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Dynamics of Inflation in Turkey: Supply Shocks or Demand Shocks?

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Abstract

This study investigates whether supply-side or demand-side shocks are the primary drivers of core inflation and inflation expectations in Turkey during the post-2013 period. To capture the evolving nature of inflation dynamics, the analysis employs a Time-Varying Parameter Vector Autoregression (TVP-VAR) model covering the period 2013–2024. In addition, the interdependence and transmission of shocks are examined within a connectedness framework, allowing for a comprehensive assessment of how different macroeconomic disturbances propagate through the inflation process. The empirical results provide robust evidence that demand shocks exert persistent and long-lasting effects on both core inflation and inflation expectations, whereas supply shocks generate comparatively short-lived

and transitory impacts. The findings further reveal that the role of the credit transmission channel in shaping inflation dynamics has intensified in the post-pandemic period. Moreover, inflation expectations exhibit a growing degree of persistence, indicating that past expectations increasingly influence the formation of future expectations. By providing time-varying evidence on the relative importance of demand and supply shocks, this study contributes to the literature on inflation dynamics in emerging economies and offers new insights into the structural drivers of inflation in Turkey. The results highlight the dominant role of demand-side pressures in sustaining inflationary dynamics. Although these findings point to the relevance of conventional monetary tightening in restoring price stability, the effectiveness of such measures remains contested in the presence of institutional constraints and episodic shifts toward heterodox policy frameworks. In particular, the observed rigidity in inflation expectations suggests that reliance solely on monetary policy instruments – especially those operating through the credit channel – may be insufficient to anchor expectations and stabilize inflation. These results therefore underscore the importance of a comprehensive policy framework that integrates credible monetary tightening with sustained fiscal discipline and strengthened institutional credibility to achieve durable macroeconomic stability.

Keywords: Core Inflation, Demand Shocks, Supply Shocks, Inflation Expectations, TVP-VAR

JEL Classification: E31, E52, C32, D84

1. Introduction

One of the most significant challenges facing the global economy in recent years has been the resurgence of inflation driven by global factors. These forces affect not only small open economies but also advanced economies that are more deeply integrated into the global economic system. Inflation is traditionally defined as a sustained increase in the general price level, which erodes the purchasing power of money over time. Within classical monetary frameworks, inflation is commonly attributed to a monetary imbalance that arises when the growth rate of the money supply exceeds the growth rate of money demand. However, the explanatory power of this perspective has weakened under modern monetary policy frameworks, where central banks primarily conduct policy through nominal interest rate targeting rather than direct control over monetary aggregates. In recent years, beyond the traditional quantity theory of money, theoretical and empirical approaches emphasizing the role of risk perceptions, uncertainty, and expectations have gained increasing prominence. Inflation risk can indirectly influence the effective supply of money by affecting the expected returns on financial assets and thereby shaping portfolio allocation decisions. Consequently, inflation risk has become an important factor in determining both the future trajectory of macroeconomic variables and the formation of inflation expectations among price-setting economic agents (Vasishta and Maier, 2013).

In recent years, the main source of inflation risk has been cyclical global shocks, such as the increased credit volume after the 2008 global financial crisis, and disruptions in production processes and increased input costs due to both credit expansion and bottlenecks in the supply of intermediate goods, particularly energy, in the post-pandemic period. While supply-side factors (bottlenecks and increases in energy prices) have been at the forefront of recent inflation developments, expansionary fiscal and monetary policies triggered by the COVID-19 pandemic have also brought along excess demand. However, there is still no consensus on whether this increase in inflation is more attributable to supply or demand-side factors. One of the main reasons for this is the different economic structures of countries (Ha *et al.*, 2019).

Modern monetary policies are conducted with reaction functions. The response functions vary because of current inflation, inflation expectations, the output gap as an indicator of aggregate supply, and marginal costs (Calvo, 1983; Gali, 2002). Pricing decisions of economic agents are determined by cost plus average mark-up pricing. This policy approach aims to guide current aggregate demand by considering future inflation risks. Today's aggregate demand and inflation risk is determined by fluctuations in input costs and the resulting fluctuations in growth, uncertainties and monetary shocks (Baydur and Süslü, 2015). If the inflation risk is driven by demand shocks, rule-based policies can provide strong and effective responses. However, when supply shocks are the source of the risk, the effect of monetary policy weakens, and inflation expectations become more determinant. In other words, conventional monetary policy reaction functions respond strongly to demand-driven inflation but are weaker against supply-driven inflation (Clarida *et al.*, 2000; Hofmann *et al.*, 2024).

Accordingly, this study aims to reveal whether supply shocks or demand shocks are the main determinants of core inflation and inflation expectations in Turkey in the post-2013 period. Accordingly, the main hypothesis of the study is as follows:

1. *In the post-COVID-19 pandemic period, core inflation and inflation expectations are largely determined by demand-side shocks.*
2. *While demand shocks are expected to have a permanent impact on core inflation and inflation expectations, supply shocks are expected to have a temporary effect on core inflation and inflation expectations.*

This study contributes to the existing literature in three main ways. First, it employs a TVP-VAR model to dynamically assess the short- and long-term impacts of supply and demand shocks on both core inflation and inflation expectations in Turkey. Second,

it applies a connectedness analysis to uncover the directional spillovers and systemic interactions among shocks, offering a network-based interpretation of inflation dynamics. Third, by focusing on the post-2013 period and incorporating structural breakpoints specific to the Turkish economy (2018, 2021, 2023), the study provides a context-sensitive and empirically rich contribution to the macroeconomic inflation literature. The most important contribution of the article is the empirical explanation of the relative roles of demand and supply shocks in driving core inflation and inflation expectations in Turkey, particularly in the post-2013 and post-COVID-19 periods. The use of the TVP-VAR model allows for capturing the changing dynamics of inflation drivers over time, rather than assuming fixed relationships. The article provides dynamic, expectation-sensitive, and policy-relevant evidence on the determinants of inflation in Turkey and fills an important gap in the literature on emerging economies.

The remainder of the paper is organized as follows. Section 2 provides a review of the relevant literature. Section 3 introduces the conceptual model, while Section 4 offers a description of the data and key variables. Section 5 presents the empirical findings and analytical insights. Section 6 concludes the study with a summary of the main results and their broader implications.

2. Literature Review

In open economies, inflation is usually driven by supply-side shocks such as exchange rates and energy prices. The macroeconomic effects of these shocks vary depending on their underlying sources. Inflationary supply shocks can be broadly viewed as mainly nominal supply shocks, oil shocks and technology shocks. However, for developing countries, cost-push shocks cannot be restricted to oil price shocks and technology shocks. Exchange rate shocks and import price shocks are important cost push factors, especially for developing countries. In addition, mark-up pricing behaviour and productivity declines affect headline inflation with a certain lag. Such shocks are generally short-term, and direct intervention with monetary policy instruments may further destabilize inflation. However, if these shocks lead to the indexation of wages and service sector prices, *i.e.* if they become embedded in the economy through indirect effects, supply shocks can become persistent, affecting core inflation and challenging the effectiveness of monetary policy (Bandera *et al.*, 2023; Adolfsen *et al.*, 2024).

One of the main factors that increase the persistence of supply shocks is the deterioration in inflation expectations. If there is an upward trend in inflation expectations, this may lead to a carryover of past inflation into future inflation through price and wage adjustments.

In this case, central banks implement tighter monetary policies regardless of whether inflation is supply or demand driven. Thus, they aim to provide a strong response to ensure price stability. Empirical studies have generally adopted two different approaches based on the Phillips curve and vector autoregression (VAR) models. While the Phillips curve-based studies on the role of global factors are based on models using the global output gap, the VAR-based studies show that global shocks directly contribute to inflation. Altansukh *et al.* (2017) analysed the correlation between domestic and foreign inflation using the generalized least squares (GLS) method in 13 OECD countries for the period 1970–2013. They conclude that the short-term sensitivity of headline inflation to foreign energy inflation has increased significantly, but core inflation has not increased significantly.

In the context of decomposing supply and demand shocks, Eickmeier and Hofmann (2022) and Hofmann *et al.* (2024) conducted structural VAR analyses based on the mean and standard deviation of consumer inflation series for seven upper-income countries to understand whether inflation is supply or demand driven. They adopt the conceptual framework that demand shocks affect both output and inflation in the same direction, whereas supply shocks move these two variables in opposite directions. As a result, especially in the post-COVID-19 period, the combination of contractions in supply and expansions in demand significantly increased inflation, and central banks reacted more strongly to demand-driven inflation than to supply-driven inflation. Galeone and Gros (2023) analysed the relationship between energy price shocks and inflation expectations in the Euro Area with a structural VAR model. In this study, OECD Brent oil prices were used as a supply shock, and the European Central Bank's consumer expectations survey was used as an inflation expectations indicator. The results show that an increase in energy prices has a strong impact on inflation expectations, but a more limited impact on core inflation. Moreover, energy price shocks are found to have only a short-term and low lagged effect. Similar to Galeone and Gros (2023), Usman *et al.* (2024) use an energy uncertainty index as a proxy for supply shocks and find that energy uncertainties, along with industrial production and interest rate uncertainty, act more strongly as cost-push shocks to inflation.

Ascari *et al.* (2024) use the Global Supply Chain Pressure Index as a proxy for supply shocks and find that these shocks have a persistent effect on the increase in headline inflation in the Eurozone in their analysis with a Bayesian structural VAR model. Global supply chain pressures show how important supply-side pressures have become, especially in the post-pandemic period. Ha *et al.* (2023) analysed the effects of global and domestic shocks on inflation using the FVAR method in a study covering 55 countries for the period 1970–2020. The study utilizes oil prices as global supply shocks, demand for goods and services as global demand shocks, and monetary policy, nominal exchange rate and domestic

demand variables as domestic shocks. According to the findings, in the period after 2001, global supply and demand shocks explain about 35% of the variance of inflation, while national shocks explain 65%. This ratio rises to 75% in developing countries. The impact of global shocks on inflation is even more pronounced in advanced economies that are net energy importers.

Firat and Hao (2023), similar to Eickmeier and Hofmann (2022), use a VAR model to classify inflation as supply or demand driven for 32 countries. Accordingly, demand shocks are assumed to move prices and quantities in the same direction, while supply shocks have the opposite effect. In the study, oil prices and the global supply chain are used as supply shocks, while monetary shocks are used as demand shocks. The study finds that demand-side factors make a significant contribution to the first rise in inflation, especially in 2021, while the role of the supply side in creating inflation becomes more pronounced after the first quarter of 2022. They also show that supply-side inflation is more sensitive to oil shocks and supply chain pressures, while demand-side inflation responds more significantly to monetary policy shocks. Similar to Firat and Hao (2023), Shapiro (2024) identifies supply- or demand-side shocks based on the signs of the residuals in price and quantity regressions and analyses the impact of the trend of these shocks on headline and core inflation. Shapiro (2024) constructed two supply- and demand-driven series and identified demand and supply shocks based on the impact of these series on price and quantity. Accordingly, if both price and demand have a positive effect on inflation, it is a demand shock, and if both price and quantity have an opposite effect, it is a supply shock. Looking at the recent inflation trend, he emphasized that it was supply-driven during the COVID-19 period and demand-driven after 2022 (Aktug and Okan, 2024). Moreover, while a negative supply shock has a small but definite effect on core inflation, it has a large effect on headline inflation.

In studies focusing on Turkey, Yazgan and Yilmazkuday (2005) investigated inflation dynamics within the framework of New Keynesian economics. The study concluded that current inflation is driven by the future inflation expectations of price-making economic agents and these expectations are formed by imported input costs and public deficits, while interest costs and the private sector react more sensitively to changes in these costs. Yiğit and Gökçe (2012) analysed the effects of exogenous shocks on core inflation for the period 1988-2011 using the SVAR method. In this study, the prices of imported goods represent supply shocks and the change in the general level of prices represents demand shocks. The findings reveal that demand shocks are determinant in the pass-through of core inflation. Güney and Hasanov (2013) investigated the effects of changes in oil prices on inflation and output in the Turkish economy between 1999–2001. In the study, they emphasized the asymmetric

effect of oil prices. While an increase in oil prices has a positive and significant effect on inflation, a decrease in oil prices does not have a significant effect on inflation. In the study, they characterized the reason for this asymmetric effect of oil prices as taxes.

Yılmaz and Süslü (2018) conclude that cost-push factors have a positive effect on price increases in Turkey, but the effect of the demand factor on price frequency is uncertain. Yılmazkuday (2022) analysed the determinants of inflation with SVAR method in his study covering the period 2005–2021 for the Turkish economy. Inspired by the approach of Glarida *et al.* (2001), this study considers oil prices and exchange rate as the main determinants of inflation. In addition, the CBRT policy rate and the unemployment rate are also included in the model. According to the results, the impact of the policy rate on inflation is negative in the long run, while the impact of oil prices and exchange rate is more positive in the long run. Kocaoğlu (2023) analysed the main determinants of inflation in the Turkish economy between 2000 and 2021 within the framework of the New Keynesian approach. In the study, the effects of Brent oil prices, output gap and exchange rate on Consumer Price Index (CPI) were analysed with the QARDL model. The study concludes that oil prices and the output gap have a significant impact on the CPI, which is attributed to the increasing effect of import price elasticity on input costs.

While the present study captures demand-side pressures through the proxy of aggregate commercial bank credit, it is important to recognise that credit expansion in emerging market economies is often closely linked to prevailing fiscal conditions. Rising public deficits may lead to fiscal dominance, which undermines central bank autonomy and weakens the effectiveness of conventional monetary policy instruments. In such circumstances, expansionary fiscal policies not only stimulate aggregate demand, but may also hinder the transmission mechanism of contractionary monetary policy. Consequently, a comprehensive assessment of the persistence of demand shocks requires careful consideration of the interaction between fiscal policy and monetary conditions. In this context, the degree of coordination – or potential tension – between sovereign debt management and monetary policy frameworks becomes a critical determinant of macroeconomic stability and inflation dynamics (Blanchard, 2019).

3. Model

The study constructs two separate models: The first is the core inflation model, which includes core inflation. The second is the inflation expectations model.

Model 1: (Core inflation model)

$$\text{Core Inf} = \alpha + \beta_1 \text{Commercial Bank Credit (Demand Shock)}_t + \beta_2 \text{Energy Prices (Supply Shock)}_t + \varepsilon_t \quad (1)$$

Model 2: (Inflation expectation model)

$$(\pi^e) = \alpha + \beta_1 \text{Commercial Bank Credit (Demand Shock)}_t + \beta_2 \text{Energy Prices (Supply Shock)}_t + \varepsilon_t \quad (2)$$

Core inflation (*Core Inf*) stems from households' and firms' long-term expectations about inflation and contracts that regulate the wage-price relationship. Another use of core inflation is the rate of change in CPI excluding food and energy. The idea is that this measure may be a better indicator of future inflation than looking at headline inflation. In other words, it refers to the long-term or permanent component of the measured price index (Smith, 2004). These indicators are frequently used by central banks, whose main task is price stability, to monitor the underlying trend of inflation. Therefore, it is an indicator that can be guided by monetary policy and is free from (temporary) shocks other than monetary policy and is an ideal indicator for analysing the effects of monetary policy (Bryan and Cecchetti, 1993; Atuk *et al.*, 2011).

Inflation expectations (π^e) are an indicator of inflation uncertainty and, as they are the determinant of future prices and wages, they are an important indicator of the credibility of the inflation target for both price-making economic agents and central banks. Inflation expectations are a function of past realized inflation and the risk premium. There is a bidirectional causality relationship between inflation expectation and inflation uncertainty, and social welfare will decrease as inflation uncertainty increases (Soybilen and Yazgan, 2017; Gülşen and Kara, 2019).

4. Methodology and data description

Within the framework of the hypotheses put forward in the study, firstly, the breaks in both core inflation and inflation expectations will be calculated. According to these break dates, the short and long-run effects of demand and supply shocks on both variables will be analysed with TVP-VAR model. Then, the direction of the relationship between core inflation, demand shocks and supply shocks will be analysed by means of correlation analysis. As mentioned above, demand shocks are expected to have a permanent effect on core inflation and inflation expectations, while supply shocks are expected to have a temporary effect on core

inflation and inflation expectations. In this context, it will be analysed whether the CBRT's tight monetary policy is the right policy choice.

4.1 Methodology

To capture the time-varying nature of inflation dynamics, this study employs the TVP-VAR model originally proposed by Primiceri (2005). Unlike conventional VAR models that assume constant parameters, the TVP-VAR allows coefficients and error variances to evolve over time, enabling the analysis to account for structural changes, regime shifts, and evolving monetary transmission mechanisms in Turkey's inflation process.

The general form of the model is expressed as:

$$\mathbf{Y}_t = B_{0,t} + \mathbf{B}_{1,t}\mathbf{Y}_{t-1} + \mathbf{B}_{2,t}\mathbf{Y}_{t-2} + \varepsilon_t, \quad \varepsilon_t \sim N(0, \Sigma_t) \quad (3)$$

where $\mathbf{Y}_t$ is a vector of endogenous variables including core inflation, inflation expectations, credit growth, and energy prices. According to the lag selection criteria reported in Table 2, the TVP-VAR model is estimated with two lags. $B_{0,t}$ represents time-varying intercepts, while $\mathbf{B}_{1,t}$ and $\mathbf{B}_{2,t}$ denote matrices of time-varying autoregressive coefficients. The term ε_t represents the vector of innovations with a zero mean and a time-varying variance-covariance matrix:

$$\Sigma_t = \mathbf{S}_t \mathbf{H}_t \mathbf{S}_t' \quad (4)$$

where $\mathbf{S}_t$ is a lower-triangular matrix capturing contemporaneous relationships among shocks, and $\mathbf{H}_t$ is a diagonal matrix containing the stochastic volatilities of each equation (Cogley and Sargent, 2005; Nakajima *et al.*, 2011).

The model assumes that all time-varying parameters follow random walk processes, allowing for gradual but persistent structural evolution. Specifically:

$$\mathbf{B}_t = \mathbf{B}_{t-1} + \xi_t, \quad \xi_t \sim N(0, \mathbf{Q}) \quad (5)$$

where $\mathbf{B}_t$ represents the vector of evolving coefficients, and $\mathbf{Q}$ is the covariance matrix governing the degree of parameter variability. This structure ensures that coefficients can adapt in response to major economic or policy shifts, such as changes in monetary regimes or external shocks.

Estimation is carried out in a Bayesian framework, which combines prior information with the likelihood function to obtain posterior distributions of all parameters. The Gibbs sampling algorithm and Kalman filter are jointly used to estimate the time-varying coeffi-

cients and stochastic volatilities. The Kalman filter recursively updates the state variables given the observed data, while the Gibbs sampler iteratively draws from conditional posteriors, ensuring stable convergence and efficient inference in high-dimensional systems¹.

After estimating the TVP-VAR, we extend the analysis with the connectedness approach of Diebold and Yilmaz (2012) to assess the direction and magnitude of spillovers among variables. Using forecast error variance decomposition (FEVD), this method quantifies how much of each variable's forecast error variance is explained by shocks to others, yielding the Total Connectedness Index (TCI) and directional measures of transmission (to- and from- connectedness).

This integrated Bayesian TVP-VAR framework is particularly suitable for the Turkish economy, where inflation dynamics have undergone frequent regime shifts, structural breaks, and policy transitions. By allowing the parameters and volatilities to vary over time, the model provides a comprehensive view of how inflation expectations and core inflation respond to evolving macroeconomic shocks and policy interventions. During the sample period, the Turkish economy experienced several significant macroeconomic shocks and policy changes. These included the 2018 exchange rate crisis, economic disruptions caused by the COVID-19 pandemic, and subsequent changes to monetary policy frameworks and interest rates. Furthermore, fluctuations in global energy prices and domestic credit expansion exerted additional pressure on inflation dynamics. Together, these developments emphasise the necessity of a time-varying framework capable of capturing the evolving relationships between inflation, expectations, and macroeconomic shocks.

4.2 Data Set

Our main data set is monthly, and the sample period is between 2013M01 and 2024M03. Since the CBRT has been publishing the survey of expectations since 2013, the analysis starts from this date. Inflation expectations, core inflation, total commercial bank loans and Brent oil data are obtained from the CBRT Data Distribution System.

For inflation expectations, we use economic agents' expectations for the twelve-month-ahead annual CPI inflation. For core inflation, the CBRT's consumer price index (CPI) indicator that excludes energy, food and non-alcoholic beverages, alcoholic beverages, tobacco products, and gold is used.

According to Lavoie (2006) and Hein (2023), aggregate demand is primarily driven by credit-financed consumption, housing investment, government spending and exports.

¹ Detailed equations and prior settings are available upon request.

In this framework, aggregate credit volume is used as an indicator of demand shocks. While the literature identifies various factors that can cause demand shocks, such as consumption, housing investment, government spending and exports, credit growth reflects the financing of household consumption and housing investments, thereby providing an indication of the overall demand conditions in the economy. Furthermore, the credit channel plays a pivotal role in the monetary transmission mechanism in Turkey, rendering bank lending a pertinent indicator of demand-driven inflationary pressures. Additionally, fiscal policy variables, such as government spending, may influence demand conditions; however, their effects are partly reflected in credit expansion and domestic demand dynamics. Therefore, aggregate credit growth provides a useful proxy for capturing overall demand-side pressures in the Turkish economy.

Brent crude oil prices are used to represent supply shocks and proxy global energy price shocks, following Bandera *et al.* (2023) and Hofmann *et al.* (2024). In the empirical analysis, global energy prices are represented by Brent crude oil prices, a widely used indicator of global energy cost shocks in the macroeconomic literature. To ensure the robustness of the results, alternative indicators of supply shocks are also considered in additional estimations. Imported intermediate goods prices and the real output index are used as alternative measures of supply shocks. The results are reported in Appendix A.

5. Empirical results and analyses

5.1 Descriptive statistics

Considering that the basic data series used in this study are all time series, it is vital to implement stationarity tests on each data set. We adopt the Augmented Dickey–Fuller (*ADF*) and Phillips–Perron (*PP*) tests to determine the stationarity. As we can see in Table 1, all series contain unit roots at level values. Therefore, based on the assumption that the variables should be stationary in VAR analysis, all variables are included in the analysis after being stationary by taking their first differences. As shown in Table 2, the optimal number of lag lengths for constructing the TVP-VAR model is identified by calculating the log-likelihood ($\log L$), sequential modified LR test statistic (LR), final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion / Bayesian information criterion (SC) and Hannan–Quinn information criterion (HQ). According to the minimum value of SC, the optimal lag length is set to 2.

Table 1: Stationarity test

Variable	<i>CORE</i>	Δ <i>CORE</i>	<i>EXP</i>	Δ <i>EXP</i>	<i>CREDIT</i>	Δ <i>CREDIT</i>	<i>ENERGY</i>	Δ <i>ENERGY</i>
<i>ADF</i>	-1.03	-6.67***	-2.59	-8.99***	-2.24	-9.25***	-2.53	-9.99***
<i>PP</i>	-1.16	-7.27***	-2.64	-9.05***	-2.12	-9.30***	-2.38	-9.83***

Notes: *** denotes statistical significance at 1% level. A linear trend and an intercept are included in the test equations. Δ denotes the first difference operator.

Source: Authors' own calculations

Table 2: Lag selection results

Lag	log L	LR	FPE	AIC	SC	HQ
Panel A: Estimates for the set (<i>CORE</i>, <i>CREDIT</i>, <i>ENERGY</i>)						
0	708.584	NA	5.79e-09	10.453	-10.388	-10.426
1	770.573	120.304	2.64e-09	-11.238	-10.979	-11.133
2	795.589	47.437	2.08e-09	-11.475	-11.023*	-11.291*
3	801.279	10.536	2.19e-09	-11.426	-10.780	-11.164
4	817.562	29.430	1.97e-09	-11.534	-10.694	-11.193
5	826.903	16.468	1.96e-09	-11.539	-10.506	-11.119
6	838.188	19.393*	1.90e-09*	-11.573*	-10.346	-11.074
Panel B: Estimates for the set (<i>EXP</i>, <i>CREDIT</i>, <i>ENERGY</i>)						
0	524.049	NA	8.92e-08	-7.719	-7.654	-7.693
1	554.680	59.446	6.47e-08	-8.039	-7.781	-7.934
2	585.210	57.893	4.71e-08	-8.358	-7.906*	-8.175
3	603.523	33.913	4.10e-08	-8.496	-7.851	-8.234*
4	612.385	16.016	4.11e-08	-8.494	-7.655	-8.153
5	624.998	22.236*	3.91e-08*	-8.548*	-7.515	-8.128
6	631.669	11.464	4.05e-08	-8.513	-7.286	-8.015

Note: * indicates the optimal lag order determined by the corresponding method.

Source: Authors' own calculations

5.2 Model estimation results and diagnosis

First, the Bai–Perron multiple break test is used to calculate the break years for both core and inflation expectations. This study identifies three structural breaks, two of which correspond to major events: The change of administration in July 2018 (2018M07) and the COVID-19 period in August 2021 (2021M08). In addition, May 2023 (2023M05) is identified as the third break point and included in the model along with the other break dates². The transition to a presidential system in 2018 marked a significant turning point in Turkey’s economic governance and monetary policy framework. This institutional shift reshaped the policy environment and altered the operational context of economic authorities. During this period, a greater reliance on heterodox policy approaches and a shift toward shorter-term policy horizons emerged, accompanied by heightened volatility in sovereign risk indicators.

This period also coincided with a severe exchange rate crisis, as well as a sharp increase in inflation and inflation expectations. These developments were accompanied by significant exchange rate volatility and changes in monetary policy, contributing to fluctuations in inflation dynamics. Consequently, credit dynamics, inflation behaviour and the formation of expectations were all significantly affected, making this period a relevant structural break for the analysis. Considering the break dates, the short and long-term effects of supply and demand shocks on both core inflation and inflation expectations will be analysed with the TVP-VAR analysis.

Table 3 presents the estimates of the parameters selected in the TVP-VAR model with the MCMC algorithm. The results are obtained by drawing 10,000 draws from the posterior after discarding the first 1,000 samples. In each panel, we present estimates for trivariate TVP-VAR models, including those for core inflation, banking sector lending, and global energy prices (*CORE*, *CREDIT*, and *ENERGY*), as well as those for inflation expectations, banking sector lending, and global energy prices (*EXP*, *CREDIT*, and *ENERGY*).

Before estimating the TVP-VAR model using the Bayesian method, it is important to assign initial values to the parameters. As reported in Table 3, both Panel A (which includes core inflation, credit and energy variables) and Panel B (which includes inflation expectations instead of core inflation) show that the posterior mean values of the parameters lie within the 95% credible intervals. In both panels, the Geweke convergence diagnostic values fail to reject the null hypothesis at the 5% significance level, indicating that the Markov chains have properly converged to the posterior distribution. Additionally, inefficiency fac-

2 Owing to space limitations, the detailed Bai–Perron multiple structural break test results are not reported here. However, they are available from the authors upon request.

tors are generally low across parameters in both panels suggesting that a sufficient number of uncorrelated and effective samples were obtained. These findings confirm that the Bayesian estimation procedure has been carried out successfully and aligns with prior studies such as Hu *et al.* (2023) and Mumtaz and Theophilopoulou (2020).

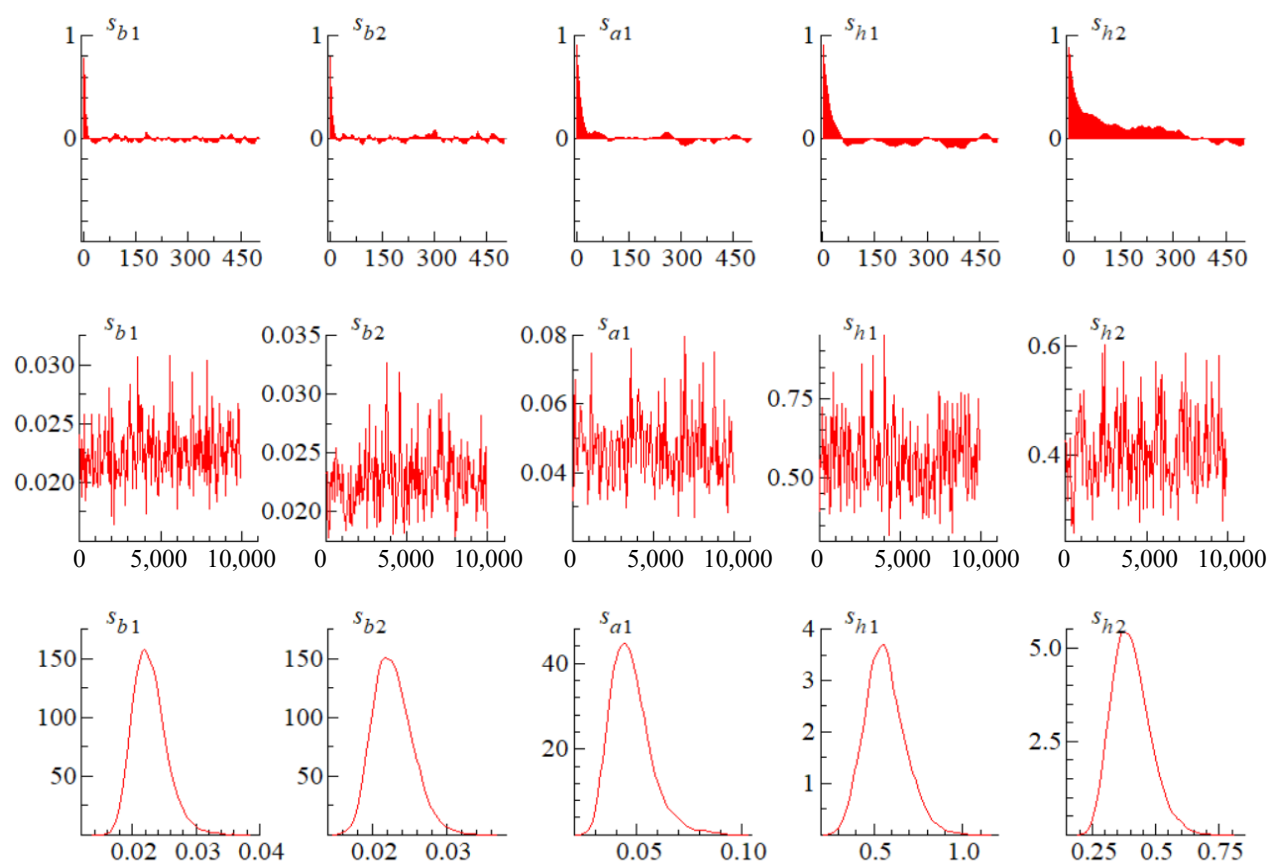
Table 3: Estimation results for selected parameters in the TVP-VAR model

Parameter	Mean	Std. dev.	95%L	95%U	Geweke	Inef.
Panel A: Estimates for the set (CORE, CREDIT, ENERGY)						
s_{b1}	0.0227	0.0027	0.0184	0.0287	0.159	6.41
s_{b2}	0.0228	0.0026	0.0183	0.0286	0.841	9.63
s_{a1}	0.0471	0.0097	0.0322	0.0705	0.717	27.08
s_{h1}	0.5643	0.1135	0.3645	0.8078	0.891	22.66
s_{h2}	0.4044	0.0738	0.2801	0.5698	0.997	78.55
Panel B: Estimates for the set (EXP, CREDIT, ENERGY)						
s_{b1}	0.0226	0.0026	0.0183	0.0284	0.590	9.03
s_{b2}	0.0228	0.0027	0.0183	0.0288	0.578	9.28
s_{a1}	0.0464	0.0096	0.0318	0.0694	0.826	27.36
s_{h1}	0.5617	0.1248	0.3555	0.8376	0.569	35.51
s_{h2}	0.4547	0.0767	0.2949	0.5965	0.102	65.37

Notes: Mean: posterior means, Std.dev: standard deviations, 95%L: 95% lower credible interval limit, 95%U: 95% upper credible interval limit, Geweke: Geweke convergence diagnostics statistics, and Inef: inefficiency.

Source: Authors' own calculations

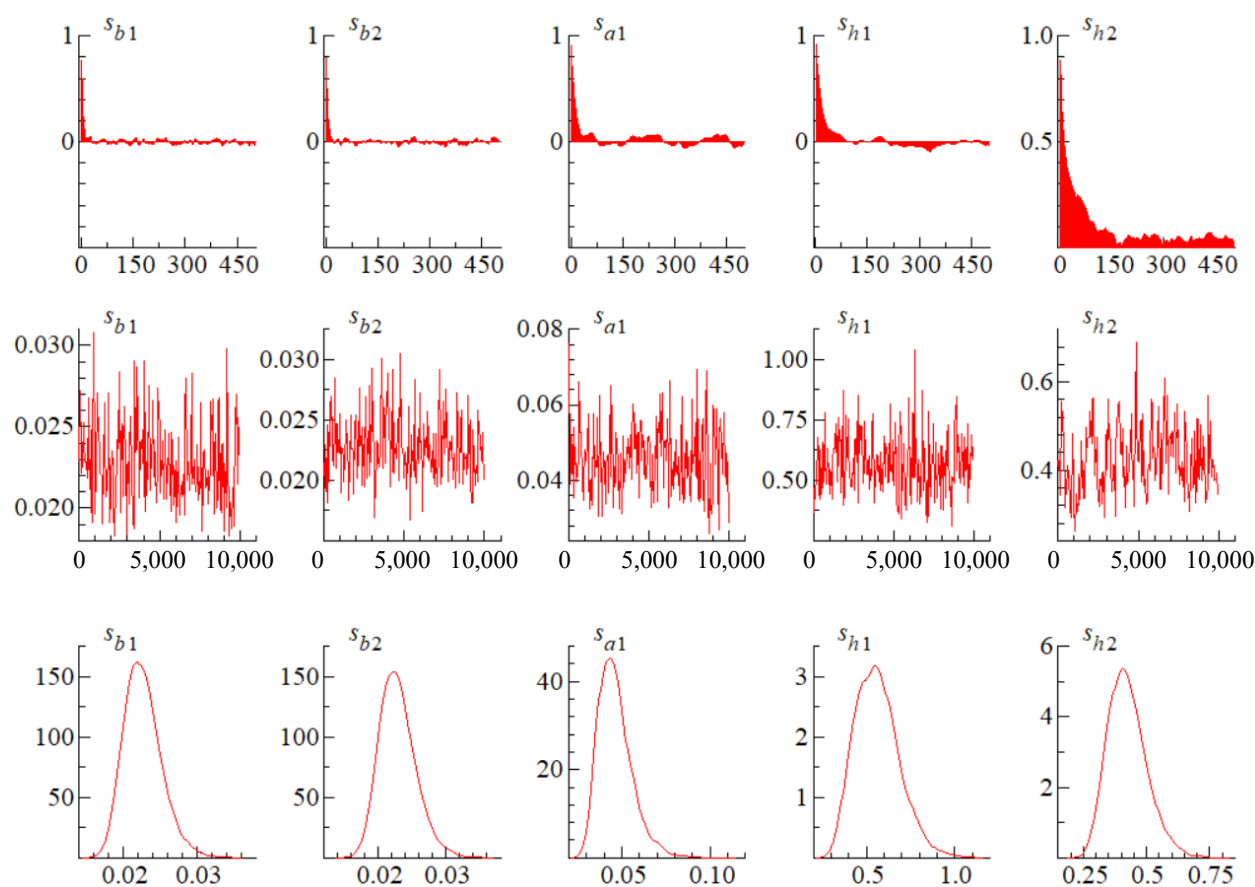
Figure 1: Estimation results for selected parameters in the TVP-VAR model for the set (CORE, CREDIT, ENERGY)



Note: Sample autocorrelations (top), sample paths (middle) and posterior densities (bottom).

Source: Authors' own elaboration

Figure 2: Estimation results for selected parameters in the TVP-VAR model for the set (*EXP, CREDIT, ENERGY*)



Note: Sample autocorrelations (top), sample paths (middle) and posterior densities (bottom).

Source: Authors' own elaboration

Figures 1 and 2 present the diagnostic plots for the Bayesian estimation of the TVP-VAR model parameters for the core inflation and inflation expectations equations, respectively. These include sample autocorrelation functions, MCMC sample paths, and posterior density plots. Overall, the results indicate that the MCMC estimation procedure has been successfully implemented. The sample autocorrelation functions show a rapid decline toward zero, suggesting that the chains quickly reach stationarity and that the samples are largely uncorrelated. The sample paths for all parameters exhibit stable fluctuations around their means without any visible trends or drifts, indicating convergence and proper mixing. The posterior density plots are unimodal and well-shaped, implying that the posterior distributions are well-defined. Overall, these diagnostics confirm that the MCMC estimation is statistically reliable and that the generated samples are valid and effective for inference in both the core inflation and inflation expectations equations.

5.3 Time-varying effects of demand and supply shocks on core inflation

In this study, we analyse the time-varying effects of Brent oil prices representing supply shocks and commercial bank loans representing demand shocks on core inflation through the TVP-VAR model. Additionally, we set the time varying impulse response as a lag of 4 periods (4 months), 8 periods (8 months) and 12 periods (one year), representing short-term, medium-term and long-term respectively.

An analysis of the impact of supply shocks on core inflation in the top panel of Figure 3 reveals a significant increase at the end of 2016 and especially in 2017. In this period, the effects were higher in short-term projections (4-month forecasts), while the effects remained relatively more limited in the medium and long term. In this period, global increases in energy prices had a significant impact on core inflation in Turkey. However, it is noteworthy that this effect was temporary and gradually diminished in the following years. In the post-2018 period, the volatility in energy prices has almost no effect on core inflation, suggesting that the structure of supply-side shocks may have changed or that the energy dependence in the composition of core inflation has decreased. Similar to Yürük and Akgül (2024) and Aktug and Akarsu (2024), the fact that the effects are close to zero, especially in the post-2020 period, indicates that supply-side effects had limited spillovers to prices after the pandemic. Furthermore, the predominance of short-term effects indicates that the impact of supply shocks on inflation is limited in terms of time.

The bottom panel shows the impact of demand shocks, *i.e.* endogenous dynamics such as credit growth, on core inflation. This effect has been positive and persistent throughout the entire period and increased particularly between 2016 and 2018. The revival in domestic demand driven by credit expansion put upward pressure on core inflation. In this period, the impact of financial expansion policies on inflation was quite strong. It is noteworthy that this effect has diminished somewhat since the pandemic period but still persists. This indicates that the impact of demand shocks on core inflation is more persistent than that of supply shocks. is longer-term and more persistent than supply shocks. This highlights the importance of the credit channel in guiding monetary policy (Banbura *et al.*, 2023).

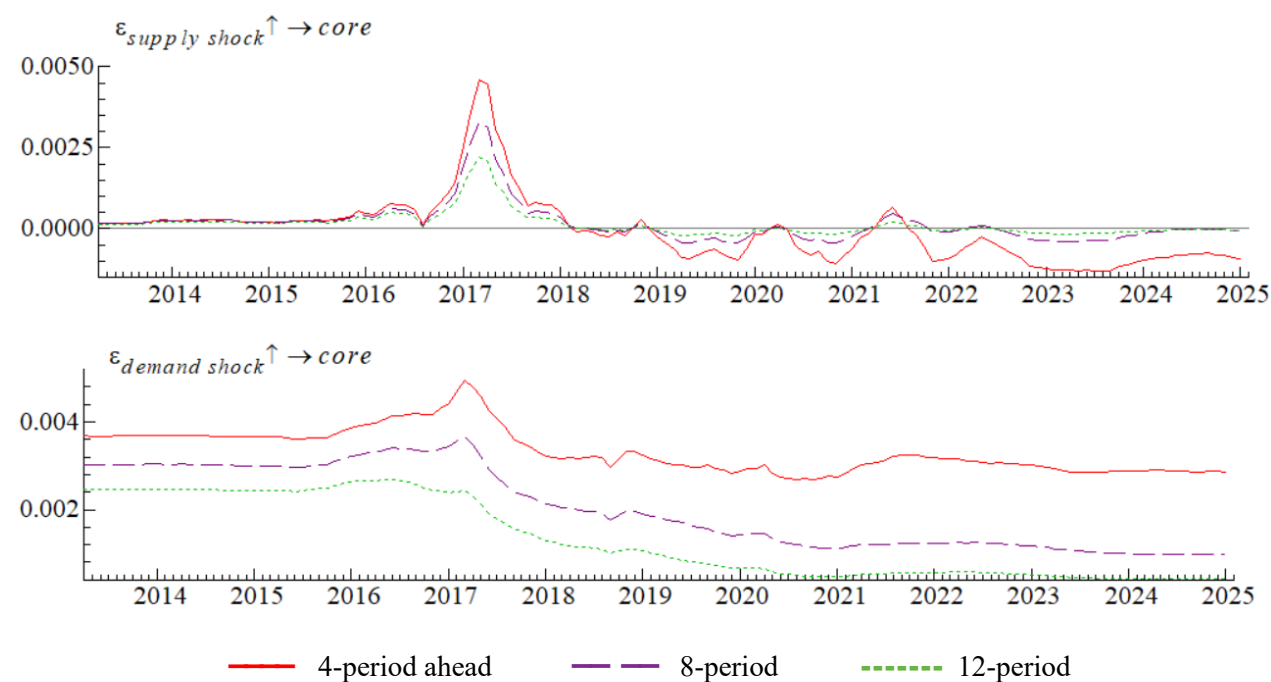
Overall, the analysis shows that core inflation is mostly affected by demand-side factors over time, while supply-side shocks have temporary effects in certain periods. While 2017 stands out as a turning point in terms of both shocks, it is understood that in the post-2020 period, demand-driven pressures on core inflation mostly persisted, while supply effects gradually weakened. This suggests that the fight against inflation, especially in recent years, should focus more on credit expansion and domestic demand dynamics.

Figure 4 shows the pulse response of the core inflation to the shock of demand and supply at three points in time. In other words, the figure shows how the response of inflation to supply shocks and demand shocks changes over time. As shown in Figure 4, the responses of core inflation to supply and demand shocks have changed significantly over time. Supply shocks, which represent energy prices, had a short-lived and limited upward impact on core inflation as of 2018. In this period, the pass-through of supply-driven cost pressures to inflation remained limited and the impact of the shock quickly faded. However, the impact of supply shocks became more pronounced during the exit process from the pandemic in 2021. In this period, the rise in energy prices had a temporary but negative impact on core inflation. This suggests that the rise in energy prices, while raising production costs, weakened the net inflationary impact by suppressing domestic demand. By 2023, the impact of energy price shocks on core inflation had weakened considerably, becoming almost neutral. This is likely to be explained by a stronger monetary policy, more effective expectations management, and potentially reduced sensitivity of the economy to energy price fluctuations.

On the other hand, an analysis of the effects of credit growth, which represents demand shocks, on core inflation reveals a rather strong and persistent effect in 2018. In this period, increases in bank loans stimulated domestic demand, which directly increased inflationary pressure. However, this relationship weakens over time. In 2021 and 2023, although the effect of credit expansion on core inflation is evident in the first phase, it disappears much sooner. This suggests that the effectiveness of the demand channel has weakened and the pass-through of credit growth to inflation has become more limited compared to the past. This change may be related to both the tightening of macroprudential policies and the change in the credit access behaviour of households and firms.

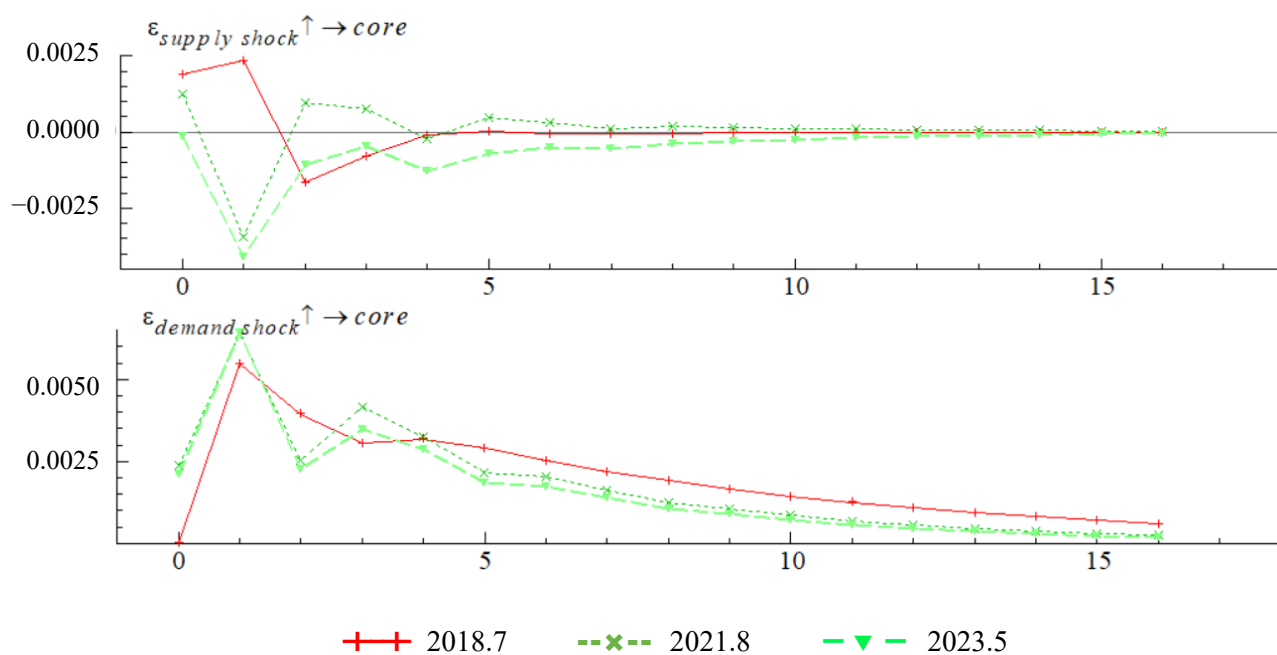
Overall, the figure reveals that core inflation has been more sensitive to credit expansion than energy prices over the last five years, but this sensitivity has also diminished over time. This suggests that monetary policy can be used more effectively in the fight against inflation by targeting the credit channel, while energy-driven price pressures have remained relatively limited in the recent period. Therefore, this structural transformation shaped by economic disruptions points to an inflation structure that requires policymakers to give more weight to demand-side instruments.

Figure 3: Time-varying impulse responses to demand and supply shocks in core inflation at different lag periods



Source: Authors' own elaboration

Figure 4. The impulse responses of core inflation to supply and demand shocks at different time points



Source: Authors' own elaboration

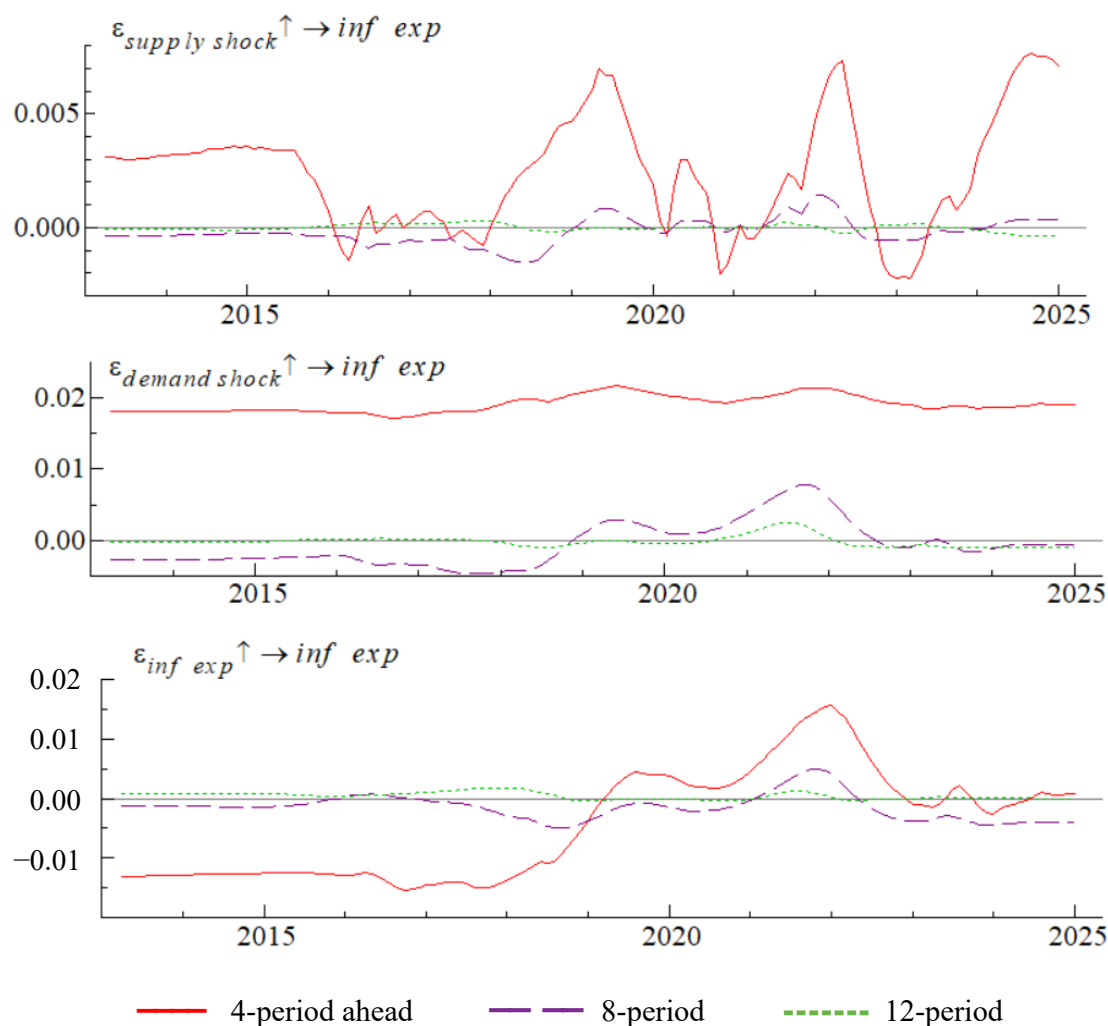
5.4 Time-varying effects of demand and supply shocks on inflation expectations

In this section, we investigate the time-varying effects of demand and supply shocks on inflation expectations at different lag periods. The results of Figure 5 show that the effect of supply shocks (energy prices) on inflation expectations increased significantly in the period after 2019, especially in the short run (4 periods). This increase is consistent with the global fluctuations in energy prices and the supply-side uncertainties after 2021. The 8- and 12-period effects are flatter and more limited. This suggests that although supply shocks (the rise in energy prices) have a strong impact on inflation expectations in the short term, this effect rapidly diminishes over time.

On the other hand, Figure 5 shows that the impact of demand shocks (commercial bank loans) on inflation expectations has been quite high and stable in the short term (4-month), especially since 2014. This suggests that credit expansion has a persistent upward impact on inflation expectations through demand-side pressures. Especially during the pandemic period, medium (8-month) and long-run (12-month) expectations increased, which supports the conclusion that credit expansion has a more permanent effect over time.

The bottom panel of Figure 5 analyses how changes in past inflation expectations affect the future. Here, we observe that the 4-period effect moves sharply upwards from below zero and becomes positive in the post-2019 period. This suggests that past inflation expectations increasingly affect forward-looking expectations and that a kind of self-feeding mechanism has developed in expectation formation. Especially after 2020, these effects have become more pronounced.

Overall, energy prices had a short-term and volatile effect on inflation expectations, while credit growth had a more sustained and permanent effect. On the other hand, the effect of past expectations on future expectations has increased significantly in recent years. This increases the importance of expectations management for economic policy.

Figure 5: Time-varying impulse responses to demand and supply shocks in inflation expectations at different lag periods

Source: Authors' own elaboration

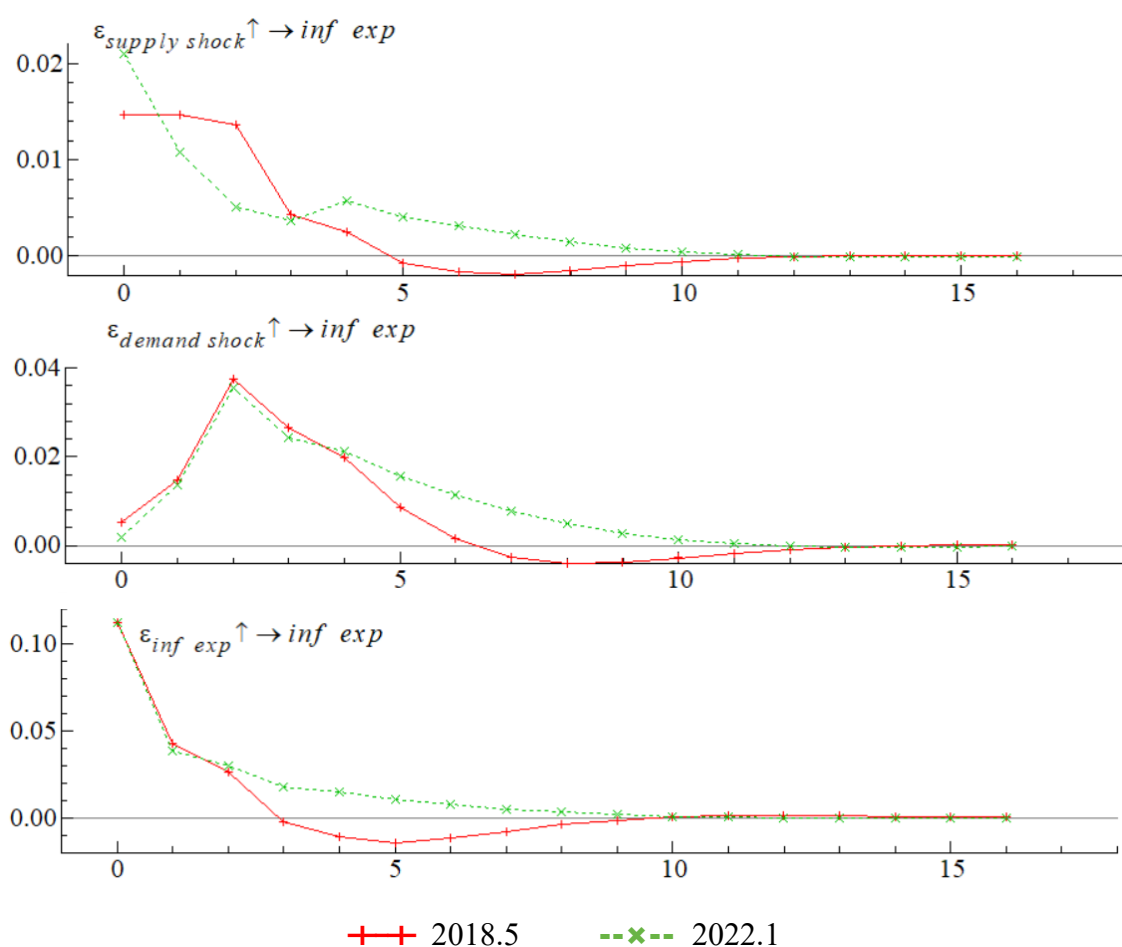
According to the results of the impulse-response analysis in Figure 6, the impact of supply shocks (an increase in energy prices) on inflation expectations was more limited in the 2018M05 period, while the effects started at a higher level and became more persistent in the 2022M01 period. This suggests that global supply shocks in energy markets after 2021 have exerted more significant and longer-lasting pressures on inflation expectations compared to the past. Geopolitical developments and sharp increases in energy prices after 2022 led to a more persistent deterioration in expectations.

The impact of demand shocks (credit expansion) in Figure 6 shows a similar initial rise in both the 2018M05 and 2022M01 periods, but a longer-term and slower decline in the 2022M01 period. This suggests that the impact of credit expansion on inflation expectations has become more resilient over time and demand-side pressures have had a more lasting impact.

Finally, an analysis of the effect of the change in past inflation expectations on future expectations reveals that in both periods (2018M05 and 2022M01), this effect is initially very high and declines over time. However, it is noteworthy that this effect is more prolonged in the 2022M01 period. This suggests that expectations formation is increasingly based on its own past, *i.e.* expectations are formed adaptively and carried forward into the future.

As a result, as of 2022M01, the effects of both supply and demand shocks on inflation expectations have become stronger and longer-lasting compared to 2018M05. At the same time, the impact of past expectations on future expectations has also increased. This suggests that expectations management has become more difficult and the need for the credibility of monetary policy has increased. This persistence in inflation expectations suggests that economic agents have become more sensitive to current and past price dynamics and have started to act more cautiously accordingly.

Figure 6: The impulse responses of inflation expectations to supply and demand shocks at different time points



Source: Authors' own elaboration

5.4 Connectedness Analysis

This part of the study presents empirical findings on the connectedness relationships among core inflation, demand shocks, and supply shocks within a network framework. To this end, the average total connectedness measures are obtained, as reported in Table 4. The diagonal elements represent own-variable shocks, while the off-diagonal elements capture the extent of spillovers across variables. Each row shows how much of the forecast error variance of a given variable is explained by shocks from the others, while each column reflects the contribution of that variable to the forecast error variance of the rest. The net spillover values in the bottom row indicate whether a variable act as a net transmitter (positive value) or a net receiver (negative value) of shocks within the system.

Table 4: Connectedness Table

	Core inflation	Demand Shock	Supply Shock	FROM
Core inflation	79.79	12.17	8.05	20.21
Demand Shock	10.59	86.04	3.37	13.96
Supply Shock	7.26	3.24	89.50	10.50
TO	17.85	15.41	11.42	44.68
Inc.Own	97.63	101.45	100.91	TCI
NET	-2.37	1.45	0.91	42.34

Note: We use a 100-day rolling window to estimate the connectedness measures, consistent with the standard in the literature. (Diebold and Yilmaz, 2012). As a robustness check, we repeated the connectedness analysis using rolling window sizes of 50 and 75. The results were largely consistent with those obtained using the 100-observation window, confirming the stability and reliability of the connectedness measures.

Source: Authors' own calculations

According to the results in Table 4, demand shocks and supply shocks act as net shock transmitters (*i.e.*, they have positive net spillover values), whereas core inflation functions as a net shock receiver (*i.e.*, it has a negative net spillover value). Specifically, core inflation contributes 20.21% of its forecast error variance to other variables, while it receives 17.85% from them, resulting in a net spillover of -2.37%, which confirms its role as a net receiver of shocks. In contrast, demand shocks exhibit a net spillover of 1.45%, suggesting they are mild net transmitters. Similarly, supply shocks also act as net transmitters, with a net spillover of 0.91%.

These results provide valuable insights into the determinants of core inflation. The finding that core inflation functions as a net receiver of shocks implies that it is primarily influenced by external factors – namely, demand and supply shocks – rather than exerting significant influence over them. In other words, core inflation appears to be largely shaped by the transmission of macroeconomic shocks from other parts of the system, indicating its reactive rather than dominant role within the network. This suggests that core inflation is not an isolated or self-driven process but is instead highly sensitive to fluctuations in demand and supply conditions. Therefore, when designing monetary policy, particular attention should be paid to developments in these areas, as play a central role in determining core inflation dynamics.

Table 5: Connectedness Table

	Inflation expectations	Demand Shock	Supply Shock	FROM
Inflation expectations	85.06	5.50	9.44	14.94
Demand Shock	7.83	88.89	3.27	11.11
Supply Shock	8.63	3.15	88.22	11.78
TO	16.46	8.65	12.71	37.82
Inc.Own	101.53	97.54	100.93	TCI
NET	1.53	–2.46	0.93	44.62

Note: We use a 100-day rolling window to estimate the connectedness measures, consistent with the standard in the literature (Diebold and Yilmaz, 2012). As a robustness check, we repeated the connectedness analysis using rolling window sizes of 50 and 75. The results were largely consistent with those obtained using the 100-observation window, confirming the stability and reliability of the connectedness measures.

Source: Authors' own calculations

Table 5 illustrates the dynamic connectedness between inflation expectations, demand shocks, and supply shocks. Inflation expectations emerge as a net shock transmitter, with a net connectedness score of +1.53. This indicates that inflation expectations influence both demand and supply shocks, particularly exerting stronger effects on supply-side disturbances (9.44%) and to a lesser extent on demand shocks (5.50%). Such findings suggest that inflation expectations are not merely passive reflections of macroeconomic conditions but function as active drivers that shape pricing, production, and consumption behaviour

in the present. In other words, forward-looking beliefs about inflation shape firms' pricing decisions and cost anticipations, which in turn contribute to supply-side volatility. Similarly, consumers and investors adjust their spending and investment behaviour based on these expectations, creating demand-side fluctuations. Demand shocks, in contrast, appear to be net receivers of influence (-2.46), indicating their vulnerability to other macroeconomic forces, especially inflation expectations and supply-side developments. Supply shocks are also affected by external dynamics, particularly inflation expectations, yet show a slightly positive net position ($+0.93$), indicating a mild transmitting role. Additionally, the Total Connectedness Index (TCI), calculated as 44.62%, implies that more than 44% of the variability in the system is driven by interactions among the variables, rather than by their own internal dynamics. Overall, Table 5 highlights the pivotal role of inflation expectations as a forward-looking driver within the macroeconomic environment. This reinforces the notion that expectations are not just outcomes but critical inputs in the formation of economic realities. For policymakers, especially central banks, these findings emphasize the strategic necessity of effective communication, transparency, and credibility to anchor expectations and prevent self-fulfilling inflationary cycles.

6. Conclusion

After 2017, inflation tends to rise, particularly in developing economies. The main reason for this is the existence of large fiscal deficits or high public debt, which leads to fiscal dominance, supply shocks stemming from cost increases in the agricultural sector, which has a large share in the economy due to frequent supply processes, and asymmetric information created by shallow credit and other financial markets, which adversely affects monetary policy transmission (Avci and Süslü, 2023). Rapidly expanding global supply chains have led to global supply and demand shocks as well as commodity price fluctuations through global input-output linkages and global labor markets and to cointegration in national inflation rates. Indeed, Ha (2019) finds that global demand shocks have accounted for most of the variation in global inflation since 2008, while oil price fluctuations have accounted for 60 percent since 2010.

Our findings reveal that demand shocks exert a protracted influence on both core inflation and inflation expectations, with backward-looking expectations increasingly governing forward price-setting dynamics. While the Central Bank of the Republic of Turkey's (CBRT) contractionary monetary policy represents a suitable primary instrument to counteract demand-driven pressures, the persistent inertia in inflation expectations highlights the structural constraints of relying solely on the credit channel for transmission macroeconomic

shocks rarely generate systemic inflation in isolation; rather, their persistence is fundamentally mediated by the coordinated institutional policy mix and the consequent formation of economic agents' perceptions. Executing monetary tightening in the absence of stringent fiscal discipline amplifies the risk of fiscal dominance, ultimately eroding the central bank's credibility and its capacity to firmly anchor expectations. Consequently, the attenuation of demand-driven inflationary pressures transcends the exclusive mandate of the CBRT. Ensuring long-term price stability necessitates a cohesive macroeconomic framework wherein robust fiscal rules and prudent public debt management are rigorously synchronized with monetary contraction (Blanchard, 2004).

The aim of this study is to reveal whether supply and/or demand shocks are the source of the rising inflation in the Turkish economy after 2013. Accordingly, our main hypothesis is that in the post-COVID-19 pandemic period, core inflation and inflation expectations are largely determined by demand-side shocks. Moreover, demand shocks are expected to have a permanent effect on core inflation and inflation expectations, while supply shocks are expected to have a temporary effect on core inflation and inflation expectations. To test this hypothesis, the study first applied Bai-Perron break tests and then used TVP-VAR analysis based on these break tests. Finally, the link between supply and demand shocks in both core inflation and inflation expectations is revealed through Connectedness Analysis.

As a result of the analysis, it is concluded that supply shocks affect both core inflation and inflation expectations as in Yilmazkuday (2022) and Kocaoğlu (2023), but this effect is short-term, whereas demand shocks, as in Shapiro (2024), show that core inflation in 2020 is mostly affected by demand-side factors over time, while supply-side shocks have temporary effects in certain periods, and core inflation is more sensitive to demand shocks than energy prices. It is observed that supply shocks have a short-term effect on inflation expectations, whereas demand shocks have a permanent and lasting effect, and the effect of past expectations on future expectations has increased in recent periods. Accordingly, both our hypotheses 1 and 2 are confirmed. It is concluded that inflation after the COVID-19 pandemic is the main demand shock and that the demand shock has a more permanent effect than the supply shock. This result reveals that the CBRT's tight monetary policy is the right policy. However, as analyses reveal, supply shocks create a secondary effect by permanently influencing core inflation through inflation expectations (Bandera *et al.*, 2023; Adolfsen *et al.*, 2024). Therefore, inflation policy should not be left solely to the CBRT but must be supported by fiscal policy.

Acknowledgement

Funding: There was no funding, either externally or internally, towards this study.

Conflict of interest: The authors hereby declare that this article was neither submitted nor published elsewhere.

AI usage statement: The authors confirm that no artificial intelligence (AI) or AI-assisted tools were used in the creation of this manuscript.

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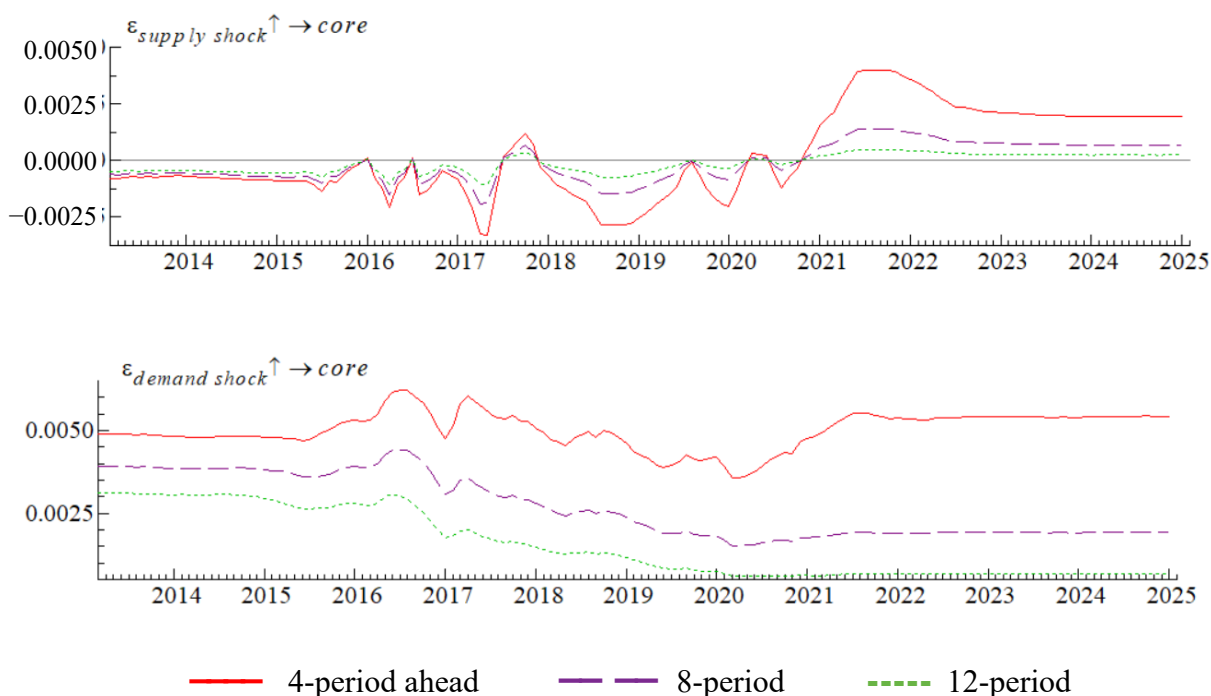
Appendix

A.1 Robustness Check

This section performs several robustness checks to verify the validity of the results of the TVP-VAR analysis presented in the previous section. For these robustness checks, we focus on the drivers of inflation in Turkey: supply shocks. Specifically, two alternative supply shock variables are considered in additional TVP-VAR estimations. Commercial bank loans, which we use to represent the demand shock, do not change. The most important reason for this is the consideration of the credit channel in the conduct of monetary policy (Atılğan and Öztürk, 2024; Bernanke and Blinder, 1998).

Based on Yiğit and Gökçe (2021), the indicator of supply shocks is changed to imported goods input prices. Imported goods input prices data are obtained from the CBRT data distribution website. According to the results of the TVP-VAR analysis, the effects of supply and demand shocks on core inflation are shown at different horizons (after 4, 8 and 12 periods). In the analysis, imported intermediate goods prices are used as a supply shock indicator, while bank loans are used as a demand shock indicator. The graphs show the time-dependent effects of these shocks.

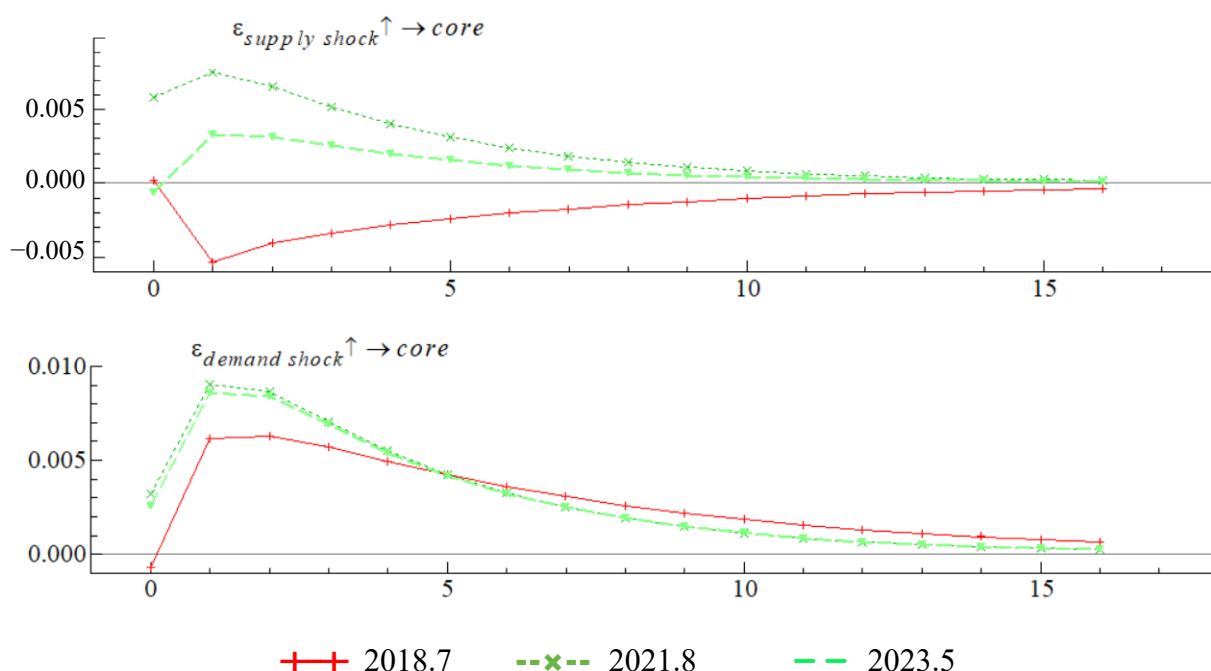
Figure 7: Time-varying impulse responses to demand and supply shocks in core inflation at different lag periods



Source: Authors' own elaboration

The top panel of Figure 7 shows the dynamic effects of supply shocks (imported intermediate goods) on core inflation, while the bottom panel shows demand shocks (bank loans). The findings from the analysis reveal that core inflation in Turkey is sensitive to both supply and demand shocks. While the impact of supply shocks increased significantly in the post-pandemic period, demand shocks stand out as a permanent and strong determinant of core inflation in all periods.

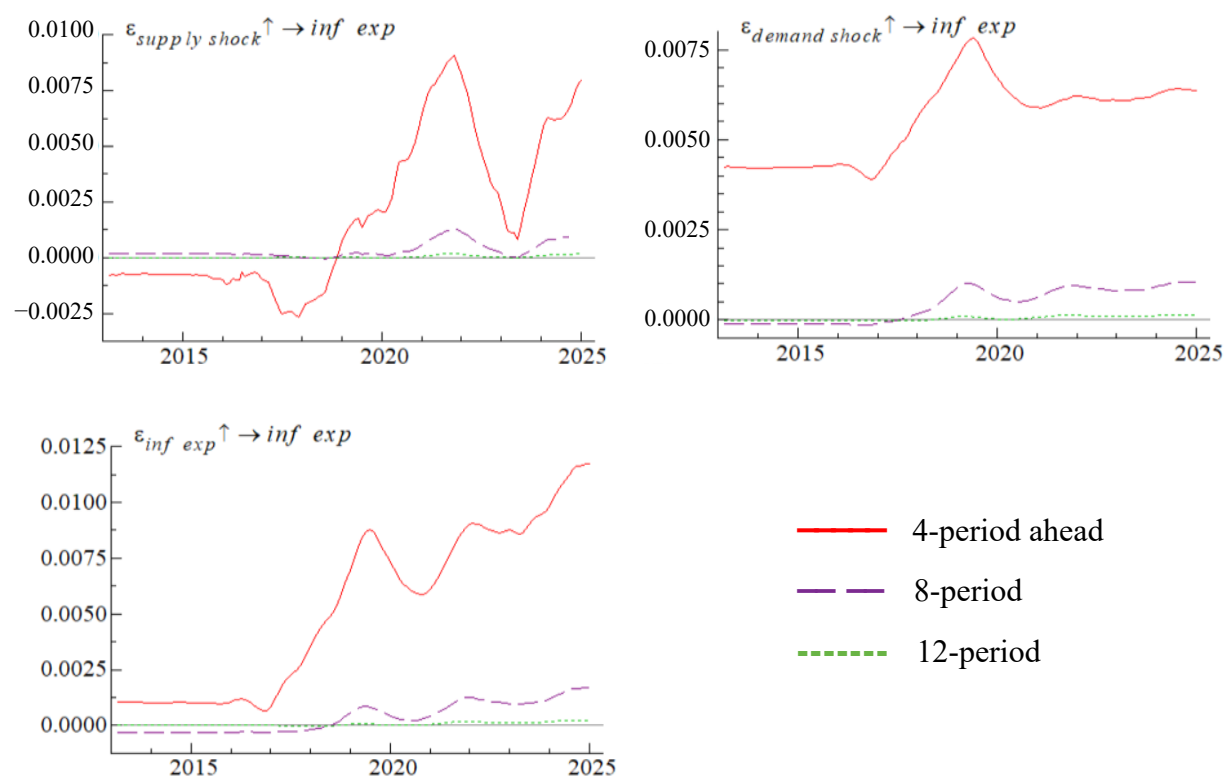
Figure 8: The impulse responses of core inflation to supply and demand shocks at different time points



Source: Authors' own elaboration

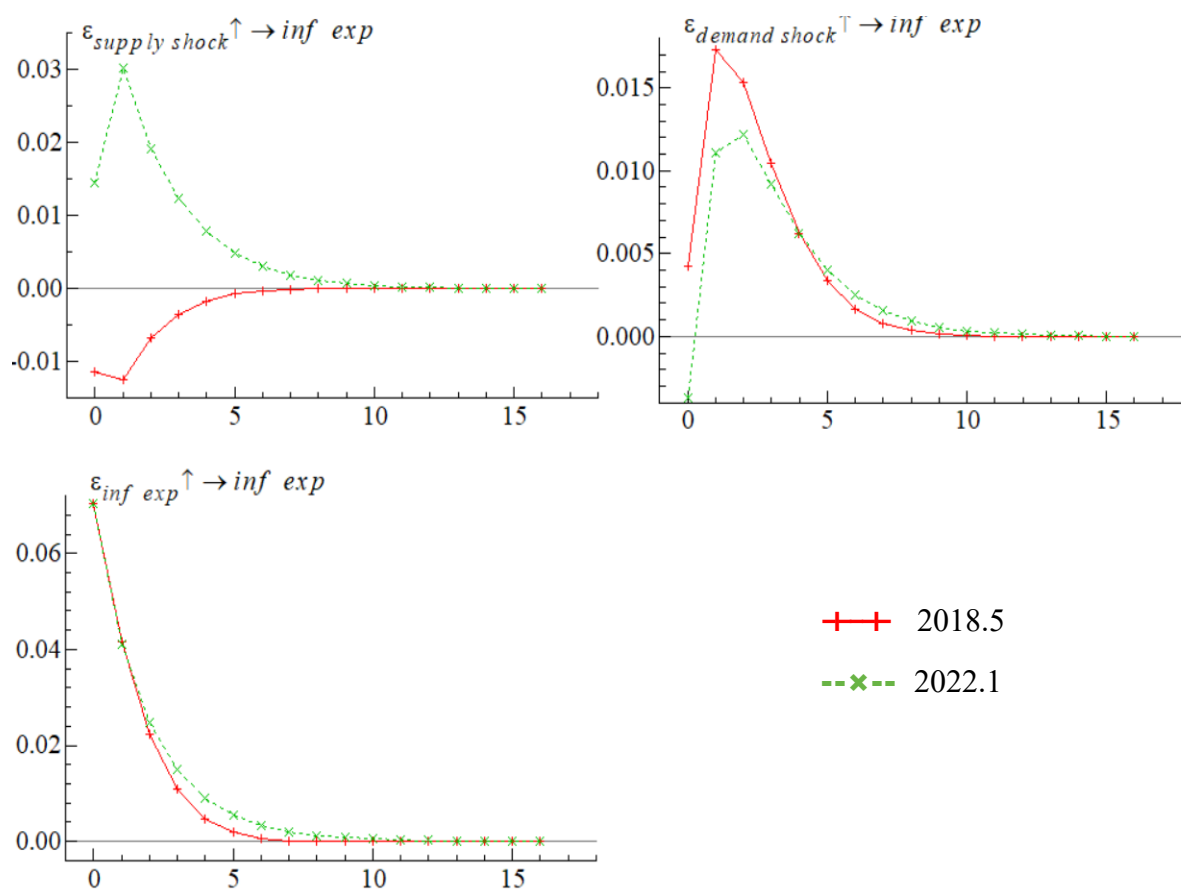
Figure 8 shows the impulse response functions of core inflation. The top panel shows the impact of supply shocks on core inflation. It shows that supply-side cost shocks have limited and temporary negative effects in the first phase. However, this effect turns positive over time and persists for about ten periods, albeit at a lower intensity. The impulse-response functions in the bottom panel show the effects of demand shocks, represented by bank loans, on core inflation. In all periods, demand shocks push core inflation strongly upwards in the short run, but this effect diminishes and disappears over time.

The findings suggest that both the magnitude and the duration of the effects of supply and demand shocks on core inflation change over time. In 2021 and 2023, the stronger impact of both supply- and demand-side shocks compared to 2018 suggests that macroeconomic vulnerabilities have increased and core inflation has become more sensitive to both endogenous and exogenous developments. Analyses for different time periods support the robustness of the model, suggest that the findings are stable and that the drivers of Turkish inflation are almost the same.

Figure 9: Time-varying impulse responses to demand and supply shocks in inflation expectations at different lag periods

Source: Authors' own elaboration

The first panel of Figure 9 shows the dynamic effects of supply shocks (imported goods input prices) on inflation expectations, while the second panel shows demand shocks (bank loans). The bottom panel shows how the change in inflation expectations affects future inflation expectations. As in the main model, supply shocks have a significant effect on inflation expectations in the short run after 2019, while the effect of long-term supply shocks is limited, again as in the main model. Demand shocks and inflation expectations themselves have a persistent effect in both the short and long run, in line with the main model.

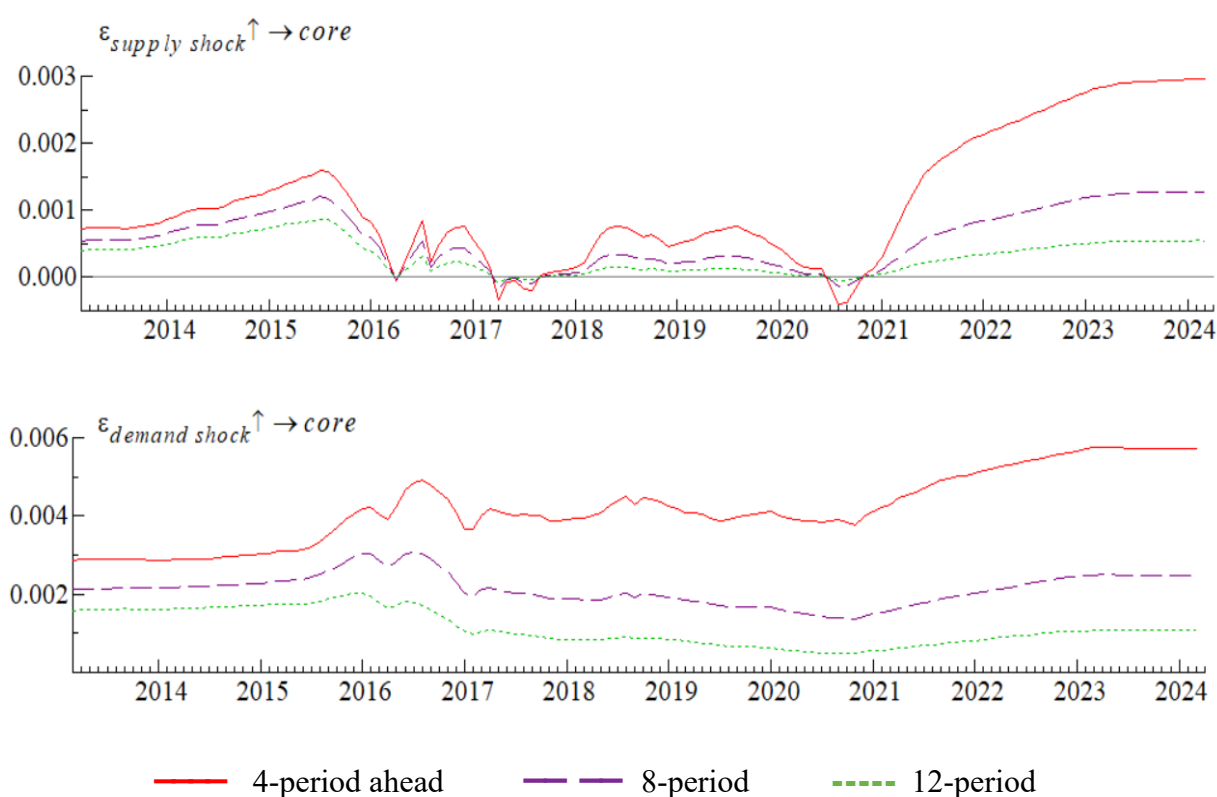
Figure 10: The impulse responses of inflation expectations to supply and demand shocks at different time points

Source: Authors' own elaboration

Figure 10 shows the impulse response functions of inflation expectations. The first panel shows the impact of supply shocks on inflation expectations. Unlike the main model, the effect of imported input goods prices started at a high level and became more persistent in the 2018M05 period. In the 2022M01 period, imported inputs had a dampening effect on inflation expectations with the effect of the pandemic. However, similar to the main model, these effects faded by the 10th period. Unlike the main model, the effect of demand shocks (total credit volume) on the imported goods prices is higher in 2021M01 and only fades in the period consistent with the main model. The effect of the change in past inflation expectations on future expectations is consistent with the main model in two periods. With the use of the variable of imported goods prices as a supply shock, the effects are realized at different levels different from the main model, but the damping period of the shocks is in line with the main model. It is observed that the results are almost the same. Therefore, it supports the robustness of the model and shows that the findings are stable.

Following Ha *et al.* (2013) and Eickmeier and Hofmann (2022), the indicator for supply shocks is replaced with the Real Output Index. The Real Output Index is obtained from the Federal Reserve Bank of St. Louis (FRED) database. According to the results of the TVP-VAR analysis, the effects of supply and demand shocks on core inflation are shown at different horizons (after 4, 8 and 12 periods). Again, bank loans are used as a demand shock indicator in the analysis. The graphs show the time-dependent effects of these shocks.

Figure 11: Time-varying impulse responses to demand and supply shocks in core inflation at different lag periods

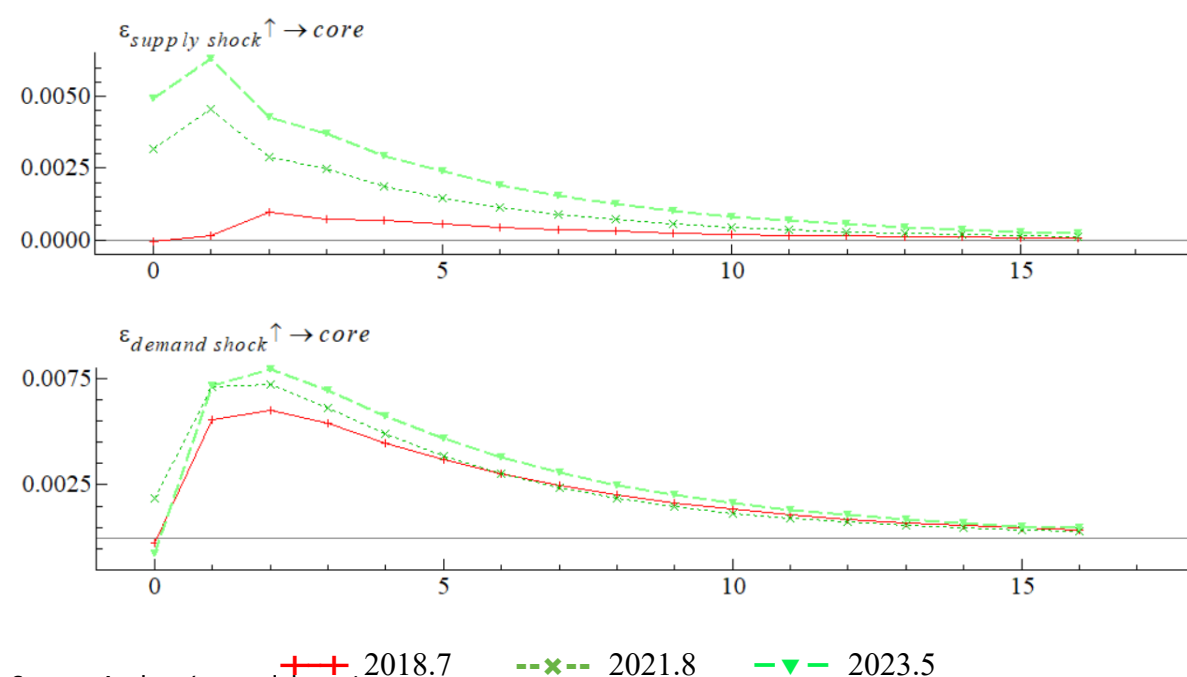


Source: Authors' own elaboration

Figure 11 shows the dynamic effects of supply and demand shocks on core inflation. Supply shocks (real production index) have a significant effect on core inflation in the short term as in the main model, but unlike the main model, short-term effects have had a significant upward pushing and permanent effect on core inflation since 2021. The main factor in this is the increase in costs and decrease in production due to the pandemic. The effect of demand shocks is consistent with the main model. The findings from the analysis reveal

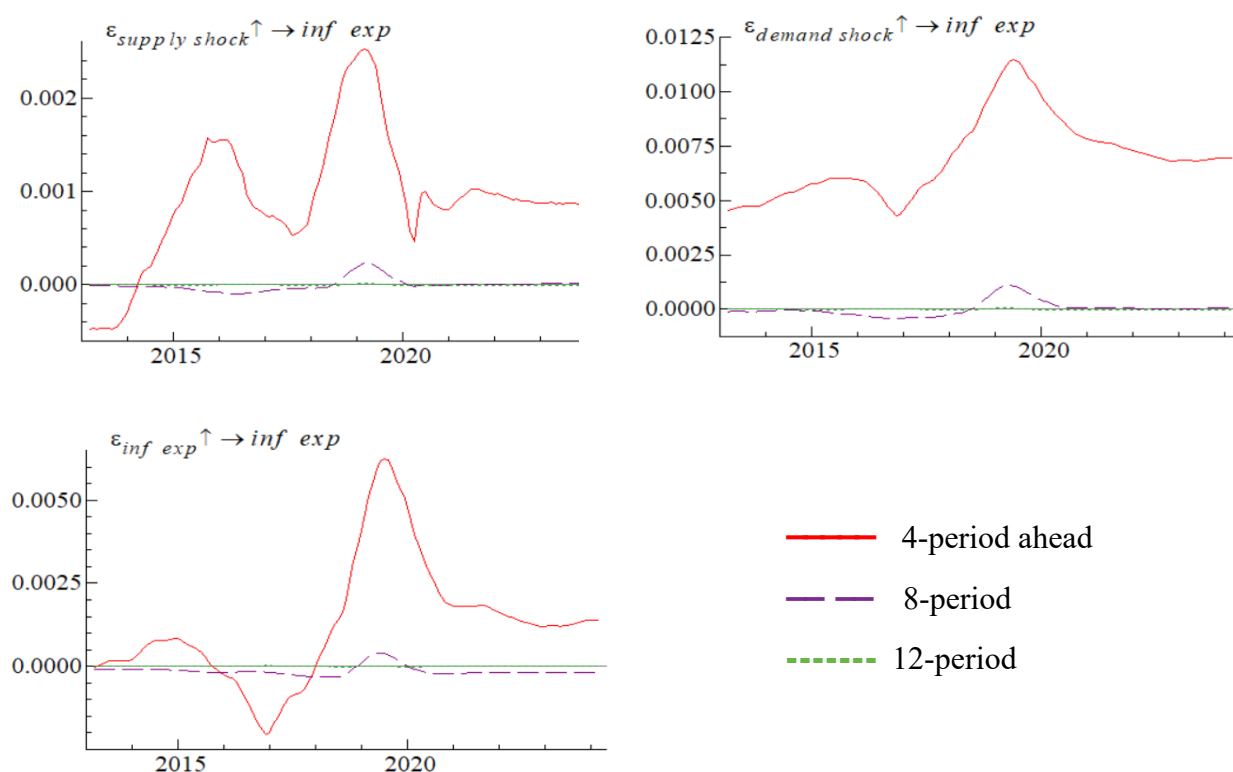
that core inflation in Turkey is sensitive to both supply and demand shocks. In the post-pandemic period, the impact of supply shocks increased significantly, while demand shocks stand out as a permanent and strong determinant of core inflation in all periods. The analysis supports the robustness of the model and shows that the findings are stable.

Figure 12: The impulse responses of core inflation to supply and demand shocks at different time points



Source: Authors' own elaboration

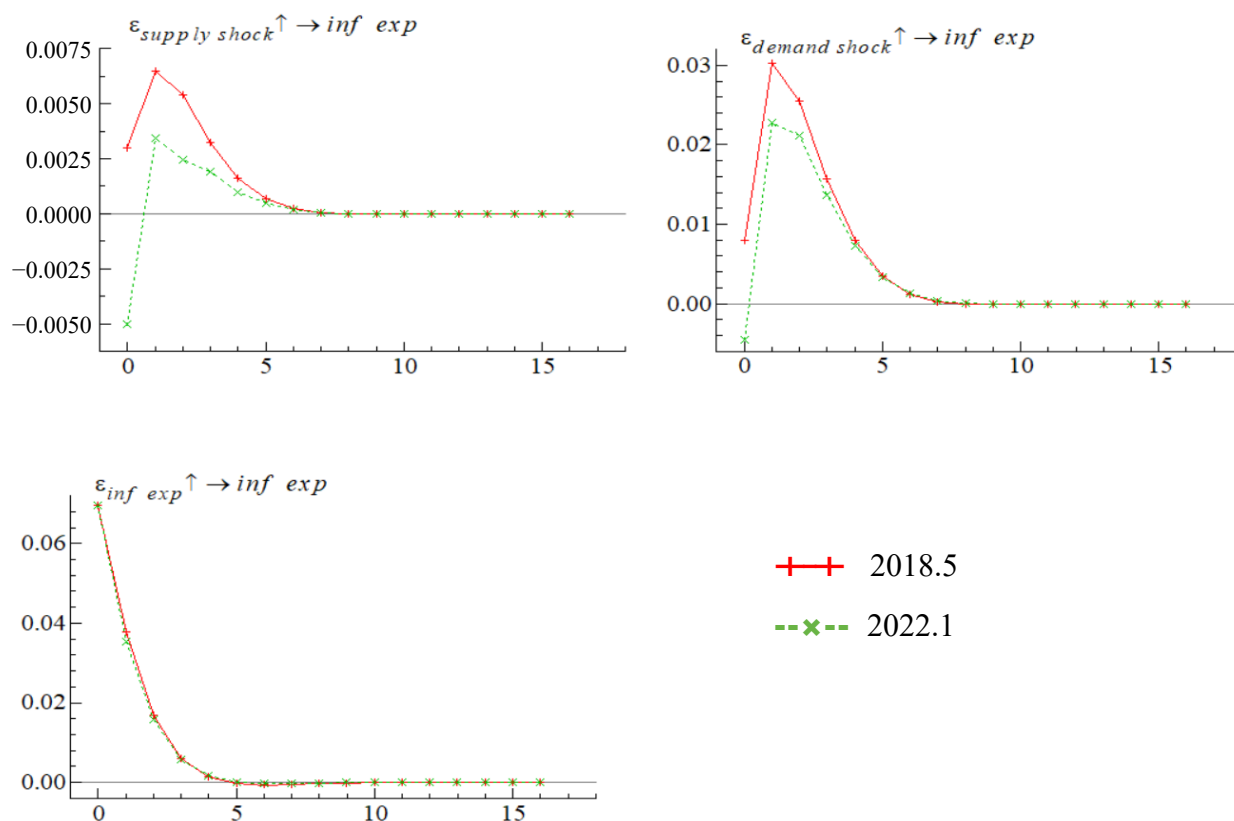
Figure 12 shows the impulse response functions of core inflation. It shows the impact of the real output index, which is taken as a supply shock, on core inflation. The real production index increased core inflation in the 2021M08 and 2023M05 periods. However, this effect was not as long-lasting as in the main model. In both the main model and robustness test 2, the years after 2021 are the periods when supply shocks increase the impact of core inflation. Demand shocks, on the other hand, increased core inflation in the 2021 and 2023 periods as in the main model, but the effect disappeared in a short time as in the main model.

Figure 13: Time-varying impulse responses to demand and supply shocks in inflation expectations at different lag periods

Source: Authors' own elaboration

Figure 13 shows the dynamic effects of supply shocks (real output index), demand shocks and past values of inflation expectations on inflation expectations. As in the main model, supply shocks have a significant impact on inflation expectations in the short run, while the impact of long-term supply shocks is limited, again as in the main model. Demand shocks and inflation expectations themselves have a persistent effect in both the short and long run, in line with the main model.

Figure 14: The impulse responses of core inflation to supply and demand shocks at different time points



Source: Authors' own elaboration

Figure 14 shows the response functions of inflation expectations. The real production index, which is a supply shock, had an upward impact on inflation expectations in the short run in both 2018 and 2022, but this effect in the main model was short-term. Demand and inflation expectations are in line with the main model. Supply and demand shocks affected inflation expectations in the short run but had a limited impact in the long run. These results show that the results are similar in inflation expectations and support the robustness of the model.

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