.7 billion dollars annually that corresponds to 2.8 % of its gross domestic product (GDP). With this record, Turkey is the seventh largest military spender across NATO (SIPRI, 2021).

Through the aforementioned arguments and facts, the main purpose of this present study is to investigate the long-run relationship between inflation and militarization that is captured by military expenditure, which stands out as the highest type of public expenditure, and arms imports, which could be a major component of external demand due to external dependency. In this context, the main hypothesis of this paper is constructed as follows:

H₀: Military expenditure and arms imports have a long-run positive influence on inflation.

H₁: Military expenditure and arms imports do not have any significant long-run influence on inflation.

It should also be noted that the economic impact of militarization have been studied widely in terms of economic growth in the empirical literature. However, inflationary aspects of militarization are relatively less studied terrain in the empirical literature. Specifically, there are a few empirical papers that deal with the interplay between militarization and inflation for Turkey ([Dritsakis, 2004](#); [Özsoy, 2008](#); [Özsoy & Ipek, 2010](#); [İpek, 2014](#); [Karakurt et al., 2018](#)). Hence, this paper aims to contribute existing literature by dealing the nexus between militarization and inflation for Turkish economy which asserts a good case to the extent that inflation is a major structural macroeconomic concern in historical perspective. On the other hand, Turkey is one of the oldest allies of NATO and devotes significant portion of budgetary sources into national defense due to geopolitical risks and tensions between neighbors. Furthermore, this paper would contribute to the empirical literature by employing a novel method that is pioneered by [Bayer and Hanck \(2013\)](#). In this respect, together with the other potential determinants of inflation the long term interplay between militarization and inflation will be investigated by employing combined cointegration tests that is developed by [Bayer and Hanck \(2013\)](#) and pretty novel approach in the terrain of defense economics. In line with these arguments, the layout of the present study is as follows: The [next section](#) is devoted to relevant theoretical and empirical literature on the interplay between inflation and militarization. The [third part](#) presents the model, data set, and methodology regarding the empirical treatment. The [fourth part](#) discloses the estimation results of empirical analysis, and discussion of the empirical results is given in the [fifth part](#). Finally, the last [section](#) concludes the study with some policy recommendations.

2. LITERATURE REVIEW

Even though the economic impacts of military expenditure have been widely discussed in terms of economic growth, the relationship between inflation and military expenditure is an area that has also attracted the interests of scholars, and therefore a large literature has been formed

so far within the framework of theoretical and empirical models. In line with the theoretical background presented above, the empirical literature is fundamentally built on two main pillars. The first pillar claims the existence of a positive relationship between military expenditure and inflation. Furthermore, in terms of causality analysis, those studies are in support of unidirectional causality running either from military expenditure to inflation or the reverse (Reich, 1972; Dumas, 1977; Smith, 1977; Melman, 1978; Gansler, 1980; Calleo, 1981; Capra, 1981; DeGrasse, 1983; Starr *et al.*, 1984; Nourzad, 1987; Chan & Davis, 1991; Gi Baek, 1991; Deger & Sen, 1995). Kaufman (1972), Dumas (1977) and Melman (1978) argue that military spending causes inflation by increasing demand without creating any increase in supply. At the same time, Melman (1978) claims that the firms that are the army contractors cause the cost increase by showing the costs to the army to be higher than they are, and this situation increases the prices in the civilian sector due to an additional increase in demand. Hamilton (1977), Melman (1986) and Stein (1980) draw attention to the relationship between war and inflation, emphasizing that inflation is affected by the increase of military spending during the war period. Similarly, DeGrasse (1983) argues that military spending deeply affects the economy through acquisitions in wartime. In fact, the findings of many studies on the existence of the relationship between war, military spending, and inflation point to similar situations. Based on the analysis made by researchers such as Melman (1986) and Kinsella (1990), inflationary pressures are mainly observed due to the serious increases in defense expenditure during the extraordinary periods, i.e., warfare. However, when the same analyses are carried out in peacetime, neither study draws a similar judgment compared to the general literature (Musgrave & Musgrave, 1980). As argued above, the direction of causality might run from inflation to military outlays. In this context, Gi Baek (1991) identifies that a rising inflation rate affected defense spending in the United States of America (USA) between 1956 and 1989. In a more recent paper, Asilogullari (2020) scrutinize the causal nexus between defense expenditure and inflation for 25 NATO countries over the period of 1990 to 2018. By performing the panel bootstrap causality test, they find a unidirectional causality running from inflation to defense expenditure in the USA, Czechia (Czech Republic), Estonia, Croatia, England, and Latvia.

Along with these views, there are also opinions on the first pillar, arguing that although military spending increases inflation, this increase is not much different from that caused by other public expenditures. Like other types of public expenditures, rises in military spending might generate an inflationary effect by pushing up the aggregate demand as it is not offset by tax increases or restrictive monetary actions (Melman, 1970; Hamilton, 1977; Stein, 1980; Schultze, 1981; Looney, 1989; Sandler & Hartley, 1990). Heo (1998) expresses that it is also unreasonable to expect an inflationary effect in a situation where the governments create money to finance military spending. In addition, Schultze (1981) and Nourzad (1987) add that an increase in military expenditures may not cause an inflationary effect in a situation where the economy is not under full employment whereas Starr *et al.* (1984) argue that the effect of rising military expenditure on the balance of payments is an alternative way to prevent inflation. There are limited studies with findings that advocate a bidirectional relationship between inflation and military expenditures, rather than one-way, in the first pillar mentioned. Two are those by Dunne *et al.* (2002) and Azam (2020). Dunne *et al.* (2002) draw attention to this bidirectional feeding mechanism in the analysis made based on economic growth with military spending in small-industrialized countries. Although there is no bidirectional causality between defense expenditure and inflation in the study conducted by Azam (2020),

the existence of this relationship between the current account balance and defense expenditure has been revealed with significant statistical results.

The second pillar consists of the studies that have not found a consistent relationship between inflation and military expenditure. [Stekler \(1979\)](#), [Domke et al. \(1983\)](#), [Starr et al. \(1984\)](#), [Vitaliano \(1984\)](#), [Payne \(1990\)](#), [Payne and Ross \(1992\)](#), [Sahu et al. \(1995\)](#), [Grier and Tullock \(1989\)](#) are among such studies. [Stekler \(1979\)](#) highlights the presence of no correlation between defense spending and inflation for the US between 1972 and 1977. [Domke et al. \(1983\)](#) do not find any pattern in the short term in their analysis of England, USA, France, and Germany between 1948 and 1978; they find a strong relationship in the long term. The authors claim that the reason for this long-term relationship was the post-war reconstruction works. This state of affairs also resembles the studies on the first pillar that mention the fact that defense expenditure in post-war periods creates growth and inflation. [Starr et al. \(1984\)](#) specifically state that the interplay between military spending and inflation is valid for Britain and the United States during the period 1956-1979, and that there is a valid relationship between military spending and inflation for France and Germany in the same period. [Payne \(1990\)](#) investigates the relationship between military spending and inflation using the Granger causality test for the United States and finds no significant relationship. [Sahu et al. \(1995\)](#) use the Gordon model of inflation proposed by [Vitaliano \(1984\)](#) in their work with quarterly data between 1960 and 1989. They claim that neither defense expenditures nor other public expenditures had a statistically significant effect on inflation.

In a similar vein, recent studies have been shaped in terms of the aforementioned pillars. [Terhal \(2001\)](#), [Fordham \(2003\)](#), [Cuaresma and Reitschuler \(2004\)](#), [Bose et al. \(2007\)](#), [Hung-Pin et al. \(2016\)](#) and [Xu et al. \(2018\)](#) all investigated the relationship between defense spending and inflation. [Terhal \(2001\)](#) emphasizes the inflationary pressure that stemmed from military spending over the period between 1960 and 1970 for India. [Bose et al. \(2007\)](#) determine the effect of defense spending on other public spending triggering and increasing demand for 30 developing countries in the 1970s and 1980s. According to [Cuaresma and Reitschuler \(2004\)](#), since defense spending is not as productive as other types of public spending, it generates more inflationary pressures compared to other types of public spending. For the USA, [Fordham \(2003\)](#) determines that an increase in defense expenditures causes higher increases in inflation. Another study that achieved similar results for developed countries is that of [Hung-Pin et al. \(2016\)](#). [Hung-Pin et al. \(2016\)](#) evaluate the relationship between military spending and inflation over the co-holistic and causality tests for China, Japan, South Korea, and Taiwan from 1995 to 2010 and reached different results according to the countries they researched. Although there is a statistically strong relationship between military spending and inflation in all countries, it has been observed that an increase in military spending creates low inflation in China and Japan, but high inflation in Taiwan. [Xu et al. \(2018\)](#) examine the nexus between defense expenditures, inflation, and economic growth for China between 1953 and 2014 by employing the wavelet analysis and found that although there is a strong relationship between defense expenditure and inflation, an increase in the former duration induced a raise in the latter especially in the short run and during warfare.

Unlike those studies, some studies suggest a relatively weak or negative relationship between inflation and military spending rather than a strong one. In one of the earlier attempts, [Olaniyi \(1993\)](#) analyzes the impact of Nigeria's defense spending on basic macroeconomic indicators by employing the ordinary least squares (OLS) method and found a dampening effect on inflation. Based on the monetary endogenous growth model, [Tzeng et al. \(2008\)](#) conclude that

the relationship between defense spending and inflation is not clear, but ambiguous. In parallel, [Aiyedogbon et al. \(2012\)](#) conduct vector autoregressive (VAR) methodology and the Granger causality test for the period between 1980 and 2010 and highlight the lack of a long-term relationship or causality between military expenditure and inflation. [Lin \(2012\)](#) deals with the nexus between defense expenditure and inflation within the framework of the Endogenous Growth Model in analyzing government spending allocation with the assumption of a rising defense spending share of overall public spending. It is strikingly argued that an increase in the share of defense spending tends to lower the inflation rate and raise the economic growth rate to the extent that defense spending is financed by raising the monetary emissions, and the overall public spending is financed by collecting income tax revenue. Furthermore, it is asserted that if the government's desire is to achieve maximum social welfare and minimum inflation, the share of the defense spending should be increased as well.

The economic impacts of militarization in Turkey have been widely examined in the context of economic growth as well as its trade-offs, which include the opportunity cost with other public services. However, less attention has been given to the relationship between militarization and inflation. It should be highlighted that in line with most of the studies in the empirical literature, there is no consensus regarding the effect of militarization on inflation within the context of Turkey in terms of the aforementioned two pillars. The main reason for the disagreement comes from the sample selection and the methodologies that construct the framework of the empirical analyses. Accordingly, non-existence of a significant relationship between military spending and inflation is one of the most commonly observed findings in the empirical literature. For instance, [Dritsakis \(2004\)](#) evaluates the relationship between military spending and inflation for Greece and Turkey by employing VAR methodology and Granger causality tests in a comparative context. The findings of the study indicate neither a long-run relationship nor causality between military spending and inflation for those countries. [Özsoy \(2008\)](#) also derives analogous findings between defense expenditure, inflation, and other macroeconomic variables over the period of 1970 to 2004 for Turkey by performing the Johansen cointegration test, the Granger causality test, and impulse-response analysis. In a similar vein, [Özsoy and Ipek \(2010\)](#) examine the relationship between inflation and military expenditure for four countries including Turkey between the years 1980 and 2006 and find no causality between military expenditure and inflation.

[İpek \(2014\)](#) and more recently [Karakurt et al. \(2018\)](#) examine the relationship between inflation and military spending by considering the presence of structural breaks and incorporating relatively long time-series. By performing [Maki \(2012\)](#) and autoregressive distributed lag (ARDL) approaches to cointegration tests and the Toda-Yamamoto causality test for the period of 1980 to 2012, [İpek \(2014\)](#) finds no long-run relationship and unidirectional causality that is running from military spending to inflation. However, [Karakurt et al. \(2018\)](#) conducts the [Maki \(2012\)](#) cointegration test and Toda-Yamamoto causality tests and reveals not only the presence of a long-run relationship but also the existence of unidirectional causality from defense expenditure to inflation for the period between 1966 and 2016. In a more recent study, [Asilogullari \(2020\)](#) examines the clarity of the relationship between military spending and inflation by employing the autoregressive distributed lag (ARDL) approach to cointegration over the period of 1960 to 2017. She concludes that a one percent rise in military spending induces inflation to rise by 1.29 percent in the long run. This result is not clearly set forth in any work previously done on Turkey. On the other hand, [Dudzevičiūtė and Šimelytė \(2022\)](#) detect opposite findings and derive only short-term relation

for Turkey. By assessing the NATO countries in terms of military burden, they point out the significant effect of inflation on military burden for Turkey. Finally, in a most current study, [Caldara et al. \(2023\)](#), determine that geopolitical risks have inflationary effects and these effects are more intense especially for emerging countries. Nonetheless, the proof within the scope of the study that military expenditure is not a geo-political risk factor does not state much for Turkey, which is a part of emerging seven countries, in the relationship between inflation and military expenditure. Hence, failing either to reach a common consensus or to figure out a plausible outcome about the relationship between inflation and militarization for Turkey is an indication of the need for studies in this field to clarify the issue. For this reason, the main aim of this study has been shaped with this need in mind.

3. MODEL, DATA, AND EMPIRICAL STRATEGY

We focus on the following two baseline specifications to investigate the long-run nexus between militarization and inflation in Turkey by incorporating the annual data that spans the period of 1970 to 2020:

$$\text{Model 1: CPI} = f(\text{ME}, \text{GOV}, \text{EX}, \text{M2}, \text{OIL}) \quad (1)$$

$$\text{Model 2: CPI} = f(\text{ARM}, \text{GOV}, \text{EX}, \text{M2}, \text{OIL}) \quad (2)$$

where consumer price index (CPI) is the proxy for annual inflation in each model. Since this paper particularly addresses the long-run nexus between militarization and inflation, we include two measures to proxy militarization in each specification. In this respect, militarization is captured by military expenditure (ME) and arms imports (ARM), respectively.

Besides the proxies of militarization, some potential determinants of inflation are also considered for the investigation. In this respect, as an important component of aggregate demand, we include general government expenditures to highlight the role of fiscal policy shocks and investigate the presence of demand-pull inflation. However, as [Sahu et al. \(1995\)](#) suggest, we incorporate the approach by which non-military government spending (GOV) is obtained by subtracting the total military expenditure from the total general government expenditure. In order to identify the exchange rate pass through effect on inflation, we also consider the role of the exchange rate (EX), to examine the idea that instability of the exchange rate might affect inflation via international trade and balance of payments mechanisms. The monetary aspect of inflation is widely confirmed by many classical economists. According to the classical approach, uncontrolled monetary growth inevitably spurs inflation even in the short run. To this end, we endeavor to examine the role of monetary expansion on inflation; we include a broader money terminology, which is represented by M2 money supply (M2). Besides the demand forces, the effect of supply shocks on inflation are also considered. As another major type of inflation, cost-push inflation is often observed in economies which are mainly dependent on the import of natural resources and adversely affected by the increases of the prices of those resources. Hence, we capture the effect of supply shocks, including the crude oil price (OIL).

As argued in the introduction, we postulate that the proxies of militarization are expected to affect inflation positively. In addition, the rest of the government outlays might have a positive influence on inflation by deteriorating the fiscal balances. On the other hand,

volatility in the exchange rate might distort the terms of trade against the domestic economy. Thus, a rising exchange rate might result in higher inflation, which might validate the phenomenon of the exchange rate pass-through hypothesis for a domestic economy. Since there is a widespread theoretical consensus regarding inflation as a monetary phenomenon, we also expect that a rising money supply would lead to higher inflation rates. Since inflation is also influenced by the imbalances in aggregate supply, we would expect that oil prices might positively affect inflation. It should be noted that except for the crude oil price, all relevant data were compiled from the World Development Indicators (WDI) database of the World Bank and were transformed into their natural logarithmic forms. To this end, [Table no. 1](#) presents the abbreviations, detailed definitions, and data sources regarding the variables that are used in the empirical analysis.

Table no. 1 – Variable Definitions

Variables	Definition and Data Source
CPI	Consumer Price Index (2010=100), World Bank, WDI
ME	Military Expenditure (current local currency), World Bank, WDI
ARM	Arms Imports (SIPRI Trend Indicator Value, million US \$), World Bank, WDI
GOV	Non-Military Government Spending (current local currency), World Bank, WDI
OIL	Brent Type Crude Oil Price (US \$/bbl), World Bank, Commodity Price Data
EX	Official exchange rate (local currency per US \$, period average), World Bank,
M2	Broad Money (current local currency), World Bank, WDI

Note: All variables are expressed in natural logarithmic form.

[Table no. 2](#) briefly displays the descriptive statistics. Compared to the other variables, M2 money supply (M2) and non-military government expenditure (GOV) assert more volatility due to having the highest standard deviations as the differences between maximum values and minimum values are relatively higher. Moreover, variance between maximum and minimum values for crude oil price (OIL) and arms imports (ARM) are relatively lower, with the standard deviations of both variables displaying the lowest values.

In dealing with the long-run interaction amidst most of the macroeconomic variables, the cointegration approach is widely employed in the empirical analyses. As conventional wisdom, a stationary check of the series is a necessary step before conducting the cointegration analysis. To this end, we employ Phillips-Perron (PP) and Generalized Least Squared-Dickey-Fuller (DF-GLS) tests. As argued by [Sohag et al. \(2019\)](#), while DF-GLS performs efficiently in the case of a sample span of time, the PP test accounts for the serial correlation in the series.

Table no. 2 – Descriptive Statistics

Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
CPI	51	-0.737	5.292	-9.245	5.573
ME	51	18.377	5.748	8.763	25.533
ARM	51	20.47	0.656	18.269	21.692
GOV	51	19.349	6.181	9.575	27.189
OIL	51	3.215	1.026	0.19	4.718
EX	51	-4.087	4.791	-11.417	1.947
M2	51	20.732	6.257	10.704	28.856

Source: authors' estimations. *Note:* All values expressed in natural logarithmic form.

Apart from most of the studies in the empirical terrain, we aim to detect the cointegration relationship by drawing upon a novel approach pioneered by Bayer and Hanck (2013). The novelty of the methodology introduced by Bayer and Hanck (2013) stems from the integration of the linear combinations of the residual-based approach by Engle and Granger (1987), the system-based approach by Johansen (1988), and error correction based approaches by Boswijk (1994) and Banerjee et al. (1998). However, most of those methods could generate biased results due to size and power issues. Thus, Bayer and Hanck (2013) developed a new approach to cointegration methodology in which linear combination of the abovementioned methodologies was done to achieve results that are more efficient. To this end, Bayer and Hanck (2013) derive the following p-values for each individual cointegration test by using Fisher's formulation:

$$EG - J = -2[\ln(p_{EG}) + \ln(p_j)] \quad (3)$$

$$EG - J - B - BDM = -2[\ln(p_{EG}) + \ln(p_j) + \ln(p_B) + \ln(p_{BDM})] \quad (4)$$

where p_{EG} , p_j , p_B , and p_{BDM} denote the p-values of each individual cointegration test, namely Engle and Granger (1987), Johansen (1988), Boswijk (1994), and Banerjee et al. (1998).

In order to estimate the long-run elasticities through the baseline specification, this study employs the fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS) methods. Developed by Phillips and Hansen (1990), the FMOLS estimator is asymptotically unbiased and wipes out serial correlation and endogeneity by employing the semi-parametric corrections. Phillips and Hansen (1990) consider the following linear model to obtain the FMOLS estimator:

$$y_t = \beta_0 + \beta_i X_t + u_{1t} \quad (5)$$

where X_t includes the set of drift parameters and regressors and follows a first difference process, i.e., I (1) in this way:

$$\Delta X_t = \omega + u_{2t} \quad (6)$$

where ω is a $k \times 1$ vector of drift parameters. The estimated parameters of residuals in Equations 5 and 6 are represented by \widehat{u}_{1t} and \widehat{u}_{2t} , which are used to compute the long-run covariance matrices $\widehat{\Omega}$ and $\widehat{\lambda}$. Hence, the FMOLS estimator is given by the following equation:

$$\widehat{\beta} = (W'W)^{-1}(W'\widehat{y}^* - nD\widehat{Z}) \quad (7)$$

where $\widehat{y}^* = (\widehat{y}_1^*, \widehat{y}_2^*, \dots, \widehat{y}_n^*)$, $W = (\tau_n, X)$, $\widehat{Z} = \Delta'_{21} - \Delta'_{22}\widehat{\Omega}_{22}^{-1}\widehat{\Omega}_{21}$, and D is the $(k + 1) \times k$ matrix of drift parameters.

For the sake of the robustness of the results, we also perform the dynamic OLS (DOLS) method. Based on the augmentation of Equation 6 by the inclusion of lags and leads, Stock and Stock and Watson (1993) obtain the following OLS estimator:

$$\widehat{\delta}_{OLS} = \left[\sum_t z_t z_t' \otimes I_{kt} \right]^{-1} \left[\sum_t (z_t \otimes I_{kt}) (\Delta^{d-l+1} y_t^l) \right] \quad (8)$$

where d denotes the maximum integration order, l denotes the number of lags, and Δ^d is the difference operator. Thus, $\Delta^{d-l+1} y_t^l = (z_t' \otimes I_{kt}) \delta + \vartheta_t^l$. It should be noted that the regressors

z_t are assumed to be uncorrelated with the errors ϑ_t^l and follows the I (1) process as well. In accordance with the baseline specifications and empirical strategy, in the next sections we will elaborate on the empirical results.

4. EMPIRICAL RESULTS

Since most of the macroeconomic variables potentially include trends, integration order of the variables becomes the core issue before conducting the further analysis because the presence of unit root in the series potentially causes spurious results. Thus, before proceeding to the main empirical analysis, we commence by investigating the unit root properties of the variables by employing PP and DF-GLS tests. Table no. 3 reports the results of the unit root tests. It is apparent that all variables are non-stationary at level but become stationary after first differencing, i.e., the variables are integrated at I (1).

Table no. 3 – Unit Root Tests

Variables	PP Test	DF-GLS Test	Outcome
CPI	0.371	-2.012	
Δ CPI	-6.911*	-4.784*	I (1)
ME	0.194	-1.349	
Δ ME	-8.833*	-5.238*	I (1)
ARM	-0.241	-1.757	
Δ ARM	-9.032*	-4.334*	I (1)
GOV	0.103	-1.815	
Δ GOV	-7.512*	-4.497*	I (1)
OIL	-2.736	-1.957	
Δ OIL	-6.246*	-3.742**	I (1)
EX	-0.534	-1.957	
Δ EX	-3.261***	-4.577*	I (1)
M2	0.160	-2.449	
Δ M2	-10.770*	-3.943*	I (1)

Notes: *, ** and *** denote the significance levels at 1 %, 5% and 10 % respectively.

Source: authors' estimations.

Having declared that all the variables are integrated at I (1), we proceed to determine whether long-run or cointegration nexus among the variables exist. Pioneered by Bayer and Hanck (2013), we performed combined cointegration tests and the corresponding results are reported in Table no. 4, which involves EG-J and EG-J-B-BDM tests. For each model specification, the results of the combined cointegration tests firmly attest to the presence of a cointegration relationship to the extent that Fisher statistics for EG-J and EG-J-B-BDM tests exceed the critical values at 1%, 5%, and 10% significance levels. Therefore, we reject the null hypothesis of no cointegration and decide that our model specifications indicate the presence of long-run interplay among the variables.

After detecting the presence of a cointegration relationship, the next step is devoted to exploration of the long-run elasticities. In this respect, we performed FMOLS and DOLS estimators, and their corresponding results are presented in Table no. 5 in which the top segment is devoted to FMOLS estimates and the bottom segment is devoted to DOLS estimates.

Table no. 4 – Bayer and Hanck (2013) Cointegration Test

Specification	Fisher Statistics		Cointegration
	EG-J	EG-J-B-BDM	
Model 1	56.549*	60.099*	Yes
Model 2	57.797*	116.446*	Yes
Critical Values			
	EG-J	EG-J-B-BDM	
1 %	15.66	30.11	
5 %	10.44	20.17	
10 %	8.27	15.98	

Source: authors' estimations

Notes: * denotes the significance level at 1 %

Table no. 5 – FMOLS and DOLS Estimates

Panel A: FMOLS Estimates						
Regressors	Model 1			Model 2		
	Coefficient	Std. Error	t-statistics	Coefficient	Std. Error	t-statistics
ME	0.144**	0.056	2.557			
ARM				0.037**	0.015	2.449
GOV	0.242*	0.053	4.569	0.307*	0.043	7.042
OIL	0.151*	0.023	6.364	0.197*	0.018	10.640
EX	0.313*	0.067	4.618	0.454*	0.049	9.234
M2	0.325*	0.088	3.694	0.273**	0.076	3.584
Panel B: DOLS Estimates						
Regressors	Model 1			Model 2		
	Coefficient	Std. Error	t-statistics	Coefficient	Std. Error	t-statistics
ME	0.156**	0.068	2.300			
ARM				0.097***	0.049	1.972
GOV	0.248*	0.065	3.795	0.520*	0.089	5.832
OIL	0.134*	0.028	4.657	0.300*	0.039	7.597
EX	0.325*	0.083	3.87	0.810*	0.079	10.231
M2	0.296*	0.109	2.715	0.320*	0.125	2.547

Source: authors' estimations.

Notes: *, ** and *** denote the significance levels at 1 %, 5% and 10 % respectively.

The estimation results of both methods reveal that inflation is positively influenced by militarization. However, the inflationary aspect of militarization led by total military expenditure (ME) is relatively more dominant over arms imports (ARM). Specifically, a 1% rise in military expenditure (ME) accelerates inflation by 0.144 and 0.156 whereas a 1% rise in arms imports (ARM) increases inflation by 0.037 and 0.097, respectively to each estimator. In line with the expectations, the non-military component of government expenditure (GOV) has an inflationary effect. Strikingly, this effect is more pronounced compared to the effect induced by military expenditure. In this context, a unit rise in GOV spurs inflation by 0.242 and 0.307 for the FMOLS estimator whereas for the DOLS estimator a unit rise in GOV spurs inflation by 0.248 and 0.520, respectively.

The long-run elasticities of the rest of the explanatory variables have the expected signs through the theoretical expectations. Accordingly, the potential adverse supply effect on inflation is captured by the inclusion of the oil prices, and the results highlight the validity of

the inflation accelerating effect of the oil prices. The results of FMOLS estimation indicate that a unit increase in OIL induces an increase in inflation by 0.151 and 0.197 whereas the DOLS estimator yields an increase by 0.134 and 0.300, respectively. The coefficients of the exchange rate (EX) are positive and support the prevalence of the exchange rate pass-through hypothesis in Turkey. Hence, a unit increase in EX accelerates inflation by 0.313 and 0.454 for the FMOLS estimations while for the DOLS estimations a unit increase in EX accelerates inflation by 0.325 and 0.810, respectively. Finally, the results confirm the view that inflation is a monetary phenomenon in Turkey. According to the FMOLS estimations, a 1% increase in M2 increases inflation by 0.325 and 0.273 while a 1% increase in M2 increases inflation by 0.296 and 0.320 for the DOLS estimations.

5. DISCUSSION

Having revealed the presence of a cointegration relationship, the estimation results of the long-run models firmly attest to the findings which have been revealed by many studies in the empirical literature (Reich, 1972; Dumas, 1977; Smith, 1977; Melman, 1978; Gansler, 1980; Calleo, 1981; Capra, 1981; DeGrasse, 1983; Starr *et al.*, 1984; Nourzad, 1987; Chan & Davis, 1991; Gi Baek, 1991; Deger & Sen, 1995). In a similar vein, the findings of the recent studies on Turkey by Karakurt *et al.* (2018) and Asilogullari (2020), who address the presence of a cointegration relationship with structural breaks between military expenditure and inflation, are in line with the findings as outlined above. Strikingly, the positive effect of military expenditure on inflation is slightly higher than on the arms imports even though the military burden has slowed down in recent decades. One of the possible reasons for this fact is the recent developments in the defense sector in Turkey. Even though Turkey is one of the major arms importers in the global context, with the recent developments in the domestic arms industry and the emergence of public-private partnerships in the arms industry, the relative significance of arms imports has diminished in recent years since the demand for armament has been met by the domestic suppliers. Yet, the findings also indicate that non-military components of government outlays tend to accelerate inflation. Besides the inflation accelerating effect, these types of expenditures would exacerbate the budget deficits and raise the tendency to borrow to the extent that efficient private investment projects would be crowded out. Thus, with the emergence of the crowding-out effect, rising government expenditure may likely retard the economic growth in the long run.

In addition, the findings are also in favor of our expectations regarding the rest of the explanatory variables that we draw upon for theoretical considerations. In this context, the findings highlight the validity of the exchange rate pass-through hypothesis. Although there are very few scholars who have tested this relationship in the long term, it is similar to Domke *et al.* (1983) and Karakurt *et al.* (2018)'s studies in terms of the direction and strength of the relationship. The study makes an important contribution to the literature in terms of making this analysis and presenting its findings regarding the long run. In this context, a rising exchange rate might affect inflation by means of two mechanisms. First, depreciation of national currency would lead domestic goods to become cheaper, and thus rising demand for domestic goods would generate demand-pull inflation. Second, a rising exchange rate would yield higher prices for imported goods. Since intermediate goods have a relatively higher share in the imports, rising cost of imported intermediate goods could potentially increase the cost of domestic goods, which in turn causes higher inflation. Another possible source of the

inflation might come from the potential monetary policy shocks, and the results indicate the validity of the monetary aspect of inflation within the context of Turkey. The monetary expansion inevitably stimulates the total expenditure, in particular private domestic investment expenditure, which in turn leads to more inflationary pressures in the economy. Finally, the results also confirm the prevalence of cost-push inflation due to a potential rise in crude-oil prices.

6. CONCLUSIONS

As one of the crucial elements of macroeconomic stability, sustaining price stability is one of the major goals for policymakers. In addition, inflation might be the potential source of the uncertainty and might negatively affect the decisions of individual agents due to its anticipated and unanticipated costs. It should be emphasized that macroeconomic stability and economic development can be achieved by satisfying both internal and external security of the country. Hence, the demand for national defense becomes one of the major priorities of the governments to sustain border security, mitigating the destabilizing effects of geo-political risks and combatting all types of terrorism besides achieving a stable economic environment and investment climate.

In this context, this paper aims to examine the long-run interplay between inflation, military expenditure, and arms imports with the other possible determinants of inflation by incorporating the annual long-term series data from the period 1970 to 2020. In order to determine the long-run relationship between the inflation, militarization, and other potential determinants of inflation, as a novel approach in the terrain of defense economics, the combined cointegration methodology proposed by [Bayer and Hanck \(2013\)](#) was performed, and the results confirmed the presence of a cointegration relationship among the variables. For the investigation of the direction and magnitude of the long-run relationship, we employed the FMOLS and DOLS estimators, and the findings of both techniques revealed that together with non-military components of government spending, military outlays and arms imports are positively associated with inflation in the long run.

Our findings also reveal that inflation is also affected by the fluctuations in oil prices and exchange rates. Given the fact that Turkey's economy is purely dependent on energy imports, the effect generated by the fluctuations of the oil prices has been one of the most vital reasons for the chronic inflation problem. Therefore, policy makers should also consider the policy measures that alleviate the import dependency on energy. The findings also emphasize that changes in exchange rates have an accentuating effect on inflation. Accordingly, the depreciation of the national currency tends to raise the export demands and inflation as the domestic goods become relatively cheaper than the foreign goods. In addition, the broad money supply is also likely to have an inflation accelerating effect. In this respect, monetary policy should be implemented to sustain the price stability in the long run. It is also important for controlling the fluctuations of the exchange rate since the frequent implementation of the expansionary monetary policies might potentially lead to the depreciation of the national currency and exacerbate the current account balance and price stability as well.

Even though price stability has historically been one of the most crucial issues relating to the Turkish economy, our findings reflect that demand and supply components also accompany the military outlays and arms imports in affecting the inflation. The past evidence also demonstrates that inflation emerges at the expense of fiscal and monetary discipline. In

this respect, policymakers should stick to fiscal discipline and diminish the inefficient outlays to sustain price stability and macroeconomic stability in the long run. In addition to these long-run objectives, scarce resources should be channeled into the efficient investment projects to the extent that new productive capacity of the economy could be enhanced. However, this situation may raise the issue of a trade-off between national security and price stability due to fragile economic and fiscal structure. In order to control for the possible risks that are attached to this trade-off, some policy measures can be taken. First, the dependency on imports and foreign resources should be curtailed because the dependency on imports and foreign resources to meet the demand for armament might exacerbate the current account balance and budget deficits that have been the basic structural problems for the Turkish economy from a historical perspective. Secondly, military burden on the government's budget could be curtailed by enabling a more competitive structure in the defense sector and promoting the public-private partnerships which support the research and development (R&D) projects to wipe out the current and potential risks that threaten Turkey. Third, despite the presence of ongoing geo-political risks and tensions in neighboring countries and fighting against terrorism, together with the above policy measures, fiscal and monetary discipline should be sustained to achieve price stability goal in the long run.

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