# Defence Spending and Economic Performance Under Sanctions: Some Sign Restricted VAR Evidence for Turkey

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Military sanctions have significant but complex effects on the economies they target, yet empirical research specifically addressing their macroeconomic implications remains sparse. Utilizing a sign-restricted Structural Vector Autoregression approach, the present paper investigates how military sanctions affect economic stability and defence expenditures in Turkey. The empirical findings indicate that sanctions induce temporary disruptions to economic output, unemployment, interest rates, and real exchange rates, while persistently elevating inflation. Notably, defence spending exhibits resilience, increasing rather than decreasing in response to sanctions, reflecting Turkey's strategic prioritization of defence capabilities. These results underline the necessity for robust monetary and fiscal policies, enhanced domestic defence industry capabilities, and proactive diplomacy to mitigate economic vulnerabilities. This study provides valuable insights for policymakers on managing sanctions' economic effects and highlights the strategic advantage Turkey holds due to its increasingly competitive defence exports.

Keywords: Defence Expenditures, Economic Performance, Sanctions, Sign Restriction, Vector Autoregression

Subject classification codes: F51, F52, C32

## Introduction

Military sanctions have become increasingly prominent instruments of international diplomacy and political leverage, yet their macroeconomic ramifications remain considerably less understood than their political or strategic dimensions. While such measures are designed to restrict a target state's military capabilities by limiting access to critical technologies, materials, and financial resources, their effects often extend well beyond the defence sector—shaping economic growth, employment, prices, exchange rates, and public finances. Despite this broader importance, comprehensive empirical research on the macroeconomic consequences of sanctions explicitly targeting military sectors remains surprisingly sparse, with most existing work either focused on narrow defence-sector outcomes or aggregating military and trade

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sanctions together (Edward Hunter Christie 2016; M. V. Klinova and E. A. Sidorova 2019).

Turkey offers an instructive case for examining this question. Owing to its strategic location and assertive defence posture, Turkey has experienced multiple episodes of military sanctions, most notably the 1970s U.S. arms embargo and, more recently, sanctions imposed under the Countering America's Adversaries Through Sanctions Act (CAATSA) in December 2020 following Turkey's acquisition of the Russian S-400 air defence system (Jim Zanotti and Clayton Thomas 2020). Each episode has carried significant macroeconomic implications and has simultaneously reshaped Turkey's defence industrial base, which has transitioned from heavy import dependence toward growing export competitiveness over the past two decades. This combination of recurrent exposure and industrial transformation makes Turkey a particularly informative setting for assessing how military sanctions propagate through an emerging-market economy.

Against this backdrop, the present paper empirically examines the macroeconomic effects of military sanctions and defence expenditure shocks in Turkey, focusing on output, unemployment, inflation, interest rates, exchange rates, and defence spending. Methodologically, the study employs the sign-restricted Structural Vector Autoregression (SVAR) approach originally proposed by Harald Uhlig (2005), with restrictions grounded in defence economics theory and historical Turkish experience. The analysis deliberately moves beyond a single historical episode to derive generalized empirical insights applicable to potential future sanctions scenarios. In doing so, the paper contributes to the defence economics and international political economy literatures by filling a clear gap concerning the broader macroeconomic transmission of military-targeted sanctions in a strategically important NATO economy.

The remainder of the paper is organized as follows. Section 2 reviews the relevant theoretical and empirical literature. Section 3 outlines the methodology and the sign restrictions imposed. Section 4 presents and discusses the empirical findings, and Section 5 concludes with policy implications and directions for future research.

## 1. Economic aspects of defence expenditure for Turkish economy

The existing body of research on defence expenditure is largely based on empirical studies that investigate its impacts on many other macroeconomic indicators and its relationship with economic growth. Before discussing the economic aspects of defence expenditure with the previous studies, some important current facts about Turkey's defence expenditures and arms trade should be mentioned. According to the latest Trends in World Military Expenditure 2020 report of Stockholm International Peace Research Institute (SIPRI), military expenditure of Turkey reached $17.7 billion, and the defence burden of Turkey amounted to 2.8% of GDP in 2020. Turkey’s share in global military expenditure of 0.9% is not noticeable. However, Turkey, the world’s 16$^{th}$ largest military spender in 2020, has increased its military expenditure by 77% in the last decade (Diego Lopes Da Silva, Nan Tian, and Alexandra Marksteiner 2021). Additionally, the composition of Turkey’s defence expenditure in 2020 should also be

highlighted. More than half of military spending (50.4%) of Turkey was devoted to personnel expenditures, 34.2% to major equipment and research-development expenditures, 13.2% to operations and maintenance expenditures and 2.2% to infrastructure investments in 2020 (NATO 2021).

Arms transfer data from SIPRI states that Turkey was the third largest arms importer in the world between 1995-1999. Then, Turkey fell to the 20th place between 2016-2020. Turkish arms imports decreased by 59% between 2011–15 and 2016–2020. The USA is the largest arms supplier to Turkey in 2016-2020 and its share of total Turkish arms import was 29%. Italy and Spain were the second and third largest arms suppliers to Turkey in 2016-2020. Italy accounted for 27% of Turkey's arms imports and Spain for 21%. Furthermore, since the 2010s, Turkey's arms exports have increased significantly. Arms export of Turkey grew by 95.8% between 2010 and 2020. Turkey was the world's 13th largest arms exporter on average between 2015 and 2019 and it accounted for 0.7% of worldwide arms exports. 19% of Turkey arms exports went to Oman and Turkmenistan in 2016-2020. In the same years, Pakistan, the third largest arms recipient of Turkey, accounted for 11% of the volume of Turkish arms exports (Pieter D. Wezeman, Alexandra Kuimova, and Siemon T. Wezeman 2021).

Previous studies offer two different approaches to examining the growth-defence expenditure relationship. The first, known as the Keynesian perspective, argues that if a country could not reach the full employment level, increasing defence expenditure would also increase investment, employment, and total income. The second approach, known as the neoclassical perspective, evaluates defence spending as a noticeable burden against economic growth, as it causes increases in taxes, deterioration of the budget balance, and decreases in private investment (Giorgio d'Agostino, J. Paul Dunne, and Luca Pieroni 2017). A much-debated question is which perspective is valid for Turkey. Since 2010, Turkey's defence spending and arms trade have changed dramatically. Therefore, empirical studies examining only before 2010 are far from informative. Recent empirical studies can be classified in three groups. Mustafa Orhan Özer (2020), which forms the first group, could not find a significant relationship between defence expenditure and output growth. On the other hand, the second group of studies—Ceylan Karakaya and Tuba Sahinoglu (2020) and Şennur Sezgin and Gülden Yağtu (2019)—report the existence of a significant long-term positive relationship between growth and defence expenditures for Turkey. These papers' findings support a Keynesian stance, and they argue that developing the defence industry and increasing the arms exports of Turkey have a significant boosting effect on economic growth. Conversely, Emrah İsmail Çevik and Gürsel Bektaş (2019) and Usman Khalid and Olivier Habimana (2021) offer noticeable empirical evidence that supports a negative long-run impact of Turkey's defence expenditure on its output growth. Çevik and Bektaş (2019) point out that expanding defence expenditures creates a negative externality on the economy. Moreover, Khalid and Habimana (2021) also provide evidence of the negative impacts of faster growth on Turkey's military spending, and the authors claim that this bidirectional negative relationship arises from actual or anticipated regional instability. Considering all these findings, this paper aims

to provide new insights into the economic growth-defence expenditure relationship under the burden of a sanction.

The factors thought to be influencing inflation in Turkey are major areas of interest in academia, given the general agreement that inflation is a chronic economic problem in Turkey's economy. In contrast to growth-defence expenditure literature, most studies agreed with the idea that defence expenditures cause upward pressure on price and many theoretical reasons are offered for this inflationist impact. Egemen İpek (2014) argues that an increase in the share of personnel payments in military spending leads to an increase in inflation. However, Birol Karakurt, Suat Hayri Şentürk, and Burak Şahingöz (2018) provide noticeable arguments that defence expenditures became highly inflationary due to several economic instabilities experienced by Turkey between 1970 and 2016. Lastly, Merve Asiloğulları (2020) highlights that although the defence needs of Turkey are mainly provided by domestic industry, the Turkish defence industry remains dependent on imports. Therefore, defence expenditures in Turkey create more demand than supply, and this increase in demand causes inflation.

As discussed theoretically by Jülide Yıldırım and Selami Sezgin (2003), defence expenditures' effect on unemployment is another compelling subject to explore, because the creation of extra jobs depends on economic growth. As such, expanding military expenditures could result in either an increase or decrease in unemployment. Yıldırım and Sezgin (2003) indicate that a major part of military spending in Turkey is allocated to payments of salaries to armed forces; however, this does not cause an increase in employment despite a significant positive impact of defence expenditure on economic growth. In 2020, total employment in the Turkish Armed Forces and Defence Industry accounted for approximately 1.85% of Turkey's active workforce. In light of this, Şerif Canbay and Derya Mercan (2020) argue that increasing Turkey's defence expenditures causes a significant decrease in unemployment in the long term. The authors state that Turkey's attempts to develop its arms industry will create extra employment in the long run.

Although the impacts of interest rates on defence spending have received scant attention in the literature, David W. Findlay and Darrell Parker (1992) offer a remarkable theoretical explanation and empirical findings. The authors indicate that military spending's positive impact on interest rates is larger than that of non-military government expenditure because the crowding out of private expenditures rises when the share of military expenditure in the total budget increases. Unfortunately, the relationship between interest rates and defence expenditure for Turkey is yet to be investigated in detail. However, the second, third, and fourth sanctions of CAATSA imposed on Turkey are noticeable examples of how a potential sanction could aim to restrict the foreign financing capability of Turkey's arms trade and the good and service procurement for its defence industry. This kind of sanction policy may force Turkey to finance its future defence needs and projects from its domestic resources. David Kinsella (1990) highlights that this kind of policy decision increases the demand for money, which results in an upward pressure in the interest rate.

Given that the price of Turkish Lira in terms of other currencies is one of the most important indicators of Turkey's economic stability, almost every international

crisis, such as the latest imposed sanctions, results in upward movements of exchange rates. Furthermore, Selami Sezgin (2001) argues that a developing country needs to provide its military requirements from foreign markets; thus, an increase in defence expenditures would lead to an increase in trade deficit and demand for foreign currencies, thereby causing the national currency to depreciate against other currencies. Up to now, far too little attention has been paid to defence expenditure's impacts on exchange rates. Reported findings of Sezgin (2001), which concern the period of 1956-1994, argue that there is no significant relationship between Turkey's trade balance and defence expenditures. However, these empirical outcomes are outdated and not based on the current structure of Turkey's defence expenditures.

## 2. Methodology

The sign restriction approach is one of the latest additions to the structural analysis of VAR models. Unlike other structural VAR methods, the sign restriction approach does not suggest zero restrictions on the reduced form model to estimate structural shocks. Fabio Canova and Gianni De Nicoló (2002) and Uhlig (2005) indicate that structural inference of VAR models could be built with prior beliefs about the signs of some variables' response to shocks which are derived from the theory of economics. Before explaining Uhlig's (2005) rejection algorithm for computation of responses with sign restriction, it is useful to illustrate mathematical background of structural VAR models; a structural VAR model for $p$ lags and n variables could be written as

$$AY_t = B_0 + \sum_{i=1}^{p} B_i Y_{t-i} + \varepsilon_t \quad (1)$$

where $Y_t$ is an $n \times 1$ variable vector, $A$ is an $n \times n$ parameter matrix that includes contemporaneous relations between variables, $B_0$ is an $n \times 1$ vector of constants, $B_i$ is an $n \times n$ matrix of autoregressive coefficients, and $\varepsilon_t$ are serially uncorrelated and independent structural shocks with $\varepsilon_t \sim N(0, I_n)$. To derive the reduced form, Model (1) should be multiplied by $A^{-1}$

$$Y_t = \Gamma_0 + \sum_{i=1}^{p} \Gamma_i Y_{t-i} + u_t \quad (2)$$

From (2) it is clear that $\Gamma_0 = A^{-1}B_0$, $\Gamma_i = A^{-1}B_i$, and $u_t = A^{-1}\varepsilon_t$. Also, it is assumed that $E[u_t] = 0$ and $E[u_t u_t'] = \Sigma_u$. According to these assumptions, the expression of $\Sigma_u$ can be expand as

$$u_t = A^{-1}\varepsilon_t \quad (3)$$

$$\Sigma_u = u_t u_t' = A^{-1}\varepsilon_t {A^{-1}}' \varepsilon_t' = A^{-1} I_n {A^{-1}}' = A^{-1}{A^{-1}}' \quad (4)$$

As mentioned by Christopher A. Sims (1980), Cholesky decomposition requires that $A^{-1}$ would be a lower triangular matrix. Also, it should be noted that the Cholesky approach does not offer unique decomposition. This could be proved with any orthogonal matrix, i.e., $S'S = I$. Let say that $P$ is a lower triangular matrix that satisfies Cholesky's requirements

$$\Sigma_u = P'P \quad (5)$$

then, it could be written as

$$\Sigma_u = P'IP = P'S'SP = \Lambda'\Lambda \quad (6)$$

$\Lambda$ should not be a triangular matrix anymore. Therefore, the expression from (6) indicates that an infinite number of $S$ could be drawn from a distribution and, because

of this, an infinite number of Λ matrix could be produced. According to Mikko Sariola (2015) and Christian Danne (2015), from this point on, the rejection method algorithm of Uhlig (2005) can be summarized as follows:

i. Estimate reduced form (2) with Ordinary Least Squares and get $\hat{\Gamma}_0$, $\hat{\Gamma}_i$ and $\hat{\Sigma}_u$.
ii. Extract $P$ from $\hat{\Sigma}_u$ with Cholesky decomposition.
iii. Draw a random orthogonal matrix $S$.
iv. Calculate $\Lambda = SP = A^{-1}$.
v. Compute the impulse and responses.
vi. If the impulse and responses satisfy the sign restrictions, save the impact matrix Λ. Otherwise, discard the calculated impulse and responses. Continue random drawing until receiving predetermined number of accepted impulse and responses.
vii. Report on median impulse and responses with its confidence interval.

The sign-restricted VAR approach is employed here as it offers a flexible alternative for identifying structural shocks, particularly when strong theoretical justifications for traditional zero restrictions are not readily available. This method is valuable because economic theory often provides clear predictions regarding the qualitative signs of impulse responses to specific shocks, even if the precise magnitudes or timing are uncertain. By imposing inequality constraints on the signs of impulse responses, this approach allows for the identification of shocks consistent with theoretical priors and empirical regularities, implicitly formalizing restrictions often used in practice. However, it is important to acknowledge potential limitations. A primary weakness is that sign restrictions typically yield set identification rather than a unique point estimate for impulse responses, meaning a range of models can satisfy the restrictions. Furthermore, the results can be sensitive to the specific set of sign restrictions imposed, and there is a potential for "shock masquerading," where linear combinations of other shocks might be misinterpreted as the shock of interest. While challenges related to the influence of prior distributions exist, the impact may be mitigated in models with multiple restrictions (Christian K. Wolf 2022; Atsushi Inoue and Lutz Kilian 2020; Christiane Baumeister and James Hamilton 2014).

## 3. Identifying structural shocks, VAR system, and sign restrictions

This study utilizes a sign-restricted VAR modelling framework introduced by Uhlig (2005) to investigate the macroeconomic impacts of military sanctions and defence expenditure shocks on Turkey's economy. The chosen methodological approach involves imposing theoretically and empirically grounded sign restrictions derived from the Dynamic Stochastic General Equilibrium (DSGE) literature and empirical Vector Autoregression (VAR) studies. By incorporating insights from international DSGE models and comprehensive empirical findings, the designed empirical study provides a robust analytical foundation for understanding the economic repercussions of military-related shocks. Each imposed sign restriction is extensively justified by aligning it with prevailing economic theory and empirical evidence, ensuring methodological rigor and theoretical coherence.

The VAR model is formed with six quarterly variables and has 4 lags and a constant term. The variables are real GDP, interbank rates as interest rates, unemployment rates, the consumer price index, defence expenditures, and the real effective exchange rate index. The sample period is from 2006 (Q1) to 2020 (Q1). Natural logarithms of all variables, except the interest rates and the unemployment rates, are used for this empirical study. The base year is 2015 for real GDP and the consumer price index. Moreover, real GDP and unemployment series are seasonally adjusted. Except for defence expenditures, all series are collected from the OECD database. Quarterly defence expenditures are obtained from General Government's Finance Statistics reports of Republic of Turkey Ministry of Treasury and Finance and the data covers expenditures on the Ministry of National Defence (Turkish Armed Forces), General Command of Gendarmerie, Turkish Coast Guard Command, Presidency of Defence Industries, and Defence Industry Support Fund.

**Table 1** Identifying Sign Restrictions

| Shocks | Unemployment | Interest Rate | Real Exchange R. | Output | Consumer Prices | Defence Expenditures |
|---|---|---|---|---|---|---|
| Military Sanction | + | + | - | - | + | |
| Positive Defence Expenditures | | + | | | + | + |
| Negative Defence Expenditures | | - | | | - | - |
| Inflationary | | + | - | - | + | |

**Notes:** "+" means positive restriction on the response of related variable for four quarters following the shock. "-" indicates negative restriction on the response of related variable for four quarters. Blank cells show unrestricted responses.
**Source:** Own Construction.

The sign restrictions are identified by utilizing Uhlig's (2005) approach. The purpose of this restriction is to determine the sign of each restricted variables' responses in the first four quarters following the shock. The structural shocks are formed by a group of sign restrictions. The sign restrictions to be used for each structural shock are determined based on the expected effects of the related shock on economic variables. Three structural shocks are identified. These are military sanction shock (based on geopolitical events), positive defence expenditure shock (policy-driven increase), and negative defence expenditure shock (policy-driven cut) respectively. The formation of restrictions for each shock are discussed below. Each identified structural shock and imposed sign restrictions can be seen in Table 1.

### 3.1. Military Sanction Shock

The first shock considered in the analysis pertains to military sanctions, which are generally viewed as adverse geopolitical events exerting negative supply-side pressures on the economy. According to the imposed sign restrictions, military sanctions are anticipated to elevate unemployment, raise interest rates, reduce economic output, and increase consumer prices. The theoretical underpinning of these restrictions aligns closely with standard predictions found in DSGE literature, which models adverse geopolitical shocks as stagflationary events leading to reduced production capacity, higher unemployment, and inflationary pressures due to disrupted supply chains and increased input costs (Andrew Mountford and Harald Uhlig 2009; Valerie A. Ramey 2011; Marco Lorusso and Luca Pieroni 2017). In particular, Lorusso and Pieroni (2017) illustrate within a DSGE framework that geopolitical tensions negatively influence output and consumption dynamics, reinforcing the theoretical validity of the imposed restrictions.

Empirical evidence further substantiates these theoretical assertions. Olivier Blanchard and Jordi Galí (2007) and Lutz Kilian and Daniel P. Murphy (2012) indicate that geopolitical uncertainties, including sanctions, frequently lead to significant capital outflows and currency depreciations in emerging markets. This is particularly relevant for Turkey, where historical episodes of sanctions have typically resulted in notable economic disturbances, prominently featuring currency depreciations. Specifically, the Real Exchange Rate Index, which is used in this study, decreases when the Turkish lira depreciates. However, the mechanism behind the relationship between exchange rates and a military sanction is not clear for Turkey. It is obvious that the value of Turkish Lira has become sensitive to almost all international debates against Turkey due to Turkey's poor management of monetary policies. This negative relationship aligns well with historical observations during periods of intensified geopolitical tensions and sanctions affecting Turkey. Additionally, Mohammad Reza Gharibnavaz and Robert Waschik (2018) employ a Computable General Equilibrium (CGE) model to analyse international sanctions' impacts, demonstrating considerable economic welfare losses and reinforcing the appropriateness of the restrictions set forth in this practice. Moreover, although the Russian economy has very different dynamics from the Turkish one, studies on Russia have also been analysed to understand the negative effects of Western military sanctions on the economy and to gain insight into the direction of sign restrictions. (Christie 2016; Victoria Golikova and Boris Kuznetsov 2017; Klinova and Sidorova 2019; June Borge Doornich and Andreas Raspotnik 2020). In the light of all these theoretical and applied studies, the sign restrictions for the military sanctions shock are set as (+) for unemployment, (+) for interest rates, (-) for real exchange rates, (-) for output, and (+) for consumer prices, respectively.

### 3.2. Positive Defence Expenditure Shock

When identifying expected sanctions shock, no restriction is placed on response of defence expenditures. However, to achieve better understanding, it is useful to estimate impacts of a shock identified by defence expenditures. A positive defence expenditure shock intends to capture a shock that occurs due to the Turkish government's policy

decision of raising defence expenditure. Therefore, this policy action creates more demand for money, thereby driving up interest rates. Moreover, R. W. DeGrasse (2016) highlights that expanding military expenditures exert upward pressure on prices and, according to Seymour Melman (1985), rising military expenditures lead to an increase in demand for scarce domestic resources, which also drives prices up. When all these conditions are evaluated, positive sign restrictions should be imposed on the response of consumer prices and interest rates along with defence expenditures. In analysing positive defence expenditure shocks, positive restrictions are imposed on defence spending, consumer prices, and interest rates, thereby reflecting typical fiscal stimulus scenarios detailed extensively in the macroeconomic literature. Defence expenditure shocks are commonly analysed within the context of fiscal policy expansions, which are associated with outcomes such as increased aggregate demand, higher inflation, and subsequent monetary tightening (Ramey 2011; Luca Pieroni, Giorgio d'Agostino, and Marco Lorusso 2008). DSGE studies, including research conducted by Lorusso and Pieroni (2017), explicitly demonstrate that military expenditure expansions have limited positive effects on economic output compared to civilian spending. Such military expenditure increases frequently result in private consumption crowding-out effects, necessitating cautious treatment regarding the economic multipliers involved. Consequently, these findings support the deliberate decision to leave the output and unemployment responses unrestricted. Empirical studies further reinforce these theoretical implications and highlight variations in outcomes depending on contextual factors. For instance, research conducted by Valerie A. Ramey and Matthew D. Shapiro (1998) and Mountford and Uhlig (2009) indicates that defence expenditure expansions typically result in higher economic output and employment in advanced economies. Nevertheless, findings from Turkey, as documented by Turgay Ceyhan and Ahmet Köstekçi (2021), suggest that the employment effects of military expenditures may not be consistently positive due to structural rigidities and resource reallocations across sectors. These nuanced insights emphasize the importance of leaving certain sign restrictions empirically open-ended, thereby allowing the data to reflect specific contextual dynamics rather than imposing overly restrictive theoretical expectations.

### 3.3. Negative Defence Expenditure Shock

The empirical study also considers a negative defence expenditure shock, imposing symmetrical negative sign restrictions on defence spending, consumer prices, and interest rates. This configuration effectively captures typical scenarios of fiscal austerity or expenditure contractions well documented in the economic literature. Reductions in government spending generally alleviate inflationary pressures and allow monetary authorities to lower interest rates to stimulate economic activity during downturns (Mountford and Uhlig 2009; Olivier Blanchard and Roberto Perotti 2002). The symmetrical treatment of negative shocks relative to positive shocks adheres closely to the theoretical predictions of standard macroeconomic models, thus justifying the methodological symmetry employed. Furthermore, the DSGE-based research by Pieroni, d'Agostino, and Lorusso (2008) provides valuable insights

regarding the limited and relatively modest long-term macroeconomic impacts of variations in defence spending. Their findings specifically underscore the limited long-term stimulative effects of military expenditures, lending support to the cautious and theoretically driven approach adopted by leaving output and unemployment responses unrestricted in the manuscript. This strategy accommodates potential asymmetric or nonlinear effects that may arise in empirical analyses, ensuring that the modelling framework remains flexible and responsive to empirical realities.

### 3.4. Inflationary Shock

The incorporation of an inflationary shock is essential when examining macroeconomic performance, particularly in the context of Turkey's historically volatile inflation dynamics. Inflationary shock identification through sign restrictions derives from empirical research focused on Turkey's economy. Following (M. Utku Özmen and Erdal Yılmaz 2017), who employ SVAR methodology to analyse monetary policy transmission in Turkey, inflationary shocks are characterized by rising consumer prices accompanied by central bank responses through increased interest rates. Their findings demonstrate that inflationary pressures in Turkey typically trigger monetary tightening, resulting in output contraction. Complementing this perspective, (Cem Çebi 2012) utilizes a small-scale DSGE model for the Turkish economy and establishes that inflationary shocks lead to real exchange rate depreciation as purchasing power parity adjusts. This pattern is consistent with Turkey's historical experience where inflation episodes frequently coincide with currency weakening. Similarly, (Harun Alp and Selim Elekdag 2011) develop a New Keynesian DSGE model that highlights how inflation shocks in Turkey generate negative output effects through monetary policy transmission channels and eroded competitiveness. The research by (Nejla Adanur Aklan and Mehmet Nargelecekenler 2008) employing VAR analysis further confirms these patterns, demonstrating that inflation shocks in Turkey typically present as stagflationary phenomena with appreciable negative impacts on production. Their findings suggest that inflationary pressures force monetary authorities to implement restrictive policies that subsequently dampen economic activity.

Based on these empirical findings and theoretical considerations, the sign restrictions imposed to identify inflationary shocks include positive response in consumer prices, positive response in interest rates reflecting monetary policy reaction, negative response in real exchange rate index indicating currency depreciation, and negative response in output capturing the contractionary effect. These restrictions are maintained for four quarters following the shock, consistent with the identification approach applied to other shocks in the analysis.

Defence expenditures and unemployment variables are deliberately left unrestricted in the inflationary shock identification. Regarding defence expenditures, the relationship between inflation and military spending in Turkey shows mixed empirical evidence. While (Jülide Yıldırım, Selami Sezgin, and Nadir Öcal 2005) suggest inflation can decrease real defence budgets over time, the actual response depends on government fiscal priorities during inflationary periods. For

unemployment, empirical findings from Turkish data reveal ambiguous relationships with inflation shocks. (M. Hakan Berument, Nukhet Dogan, and Aysit Tansel 2009) note that the unemployment response to inflation depends on whether the shock originates from supply or demand factors, with potentially offsetting effects in the short term. When these variables are left unrestricted, the data can determine their responses, avoiding the imposition of potentially restrictive assumptions that might not reflect Turkey's complex macroeconomic dynamics.

## 4. Empirical results and policy implications

According to Christopher A. Sims, James H. Stock, and Mark W. Watson (1990) and Helmut Lütkepohl and Hans-Eggert Reimers (1992), if there is a significant co-integration relationship between the series, using nonstationary series do not result in inconsistent standard VAR estimation. In addition, sign-restricted VAR estimation is a Bayesian method, which, as highlighted by Christopher A. Sims and Harald Uhlig (1991) and Harald Uhlig (1994), could offer robust results with nonstationary series. Also, the pioneer applied studies of the sign-restricted VAR (Uhlig 2005; Andrew Mountford 2005) never reported unit root test results. Despite this, the Augmented Dickey-Fuller (ADF) unit root test (Said E. Said and David A. Dickey 1984; Peter C. B. Phillips and Pierre Perron 1988) results are reported for level and first difference of the six series in Table 2. ADF test results indicate that the null hypothesis of nonstationary can be rejected for unemployment and interest rates. However, findings by Phillips and Perron (1988) support that all the six series contain a unit root in levels and that all series are stationary in first differences.

It is also useful to report results of Søren Johansen (1996)'s maximum likelihood cointegration test statistics. Table 3 demonstrates that only trace test statistics rejects the null hypothesis of zero cointegrating vectors. In addition, there are two cointegrating vectors based on trace statistics. Conversely, maximum eigen value test statistics cannot suggest any significant cointegration vector at the 10% probability level. Although the two test statistics do not give identical results, there is evidence of some long run cointegrating relationships between the six variables.

**Table 2** Unit Root Test Results

| Series | ADF Drift | ADF Drift & Trend | Phillips & Perron |
|---|---|---|---|
| Unemployment | -2.939 (0.049$^{*}$) | -3.065 (0.127) | -8.727 (0.596) |
| Δ Unemployment | -3.542 (0.011$^{*}$) | -3.606 (0.041$^{*}$) | -25.869 (0.010$^{**}$) |
| Consumer Prices | 2.414 (1.000) | -0.376 (0.986) | -4.039 (0.880) |
| Δ Consumer Prices | -5.816 ($1.216\times10^{-5**}$) | -6.712 ($5.071\times10^{-5**}$) | -45.794 (< 0.01$^{**}$) |
| Interest Rates | -2.908 (0.052$^{\dagger}$) | -3.552 (0.046$^{*}$) | -8.141 (0.631) |
| Δ Interest Rates | -4.139 (0.002$^{**}$) | -4.095 (0.012$^{*}$) | -33.321 (< 0.01$^{**}$) |
| Real Exchange Rates | -0.777 (0.816) | -2.160 (0.499) | -9.075 (0.574) |
| Δ Real Exchange Rates | -6.769 ($6.187\times10^{-7**}$) | -6.784 ($3.996\times10^{-6**}$) | -54.105 (< 0.01$^{**}$) |
| Output | -0.675 (0.843) | -1.662 (0.752) | -10.725 (0.474) |
| Δ Output | -6.611 ($1.004\times10^{-6**}$) | -6.630 ($6.666\times10^{-6**}$) | -49.834 (< 0.01$^{**}$) |
| Defence Expenditure | 0.972 (0.996) | -0.898 (0.947) | -3.143 (0.926) |
| Δ Defence Expenditure | -6.322 ($2.46\times10^{-6**}$) | -6.567 ($8.211\times10^{-6**}$) | -53.287 (< 0.01$^{**}$) |

**Notes:** p-values are placed in parentheses. Actual p-values are smaller than reported 0.01 for Phillips and Perron (1988) test statistics. Δ represents first differences. * p-value < 0.1; ** p-value < 0.05; *** p-value < 0.01.
**Source:** Own Calculation.

**Table 3** Johansen Cointegration Test Results

| Hypothesis | Trace Statistic | p-value | Hypothesis | Max Eigen Val. Statistic | p-value |
|---|---|---|---|---|---|
| $r = 0$ | 126.701 | 0.001** | $r = 0$ | 40.216 | 0.106 |
| $r \leq 1$ | 86.484 | 0.012* | $r = 1$ | 30.325 | 0.254 |
| $r \leq 2$ | 56.159 | 0.039* | $r = 2$ | 26.099 | 0.172 |
| $r \leq 3$ | 30.059 | 0.157 | $r = 3$ | 20.869 | 0.135 |
| $r \leq 4$ | 9.190 | 0.568 | $r = 4$ | 8.8225 | 0.521 |
| $r \leq 5$ | 0.368 | 0.544 | $r = 5$ | 0.3678 | 0.544 |

**Notes:** Optimal lag length is selected as 1 by Bayesian Information Criteria. * p-value < 0.1; ** p-value < 0.05; *** p-value < 0.01.
**Source:** Own Calculation.

Kinsella (1990) and Ehung Gi Baek (1991) estimate VAR models with different equation orderings. In this study, the specification of equation ordering is determined by causality relationships between series. For this purpose, a Granger causality test (Hiro Y. Toda and Taku Yamamoto 1995) is deployed, and results are reported in Table 4. It is obvious that the first four variables have a direct causal impact on defence expenditures. Only output does not satisfy the Granger causality of defence expenditure. In the same way, there is no significant causal relationship between defence expenditure and output. In addition, defence expenditure only satisfies Granger causality in real exchange rates. According to Table 4, variables should be ordered from the most exogenous to the most endogenous as unemployment, interest rate, real exchange rate, output, consumer prices, and defence expenditures. Thus, Granger causality test results suggest that defence expenditure is the most endogenous variable and unemployment is the most exogenous variable in the system.

**Table 4** Toda and Yamamoto Granger Causality Test Results

| Null Hypothesis | Unemployment | Consumer Prices | Interest Rate | Real Exchange R. | Output | Defence Expenditure |
|---|---|---|---|---|---|---|
| Unemployment ≠> | - | 4.3 (0.038*) | 14.5 (0.001**) | 0.14 (0.700) | 13.9 (0.001**) | 3.5 (0.06) |
| Consumer P. ≠> | 0.31 (0.580) | - | 1.1 (0.300) | $7.4\times10^{-7}$ (1.000) | 1.5 (0.220) | 5.9 (0.015*) |
| Interest Rate ≠> | 5.9 (0.016*) | 0.14 (0.710) | - | 2.6 (0.110) | 1.1 (0.300) | 43.8 ($3.6\times10^{-11}$**) |
| Real Ex. Rate ≠> | 0.13 (0.720) | 4.6 (0.031*) | 0.088 (0.770) | - | 2.8 (0.093†) | 8.7 (0.003**) |
| Output ≠> | 0.032 (0.860) | 7.1 (0.008**) | 2.4 (0.120) | 4.5 (0.034*) | - | 0.03 (0.860) |
| Defence E. ≠> | 0.63 (0.430) | 2.6 (0.110) | 0.92 (0.340) | 5.3 (0.021*) | 0.014 (0.910) | - |

**Notes:** p-values are placed in parentheses. "≠>" means "*does not cause*". Optimal lag length is selected as 1 by Bayesian Information Criteria. * p-value < 0.1; ** p-value < 0.05; *** p-value < 0.01.
**Source:** Own Calculation.

Figures 1, 2, and 3 contain the impulses and responses of three identified structural shocks. Each figure is formed with three lines that represent the 16th, 50th, and 84th percentiles of the impulse responses. The 16th and 84th lines provide confidence band. The impulse responses are generated by 1000 accepted draws from 300 posterior draws and 300 sub-draws for each posterior draw. Uhlig (2005)'s rejection approach is used as the drawing method for the posterior distribution. The impulse responses of the three identified structural shock will be discussed below.

### 4.1. Responses to the Military Sanction Shock

Figure 1 shows the impulse responses of an identified sanction shock. The response of the unemployment rate significantly rises for five quarters, then decreases gradually to below zero in the long run. A possible sanction affects the output by -0.01% in the first year and a steady significant decrease is observed until the 5th quarter. The response of interest rates shows that a future sanction shock significantly raises interest rates by 1% after three quarters and decreases to below zero in the 7th quarter, followed by a return to zero level in the long run. The response of consumer prices remains permanently above the zero level. The Turkish Lira showed its first response to the sanction shock, depreciating by 0.02 percent. The response of the real exchange rate significantly increases until the 4th quarter and reaches zero level after 16 quarters. Defence expenditure is the only unrestricted variable, and its response to the sanction shock appears as a 0.03% significant increase in the first quarter. Moreover, it remains above zero until the 20th quarter.

The estimated median responses of the sanction shock also put into question the effectiveness of the sanctions for Turkey. As highlighted by Maarten Smeets (2018), the effectiveness of economic and political sanctions is highly debatable. Chao Jing, William H. Kaempfer, and Anton D. Lowenberg (2003), Navin A. Bapat et al. (2013) and Dursun Peksen (2019) offer a consistent guide to determine whether a sanction is effective or not. According to these studies, a sanction could be more effective if it is directed at an ally country; if the sender and target countries have a warmer prior relationship; if it does not include export restrictions; and if the target country is highly dependent on trade with the sender. The findings indicate that the sanction shock's negative impact on output is not permanent, and the long-run gradual increase in output is associated with a long-run appreciation of the Turkish Lira and a long-run decrease in unemployment. Additionally, without any restrictions, the estimated response of defence expenditure demonstrated that even if sanctions were imposed, Turkey would not reduce its military spending. Although Turkey is an ally and import-dependent economy with the Western countries, these results raise the possibility that a potential military sanction's impact on Turkey will be ineffective. It seems possible that this result is due to two main reasons. Firstly, the latest Emerging Suppliers in The Global Arms Trade report of SIPRI states that Turkey has been one of the fastest growing

arms exporters in the world in the last decade Lucie Béraud-Sudreau et al. (2020). The same report also argues that Turkey needs to export key components (e.g., the engines) and could not find new markets among the Western and NATO member countries. However, Turkish defence firms have started to test tank and helicopter engine prototypes (Defenseworld 2020; Gökhan Ergocun 2021), and negotiations are underway on the sale of a 50% stake of the Ukrainian aerospace engine company Motor SICH to Turkey in 2021 (Defenseworld 2021). Moreover, Poland became the first NATO and European Union member country to buy unmanned aerial vehicles with their smart ammunition from Turkey. This arms deal was followed by agreements with Albania and Romania (Inder Singh Bisht 2024). It has been shown from this review that, despite several imposed sanctions, Turkey could continue expanding its defence industry and export market in the future. Secondly, it is apparent that almost all borders of Turkey are a source of regional instability. For instance, Turkey has launched several operations across its borders in northern Syria and northern Iraq. In addition, there is a growing tension between Greece and Turkey over gas reserves in the Eastern Mediterranean. Moreover, the coup attempt in 2016 and the Nagorno-Karabakh war in 2020 have increased Turkey's security concerns. It is evident from the examples given here that Turkey's defence expenditure is driven predominantly by security concerns. Therefore, military sanctions on Turkey's military expenditure seem likely to remain ineffective.

On the other hand, impulse response results from the sanction shock indicate that there is only one permanent positive effect observed for consumer prices. Hence, the response of consumer prices could be interpreted as the main negative impact of future possible military sanctions on the Turkish economy. Inflation is a structural problem of the Turkish economy that has persisted for many years. Hence, it is expected that expanding military spending due to a potential sanction makes an extra contribution to consumer prices. It is apparent, therefore, that the underlying mechanism of the relationship between defence expenditure and inflation should be clarified for Turkey. In the current literature on defence spending's impact on prices, three main views have been debated. First, İpek (2014) argues that the main reason for Turkey's inflationary defence expenditure is the high share of personnel payments in total military expenditure. Nevertheless, when the data in the latest NATO report are examined, since 2013, the share of personnel payments in Turkey's defence spending has remained mostly below the NATO average (NATO 2021). Second, Asiloğulları (2020) claims that defence spending causes inflation because Turkey's defence needs create an import-export imbalance. However, as can be proven from SIPRI's Arms Transfers Database, the defence trade deficit of Turkey dropped by about 73% between 2010-2015 and 2016-2020. Hence, contrary to what is claimed, the arms trade deficit of Turkey is currently far from creating inflation. The last and most convincing idea, which is supported by Karakurt, Şentürk, and Şahingöz (2018), states that defence spending, like other public expenditure, has an inflationary effect in times of economic instability. It is a well-known fact that Turkey has been struggling with many structural economic problems recently and has not been able to offer efficient policies to solve its economic problems. Therefore, increased defence spending due to potential military sanctions will further exacerbate the inflation problem.

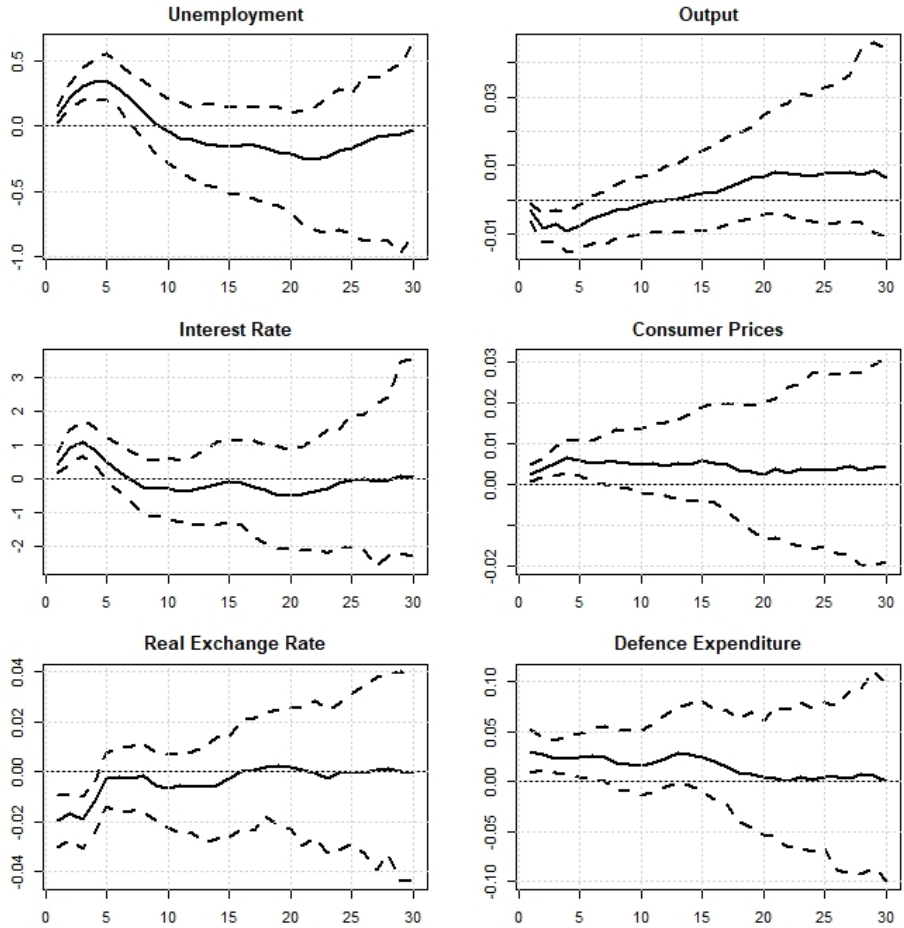


**Figure 1** Responses of the Variables to the Sanction Shock.

4.2. Responses to the Positive Defence Expenditure Shock

According to Figure 2, a positive defence expenditure shock significantly increases interest rates by 1% for the first year. After the 5th quarter, the response of interest rate reduces by about 2% and follows a path below the zero level until the 28th quarter. In addition, the positive defence expenditure shock has a positive significant impact of 0.01% on consumer prices in the first and the second year and places on the zero line after the 25th quarter. Another sign-restricted variable for this shock is defence expenditure and its response reaches 0.04% in the second year after the shock and gradually falls to the zero line between the 7th and 18th quarters. It is obvious that all sign-restricted responses tend to return to the zero level. Furthermore, the unemployment rate responds to positive defence expenditure shock with an increase in the first year. Then, the response values are significant between 5th and 8th quarters

and falls below the zero level after 10th quarter. Similarly, the decreasing response of output turns into a gradual and permanent increase starting from the 10th quarter. Finally, the significant depreciation of the Turkish Lira, which could be interpreted as a negative response of real exchange rate, becomes an appreciation after the 13th quarter. In short, a policy preference for increasing defence expenditures is expected to negatively affect the economy by increasing unemployment and decreasing output and real exchange rate. Based on the responses displayed in Figure 2, this expectation can be confirmed for the short run. In the long run, however, negative impacts of positive defence expenditure shock on economic performance are not persistent.

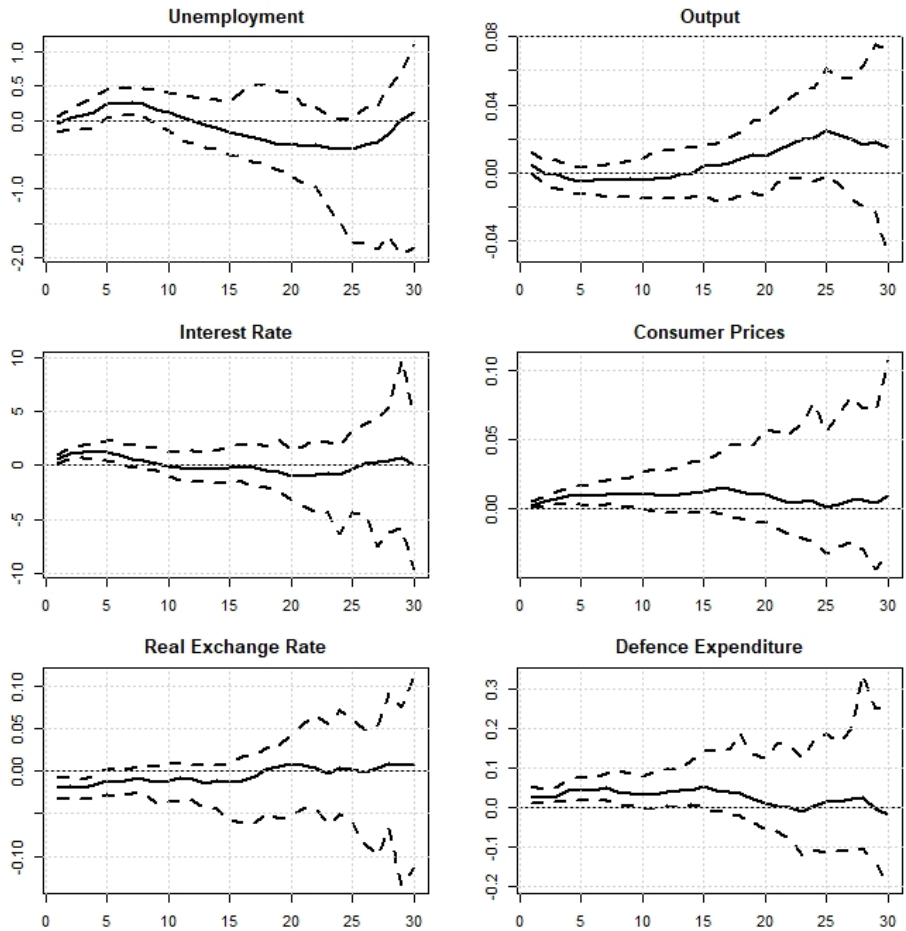


**Figure 2** Responses of the Variables to the Positive Defence Expenditure Shock.

### 4.3. Responses to the Negative Defence Expenditure Shock

Figure 3 shows the impulse responses to a negative defence expenditure shock. These responses indicate that a negative defence expenditure shock decreases consumer prices and produces a median response of consumer prices which follows a path below the zero line in the long run. Therefore, decreasing consumer prices can be interpreted as a positive impact of the negative defence expenditure shock on Turkish economy. Furthermore, the negative impact on interest rate of a negative defence expenditure shock is not permanent; it becomes positive after the 10th quarter and falls below the zero level again in the 26$^{th}$ quarter. Additionally, the median response of defence expenditures remains below the zero line for about 22 quarters and becomes positive between 23$^{rd}$ and 24$^{th}$ quarters and after the 29$^{th}$ quarter. The appreciation of the Turkish Lira is also not persistent, as the response of the real exchange rate only remains positive for about 17 quarters following the shock. The identified negative defence expenditure shock causes the unemployment rate to decrease by -0.02% in the first two years but to rise to 0.49% after 24 quarters. Lastly, the response of output to the reduced defence expenditure shows a small insignificant increase for 10 quarters, then decreases to -0.02% in the 24$^{th}$ quarter and remains permanently below the zero line in the long run. As such, only one expected positive impact of a negative defence expenditure shock could be observed, which is a permanent decrease in consumer prices. However, the increase in output is not remarkable and then turns into a persistent decline in the long run. Moreover, the decrease in the unemployment rate and interest rate, and the appreciation of the Turkish Lira, are also not persistent.

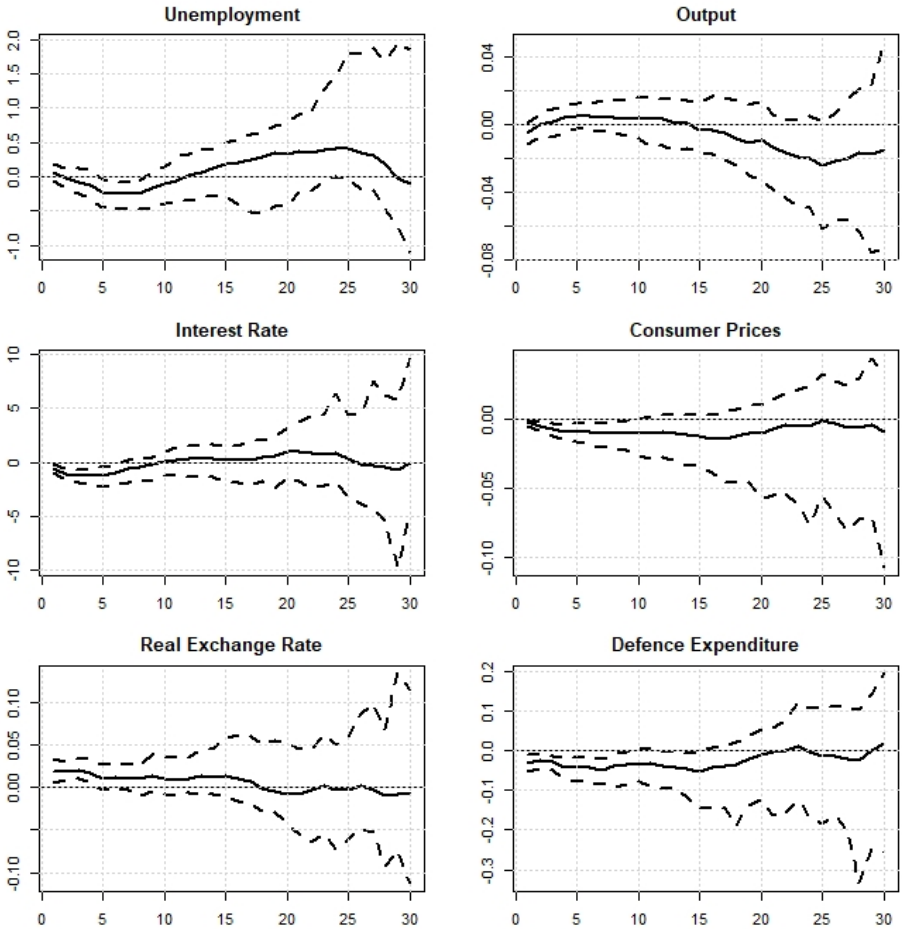


**Figure 3** Responses of the Variables to the Negative Defence Expenditure Shock.

### 4.4. Responses to the Inflationary Shock

Figure 4 illustrates the dynamic responses of six key macroeconomic variables in Turkey to inflationary shock, as identified through the sign restricted structural VAR model. According to the imposed restrictions, inflationary shocks are characterized by an increase in consumer prices, accompanied by a contractionary monetary policy stance (reflected in rising interest rates) and a nominal depreciation (an increase in the real exchange rate), alongside a reduction in output. The impulse-response functions reveal that consumer prices exhibit a sustained upward trajectory for several quarters, validating the effectiveness of the inflationary shock identification. Interest rates respond positively and significantly in the immediate quarters following the shock, which is consistent with the central bank's inflation-targeting behaviour. The real exchange rate also shows a rapid depreciation, confirming the pass-through of

inflationary pressures into external competitiveness. Output contracts sharply in the short term, which aligns with the stagflationary implications of inflation shocks in emerging markets. Unemployment increases moderately, reflecting a delayed labour market adjustment to declining output. Defence expenditures exhibit an initial rise before plateauing, which may suggest rigidities in fiscal defence allocations even under inflationary stress.

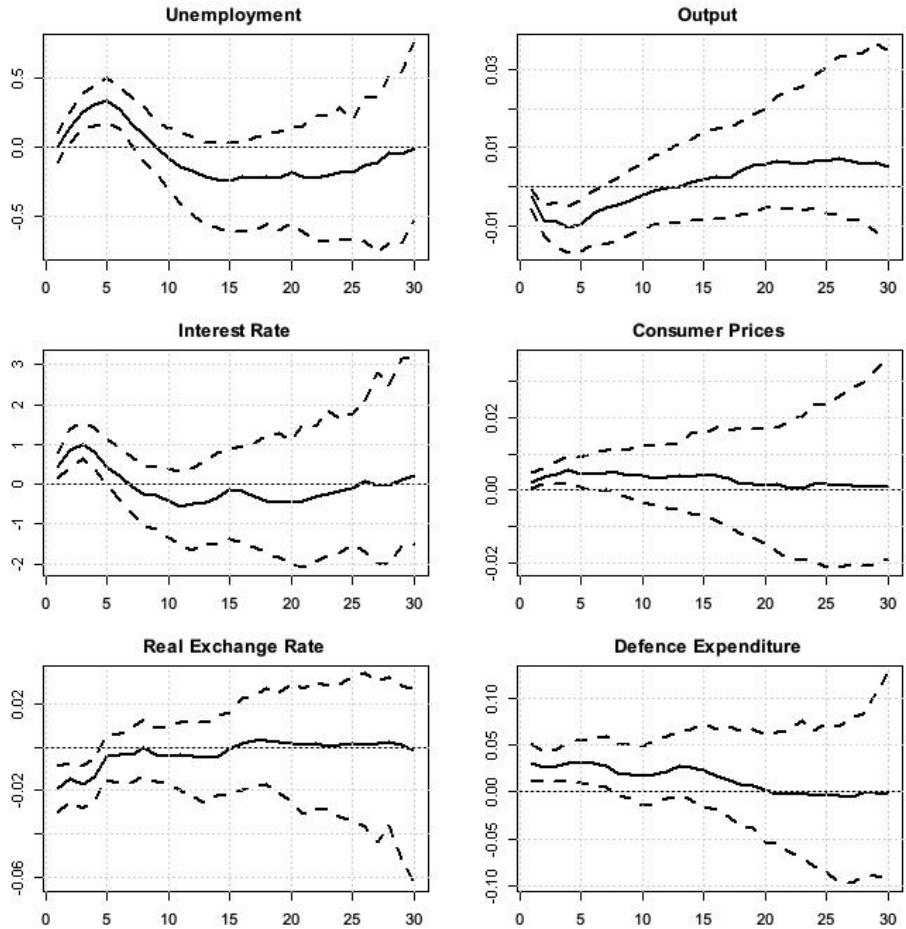


**Figure 4** Responses of the Variables to the Inflation Shock.

### 4.5. How important are the shocks for macroeconomic fluctuations?

One other key finding of the VAR models is the forecast error variance decomposition (FEVD) values. In the sign restricted VAR framework, the FEVD is defined as the percentage of the variance of the error made in forecasting a variable due to a specific shock at a specific time horizon. Or more specifically, the forecast error variance

decomposition is the size of the variance of the error made in forecasting a variable due to the model's structural shock (Sariola 2015).

The Forecast Error Variance Decomposition (FEVD) results from the sign-restricted VAR model used to examine the impact of military sanctions and defence expenditure shocks on Turkey's economy reveal significant economic insights.

The FEVD values derived from the military sanctions shock, detailed in Figure 5, show the percentage contribution of this shock to the variance of forecast errors across various periods. By period 4, military sanctions account for 10.43% of unemployment variance, 13.5% of interest rate variance, 12.16% of real exchange rate variance, 9.39% of output variance, 12.95% of consumer price variance, and 12.12% of defence expenditure variance. These figures highlight how military sanctions disrupt economic stability significantly, especially reflected in monetary conditions (interest rates) and price levels (inflation). By the 20th period, these impacts remain robust, indicating persistent economic vulnerabilities, with contributions ranging between 10.82% (consumer prices) and 11.56% (defence expenditures).

In Figure 6, the identical FEVD values for positive and negative defence expenditure shocks demonstrate impacts on economic variables[1]. By the fourth period, defence expenditure shocks explain 11.01% of unemployment variance, 13.9% of interest rate variance, 11.99% of real exchange rate variance, 9.27% of output variance, 13.22% of consumer price variance, and 13.38% of defence expenditure variance. These results emphasize defence expenditures' strong influence on both inflation and unemployment, showcasing their effectiveness as fiscal tools. At the 20th period, these contributions are sustained, particularly for output (12.36%) and interest rates (12.55%), indicating prolonged economic responsiveness to defence budget adjustments.

Figure 7 provides the FEVD values associated with the inflationary shock defined for the limited six-variable VAR system. In the short run (first two quarters), the inflationary shock explains approximately 9.26% of the variance in consumer prices and 9.85% in defence expenditures. These contributions increase over time, peaking at around 12.76% for consumer prices and 12.12% for defence expenditures by the fourth quarter. The inflationary shock also accounts for roughly 11.8% to 12.7% of the variation in interest rates and the real exchange rate between the third and sixth quarters, underscoring the prominent role of inflation in influencing both nominal and external dynamics. For output, the explanatory power remains more modest but steadily increases to exceed 10% after the seventh quarter. Interestingly, the share of forecast error variance attributed to inflation in unemployment stabilizes around 11.3% from the seventh quarter onwards. Overall, the FEVD results affirm that inflationary shocks are substantial drivers of macroeconomic volatility in Turkey, particularly for price dynamics, monetary policy instruments, and components of public expenditure such as defence.

[1] Because of the exact opposite sign restriction of the positive and negative defence expenditure shocks, the FEVD values of these two shocks are identical.

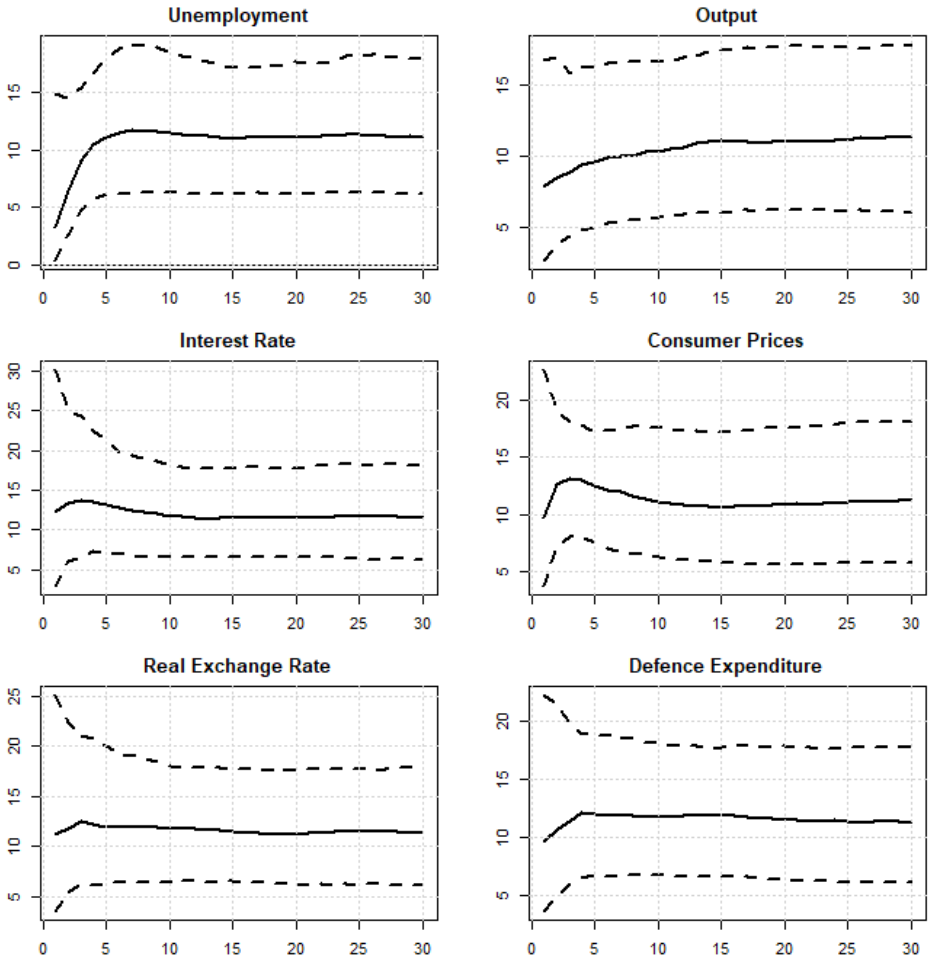


**Figure 5** Contribution of sanction shock to the variance of the forecast errors.

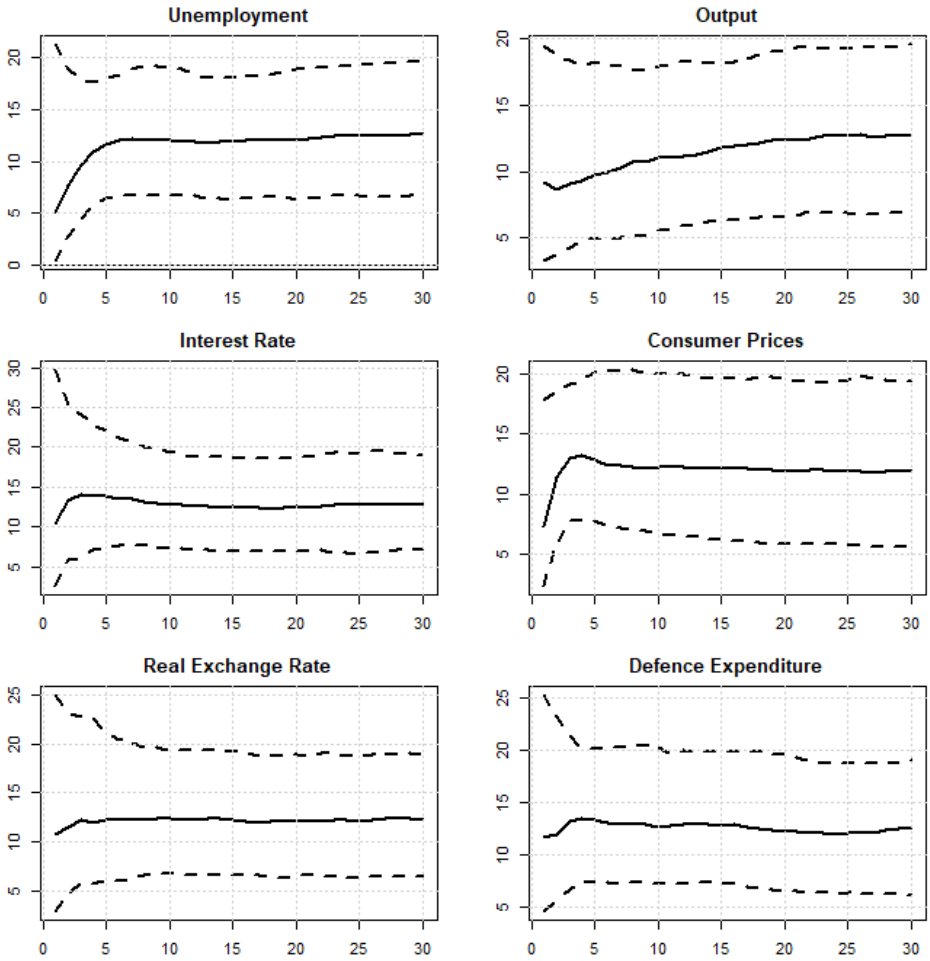


**Figure 6** Contribution of positive and negative defence expenditures shocks to the variance of the forecast errors.

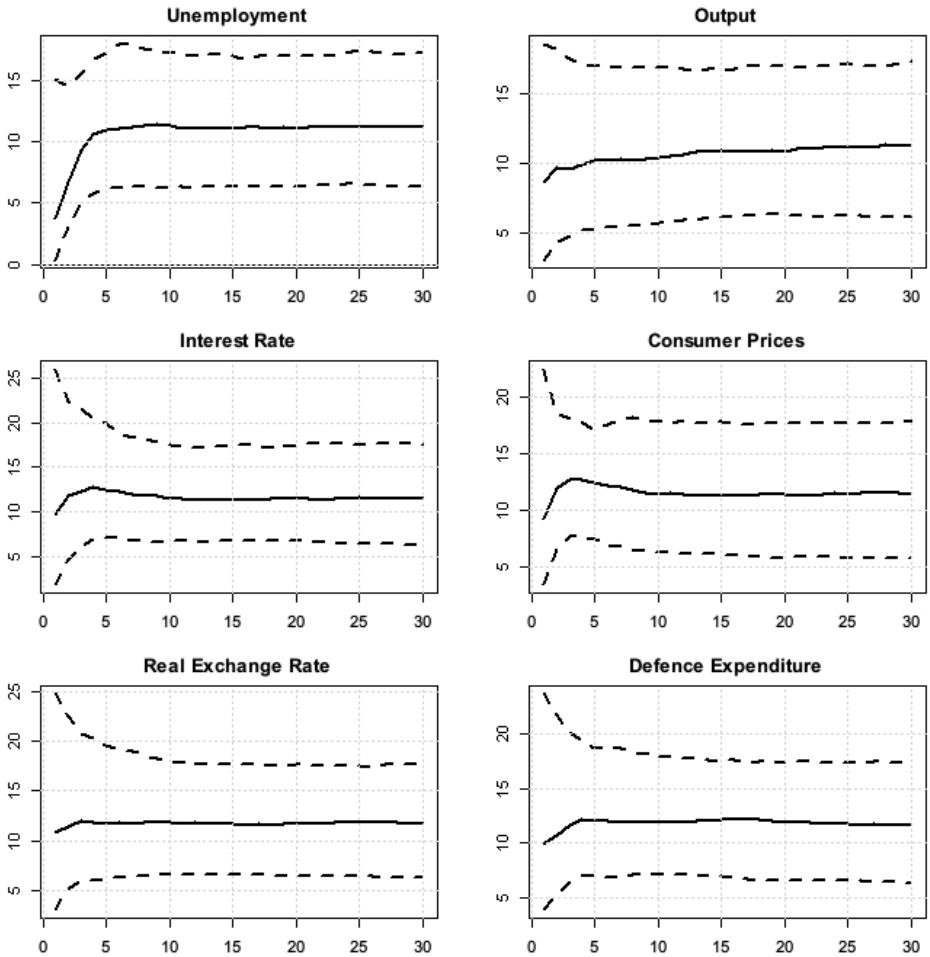


**Figure 7** Contribution of Inflationary shocks to the variance of the forecast errors.

## 5. Robustness checks

Given that robustness check is a standard practice in applied Bayesian VAR studies, a few more analyses with different identifications were conducted to ensure the reliability of the results obtained in the previous section. Firstly, the sign-restricted response period set at four quarters was replaced with different values, and the responses were re-estimated. Thus, all sign restrictions stated in Table 1 were imposed for two and six quarters, respectively, following the shock. For either two or six quarters of the response horizon, the overall findings were largely the same as those in the four-quarter response horizon case. However, there are some differences that need to be highlighted. For the sanction shock, when the sign restriction was imposed for

six quarters, the confidence band of unemployment and response of interest rate became larger than when imposed for only four quarters. Also, in the long run, the response of interest rate rose above the zero line, the response of real exchange rate became negative, and the response of defence expenditure remained below the zero level between 21st and 24th quarters. Moreover, the positive response of consumer prices to sanction shock persistently remained positive.

Secondly, the autoregressive lag, which was previously set at four, was changed to three and five, respectively, and the responses of the variables were re-estimated. These estimations showed that the gap between the 16th and 84th percentiles of the impulse responses expands rapidly over time as the value of the autoregressive lag increases. In addition, some responses changed in the long run. For instance, the response of output to sanction shock became negative after the 25th quarter for the five lags case. The long run negative response of unemployment to positive defence expenditure shock that was computed from 3 autoregressive lags remained negative. Additionally, the response of unemployment to negative defence expenditure shock persistently maintained positive values in the long run for the three autoregressive lags.

Finally, the constant term was removed from VAR models, and the responses of the variables to the three identified shocks were re-estimated. The results indicated that there were no remarkable differences in responses for the sanction shock. However, the response of real exchange rate to positive defence expenditure shock was persistently negative. However, real exchange rate's positive response to negative defence expenditure shock became permanent. Other differences in response values are observed for defence expenditure. For the positive defence expenditure shock, similar to the real exchange rate, the response of defence expenditure never reached the zero line and permanently remained positive. Also, when the constant term was removed from the system, the negative expenditure shock had a permanent negative effect on defence expenditure.

Based on the robustness check estimates, it can be argued that the final outcomes were essentially the same as in the baseline identification case. In particular, for all specifications, the estimated responses up to the 15th quarter were identical to each other. Moreover, the estimated responses of output, consumer prices, and defence expenditure to the sanction shock were highly robust against different identifications of the VAR system. In the same manner, this kind of robustness could be observed for the responses of output and consumer prices to both positive and negative defence expenditure shocks.

## 6. Discussion and Conclusion

This study empirically investigates the economic impacts of military sanctions on Turkey, using a sign-restricted Structural VAR (SVAR) methodology introduced by Uhlig (2005). The primary objective was to analyse how sanctions targeting Turkey's defence sector affect macroeconomic stability, specifically examining key variables such as economic growth, unemployment, inflation, interest rates, exchange rates, and defence expenditures.

The findings clearly demonstrate that the macroeconomic repercussions of military sanctions on Turkey are significant but predominantly short-lived, except for

the persistent adverse impact on consumer prices. This inflationary persistence suggests that military sanctions exacerbate Turkey's already structural inflation problem. Given Turkey's historical struggle with inflation, the sanctions-induced pressure on prices underlines a crucial vulnerability. Thus, policymakers must prioritize anti-inflationary measures and improve economic governance structures to mitigate such enduring effects.

Empirical results further indicate that a military sanction leads to temporary but notable disruptions in output, unemployment, and interest rates, along with an initial depreciation of the Turkish Lira. Interestingly, defence expenditures do not decrease in response to sanctions. Instead, expenditures temporarily increase, underscoring Turkey's strategic priority on defence readiness and highlighting resilience within the Turkish defence sector despite external pressures. This resilience can be attributed to Turkey's enhanced domestic production capacities, which have grown significantly due to previous embargoes and sanctions. Consequently, Turkey appears less vulnerable to external economic coercion aimed specifically at military capabilities.

From a policy perspective, several implications arise. Firstly, Turkey should urgently reinforce its monetary and fiscal frameworks to stabilize inflationary pressures effectively. Strengthening the independence of the central bank, improving fiscal discipline, and establishing credible anti-inflationary policies could provide essential buffers against sanctions-induced economic shocks. Secondly, given the sustained importance of defence expenditures and their resistance to sanctions, policymakers should further invest in technological innovation and domestic defence industries. The Turkish arms industry can expand its export market to the West. Due to the depreciated Turkish Lira and a relatively low-cost labour force, Turkish companies could offer more competitive prices for products meeting Western standards. Such competitive advantages could support economically efficient defence strategies for middle-income NATO countries, enhancing Turkey's economic resilience against future military sanctions.

Moreover, diplomatic strategies should accompany economic and defence policies. As geopolitical tensions continue to rise, particularly due to conflicts in Ukraine, the Eastern Mediterranean, the South Pacific, and broader NATO-Russia-China tensions, proactive diplomatic engagement can reduce the likelihood and severity of sanctions. Enhancing Turkey's diplomatic relations, particularly with NATO allies and major economic partners, can alleviate potential economic disruptions by fostering political goodwill and cooperation.

For future research, several promising avenues are recommended. One particularly important area is the decomposition of military expenditures into military consumption and military investment spending. Although obtaining detailed data on military spending is challenging due to its sensitive and classified nature, this distinction could yield deeper insights into the specific economic mechanisms affected by sanctions, enabling policymakers to tailor responses more precisely. Future studies employing this dual-component approach, if feasible, would clarify whether investments aimed at technological advancements and infrastructure improvements differ significantly in their macroeconomic impacts compared to routine operational expenditures. Additionally, expanding comparative studies to other sanctioned

countries, such as Russia or Iran, could yield significant insights into the generalizability of these findings. By conducting comparative cross-country analyses, researchers can better understand the differential effectiveness and macroeconomic impacts of military sanctions across diverse economic and geopolitical contexts. Such comparative analyses would not only broaden theoretical and empirical literature but also assist policymakers internationally in designing sanctions with more predictable outcomes.

In conclusion, while Turkey's economy demonstrates resilience against short-term effects of military sanctions, the persistent inflationary impact highlights a critical area of vulnerability. Addressing structural economic weaknesses, particularly inflation and currency volatility, should be central to Turkey's economic policy agenda. Simultaneously, investments in defence innovation and strategic diplomacy will be key in mitigating future vulnerabilities. The integration of differentiated military expenditure components in future empirical analyses will significantly enrich policy-relevant insights, providing a nuanced understanding essential for effective policy formulation.

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