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Monetary policy, the price puzzle and inflation expectations: evidence from Türkiye

Para politikası, fiyat bulmacası ve enflasyon beklentileri: Türkiye'den kanıtlar

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ABSTRACT

This article mainly investigates the relationship between monetary policy and inflation rates in Türkiye. We also consider the impact of inflation expectations on consumer inflation. The inflation data in Türkiye reveals outliers due to frequently occurring political and economic instabilities and hence exhibits tail dynamics. We differ from the traditional literature and aim to capture the asymmetry in the data by quantile regressions. Our results first show that the CBRT monetary policies generate a price puzzle. Second, we reveal that consumer inflation increases in response to a deterioration in inflation expectations. Recent distortions of inflation expectations may explain why the demand channel has failed and why domestic prices are elevated in response to increased monetary policy rates. Third, our results imply that the lack of a proper international economic environment is also responsible for price increases. Finally, the results are robust using alternative specifications, different measurements of monetary policy change and existence of structural breaks.

Keywords: Monetary Policy, Price Puzzle, Asymmetry

JEL Classification: E30, E31, E43

ÖZ

Bu çalışma temel olarak, Türkiye de uygulanan para politikası ile enflasyon oranları arasındaki ilişkiyi incelemektedir. Ayrıca, çalışmada enflasyon beklentilerinin tüketici enflasyonu üzerinde yarattığı etki de göz önüne alınmaktadır. Türkiye'ye ait enflasyon verisi sıklıkla karşılaşılan politik ve ekonomik istikrarsızlıklar nedeniyle istatistiki olarak aşırılıklar göstermektedir. Bu çalışma geleneksel literatürden ayrılmakta ve enflasyon verisinin sahip olduğu asimetriyi kantil regresyonlar aracılığıyla analiz etmektedir. Elde edilen sonuçlara göre TCMB para politikaları fiyat bulmacası yaratmaktadır. İkinci olarak, enflasyon beklentilerindeki kötüleşme tüketici enflasyonunda bir artışa yol açmaktadır. Enflasyon beklentilerinde son dönemde meydana gelen bozulma, talep kanalının neden çalışmadığını ve para politikası faizlerindeki artışa karşılık fiyatların nasıl arttığını açıklayabilir. Üçüncü olarak, uluslararası koşulların elverişli olmaması da fiyat artışları üzerinde etkilidir. Son olarak, elde edilen sonuçlar farklı spesifikasyonlara, para politikası değişimleri için kullanılan farklı faiz oranına ve yapısal kırılmalara karşı dayanıklıdır.

Anahtar Kelimeler: Para Politikası, Fiyat Bulmacası, Asimetri

JEL Classification: E30, E31, E43

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1. Introduction

Monetary policy and its impact on general prices have always been subjected to a great deal of attention in economic literature. Central banks traditionally manage price changes by driving interest rates. When a positive price shock appears, policy rates are activated to trigger the demand channel of monetary transmission mechanism and an increase in prices is intended to stabilize. Even though theoretical literature admits the stabilizing role of monetary policy on inflation by the demand channel, it is not certain that the contractionary monetary policy always leads to a decrease in general prices. Many influential papers documented that monetary policy change generates puzzling results on prices (Bernanke & Blinder, 1992; Eichenbaum, 1992; Sims, 1992). A price puzzle appears when prices and nominal interest rates both move in the same direction following a monetary policy shock. The existing monetary policy literature has still provided evidence in favor of puzzling results.

Sims (1992) stated that the price puzzle may emerge from the cost channel of monetary transmission mechanism. Similarly, Barth & Ramey (2001) argue that the cost channel of monetary policy generates price increases following a positive monetary policy shock. According to the cost channel, an increase in interest rates elevates the borrowing cost of firms and induces price rises. More interestingly, the monetary policy literature documented that the cost channel may even appear in labor-intensive production sectors. That is, the price of labor-intensive goods and services in the inflation basket may react positively to an increase in interest rates. This can be explained by substitution of factors of productions. Contractionary monetary policy naturally enhances the cost of capital in capital-intensive sectors, thereby increasing their output prices. This encourages capital-intensive sectors to substitute capital with labor, which raises wages in the overall economy. Since production costs in labor-intensive sectors are elevated by increasing labor wages, the firms in labor-intensive sectors also raise their own output prices. Consequently, the general price level goes up following an increase in policy rate (Bhattacharya & Jain, 2020; Iddrisu & Alagidede, 2020). The price puzzle is also explained by information asymmetry between the Central Bank and the public (Hanson, 2004; Tas, 2011). According to the information asymmetry channel, central banks naturally have more resources than other economic agents in an economy and hence have the ability to collect more and superior information about future inflation. Following a contractionary monetary policy, the inflation rate increases since economic agents consider that contractionary monetary policy is a signal of central banks for positive future price shocks.

The price puzzle may also appear by fiscal channel (Blanchard, 2004; Favero & Giavazzi, 2004). When fiscal policies dominate economic policies, a country with lack of fiscal discipline is naturally associated with high-risk premium. Then, contractionary monetary policy leads to capital outflows since an increase in interest rate raises debt service burden. Capital outflows are followed by depreciation of domestic currency, which causes to upward trend in prices by exchange rate pass-through.

Some authors suggest that misspecification problems in the models may be responsible for puzzling results, and hence various solutions have been offered. Sims (1992) suggested that including commodity prices in the vector autoregression (VAR) models solve the price puzzles since commodity prices naturally contain information for future inflation expectations. Following Sims, many authors traditionally employed commodity prices in their VAR models as a proxy of inflation expectations (Christiano et al., 1996; Leeper et al., 1996; Kim, 1999; Barth & Ramey, 2001; Sims & Zha, 2006). Hanson (2004), on the other hand, contained alternative plausible indicators and revealed a weak correlation between an ability to forecast inflation and an ability to resolve the price puzzle. He concluded that alternative indicators including commodity prices mostly do not resolve the price puzzle.

Some authors also argued that selected measures of the monetary policy stance of the central banks may cause a misspecification problem and hence generate puzzling results. Many papers employed monetary aggregates in their models to reflect monetary policy changes (Strongin, 1995; Eichenbaum, 1992; Kim & Roubini, 2000; Peersman & Smets, 2001; Leeper & Roush, 2003; Kim & Lim, 2018). Since monetary aggregates are claimed to provide precious information which is not included in the interest rates, they are considered to perform better than those without money. Unlike these papers, Sims (1992) suggested using short-term interest rates since innovations in monetary aggregates may not contain changes in monetary policy when money demand shocks occur. Similarly, McCallum (1983), Laurent (1988), Bernanke and Blinder (1992) insisted that interest rates reflect the monetary policy change better than monetary aggregates. On the other hand, School and Uhlig (2008) constrained impulse-response functions to resolve the price puzzle while Carlstrom et al., (2009) concluded that the orthogonal identification restriction on VAR innovations which impose that a monetary policy shock does not affect macroeconomic variables instantaneously may generate puzzling results.

When we consider the studies regarding Türkiye, we see that there has not been a general consensus on monetary policy changes and reactions to prices. Tümtürk (2020) analyzed

the impacts of monetary policy shocks by a VAR approach and introduced both recursive orthogonal and non-recursive structural identification schemes. The analysis results confirmed the existence of the price puzzles in Türkiye. Similarly, Aktas et al., (2005), Altunöz (2020), Sen et al., (2020), Doğanalp (2022), Isık & Bulut (2024) provided evidence in favor of the price puzzles while Berument (2007), Kilinc & Tunc (2014), Can et al., (2020), Bulut (2023) documented that their results were free from the price puzzles.

This paper mainly investigates the relationship from monetary policy to consumer inflation in Türkiye over the monthly period of 2015M1-20124M8. When answering the main question, we also consider the impact of inflation expectations which have dramatically worsened in recent years as seen in Figure 1. Consistently missed target rates by the Central Bank of the Republic of Türkiye (CBRT) and continuous increases in inflation rate seem to damage the future price expectations of economic agents. Deterioration in inflation expectations is also expected to distort current price decisions. This is quite challenging for the CBRT since the impact of deterioration in inflation expectations on prices may dominate the impact of monetary policy on prices. Therefore, we also analyze the impact on changes in inflation expectations on domestic inflation throughout our paper.

The past empirical literature that explores monetary policy and inflation relationships has traditionally employed vector autoregressive models and investigated the impact of policy changes by recursive or non-recursive identification assumptions. Since these identification assumptions on VAR innovations are assigned based on contemporaneous or lagged relationships in the models, they are often considered somewhat controversial. Empirical results obtained by VAR models tend to change significantly since the impulse-responses are quite sensitive to imposed identification assumptions. Another drawback of the VAR models is that they follow an assumption of "symmetry" in monetary policy and inflation debate. However, past empirical literature frequently documented the asymmetry in macroeconomic variables (Taylor & Davradakis, 2006; Surico, 2007; Moura & De Carvalho, 2010; Castro, 2011; Martin & Milas, 2013; Ahmad, 2016; Caporale et al., 2018; Iddrisu & Alagidede, 2020). Figure 2, on the other hand, depicts monthly consumer inflation over our analysis period. When taking a closer look at Figure 2, we see that Türkiye has experienced quite high price increases around 2021 and beyond due to frequently occurring political and economic instabilities and other supply shocks (exchange rate shocks, commodity and energy price shocks, etc.). This indicates that inflation distribution reveals outliers and hence exhibits tail dynamics. However, mean-based estimation techniques such as VAR would be inherently inadequate to reveal the asymmetric pattern in the inflation data since they tend to misestimate the weights of outliers. Therefore, we employ quantile regressions proposed by Koenker & Basset (1978) to capture the asymmetry in the monetary policy and inflation nexus. The fundamental supremacy of quantile regressions over conventional conditional mean-based techniques is that quantile regressions generate asymmetric responses to changes in independent variables and the impacts of the estimated coefficients may change with a dependency on quantiles of the conditional distribution. By quantile-based estimation, we differ from traditional literature and aim to capture the asymmetry in the data.

Our estimation results first revealed that monetary policy produces positive and statistically significant quantile estimates on domestic inflation and hence generates a price puzzle in Türkiye. The existence of price puzzle indicates that the demand channel of monetary transmission mechanism does not prevail and the Turkish economy experiences price rises following a contractionary monetary policy. Second, we also find that the impact of inflation

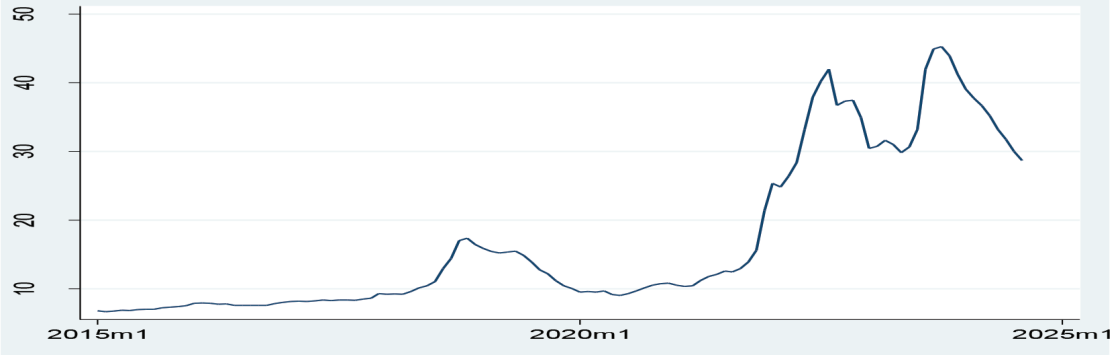

Figure 1: Inflation Expectations, Monthly

Source: The Central Bank of Republic of Türkiye

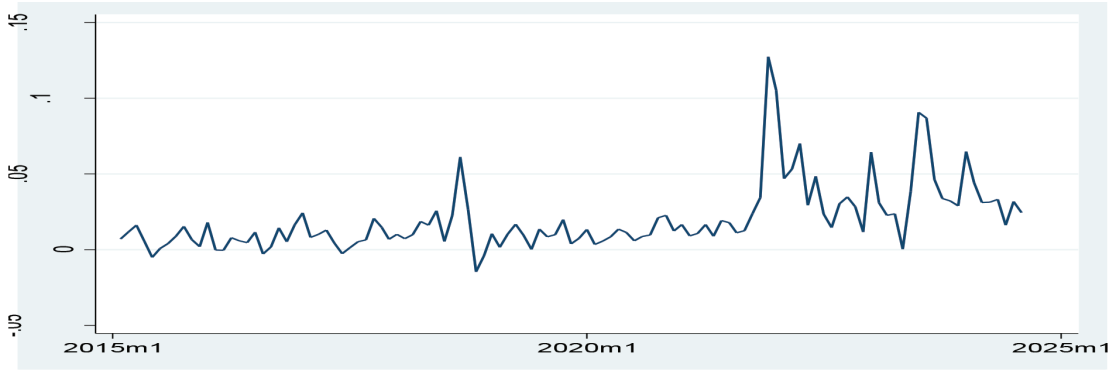

Figure 2: Consumer Inflation, Monthly

Source: The Central Bank of Republic of Türkiye

expectations on the various quantiles of inflation is positive and statistically significant. Our results empirically confirm that monetary policy-inflation and inflation expectations-inflation relationships contain asymmetric impacts across the quantiles of inflation distribution. Finally, we conclude that exchange rate, US monetary policy rate and both world commodity and energy prices are other factors that drive inflation rates in Türkiye. The rest of the paper is organized as follows. Section 2 presents details about the data and the estimation method conducted in the paper. Section 3 reports estimation results and robustness checks while Section 4 concludes.

2. Methodology and Data

We adopt the quantile regression method proposed by Koenker & Baset (1978). This estimation method stands out when the distributions of the variables of interest show extreme statistical properties such as skewed data, nonnormality, more outliers, fat tails, etc. Table 1 reports detailed summary statistics of inflation data. As seen in Table 1, the inflation data provides tail dynamics with positively skewed data. Since positively skewed data suggests that most data clustered on the left with outliers on the longer right tail, inflation distribution exhibits an asymmetric shape. In addition, the inflation data is leptokurtic which implies that the outliers have more probability mass at the tails of distribution. As a result, we include the asymmetric feature of the inflation data by employing quantile regressions.

Table 1: Summary Statistics, Consumer Inflation

	Inflation
Mean	0.019
Median	0.013
Min.	-0.014
Max.	0.127
Skewness	2.275
Kurtosis	9.470

The quantile regression model equation evaluated at the τ^{th} quantile can be presented as follows:

$$Q_{\tau}(PRICE/\bullet) = \alpha + \beta^{\tau}X + \omega^{\tau}C + e^{\tau}, \qquad \tau\in(0,1) \qquad (1)$$

PRICE variable stands for general consumer prices and is obtained from Electronic Data Delivery System of the Central Bank of the Republic of Türkiye (EDDS). Quantile regression Equation (1) denotes the quantiles of the conditional distribution of the consumer prices as a linear function of set of objective variables, X and the set of control variables, C. $Q_{\tau}(PRICE/\bullet)$ represents the conditional quantile fuction of consumer prices at the τ^{th} quantile. The objective coefficient vector β denotes the quantile estimations of consumer prices with respect to a change in our objective variables at different τ. Finally, ω reflects the impact of control variables on the quantiles of the conditional distribution of the consumer prices.

Objective variables are our main variables of interest and are represented by monetary policy rate and inflation expectations. The CBRT designed a rather untraditional monetary policy at the end of 2010 and employed more than one instrument (BIST rate, one-week repo rate, overnight lending and borrowing rates, etc.) under the interest rate corridor practice. As the new monetary policy was designed based on a combination of different policy instruments, the bank has started to announce "Weighted Average Funding Cost (WAFC)" which is simply a weighted average of the interest rates since 2011. However, the untraditional corridor practice confused the financial markets. To readapt the global conventional monetary policies, the bank has simplified the monetary policy framework and started to use a weekly repo rate since June 2018. As a result, we employ the weekly repo rate (REPO) to reflect the changes in CBRT's monetary policy. Later, we also use WAFC and control the estimation results. The inflation expectations data (EXP), on the other

hand, is defined as the "annual inflation expectations of market participants for the following 12 months (%)". Both objective variables are downloaded from the EDDS. Since the inflation expectation data was first released in 2015M1, our data covers the period between 2015M1 and 2014M8.

Control variables are selected among the variables which are mostly used in standard monetary policy literature. (Kim & Roubini, 2000; Faust et al., 2003; Hanson, 2004; Bjørnland, 2009; Barnett et al., 2016, Tümtürk, 2020). The first control variable is real GDP which is employed to capture the changes of demand conditions (OUT) in the country. Since the real GDP is not monthly published data, the industrial production index is used to represent demand conditions of the country. The second control variable is nominal effective exchange rate (EXRATE) and calculated as the geometric weighted averages of bilateral exchange rates. A decrease in exchange rate indicates a depreciation of the home currency against a broad basket of currencies. The exchange rate data is extracted from the Federal Reserve Economic Data (FRED) while production index is obtained from the EDDS. To put it shortly, our base specification can be written as follows:

Q_{τ}(PRICE/•)=f(REPO, EXP, EXRATE, OUT)

We also perform the quantile regression model (1) with different sets of control variables to see whether the objective estimates, β in the base specification (1) follow statistically and economically stable patterns. For this purpose, we introduce additional control variables: the World Commodity Price Index (COMPI), US monetary policy interest rates (Federal Funds Rate-FFR) and the World Energy Price Index (GEPI), all of which are obtained from the FRED database. We include COMPI for two reasons. First, we follow Sims (1992) and add the world commodity price index to avoid a potential misspecification problem in the base specification. Second, we control the inflationary supply shocks since changes in the world commodity prices are expected to trigger inflationary pressures in an open economy. FFR variable is employed to control the impacts of US monetary policy changes on domestic prices. Following a contractionary monetary policy by FED, domestic prices are expected to increase via exchange rate pass through as the US dollar naturally appreciates against home currency, Turkish Lira (TL). Finally, we control the effect of world energy prices on domestic prices since energy prices are expected to change production, marketing and distribution cost of output. Based on the additional control variables introduced above, we generate the following specifications and aim to control the stability of statistical and economic inferences in the base specification (1):

Specification 2:

Q_{τ} (PRICE/•)=f(REPO, EXP, EXRATE, OUT, COMPI)

Specification 3:

Q_{τ} (PRICE/•)=f(REPO, EXP, EXRATE, OUT, FFR)

Specification 4:

Q_{τ} (PRICE/•)=f(REPO, EXP, EXRATE, OUT, COMPI, FFR)

Specification 5:

Q_{τ} (PRICE/•)=f(REPO, EXP, EXRATE, OUT, GEPI)

Specification 6:

Q_{τ} (PRICE/•)=f(REPO, EXP, EXRATE, OUT, GEPI, FFR)

All variables except for weekly repo rate, inflation expectations and Federal Funds rate in the model (1) are used in logarithms. Table 1A in Appendix reports the order of integration of the variables in all specifications. We present both Augmented Dickey-Fuller (ADF) test introduced by Dickey & Fuller (1981) and Phillips-Perron test suggested by Phillips and Perron (1988). PP test results report that all variables are first-differenced stationary. However, ADF test results reveal that all variables but REPO rate are first-differenced stationary. Since PP test improves ADF test statistics by using Newey-West HAC covariance matrix estimator, we follow the PP test results and all quantile regression specifications are estimated with first-differenced stationary data.

3. Estimation Results

Figure 3 reports the quantile estimates of the base specification. First, an increase in monetary policy generates significant positive impacts on the quantiles of inflation distribution. To be more precise, we find that inflation increases by 0.0039% following a 1% monetary policy contraction at the median of inflation distribution or at τ=0.50. This result provides evidence that contractionary monetary policy produces a price puzzle and reveals a destabilizing impact on inflation. In addition, the impact of monetary policy is weaker at the left tail of inflation distribution or at roughly τ<0.30. This implies that the destabilizing impact of the policy is more pronounced when inflation rates are relatively high. When taking a closer look at the impact of inflation expectations, the response of consumer prices is significantly positive except for the very left tail. To be more specific, when τ=0.50, inflation increases by 0.0030% in response to a unit increase in inflation expectations. The positive and significant inflation responses indicate that inflation expectations are also responsible for price increases in Türkiye. This result is challenging for the CBRT since lowering inflation expectations are mostly associated with achieving institutional independence and credibility which both require long-term effort.

Figure 3: Quantile Estimations, Base Specification

Note: The solid line depicts the quantile estimates, while the gray area around the estimates are the confidence intervals at 10% significance level. We follow Huber (1967) and employed sandwich variance-covariance matrix for heteroskedastic errors in the quantile estimations.

The quantile estimates of inflation with respect to changes in the nominal exchange rate are negative and statistically significant as expected. At the 50th quantiles, an increase in nominal exchange rate by 1% causes a decrease in inflation by 0.1314% at the median estimate of the inflation distribution. Finally, domestic demand changes cannot produce statistically significant responses on the quantile of the conditional distribution of inflation rates. The lack of a significant relationship between demand changes and consumer inflation can be explained by dramatically mounting inflation expectations around 2018 and beyond as previously shown in Figure 1. Accordingly, the expected significant relationship between demand changes and prices may not emerge since the strong expectations of economic agents about future price increases may have encouraged them to alter their selling prices regardless of the demand changes in the economy.

Figures 1A-5A in the Appendix depict the quantile plots and associated confidence interval at a 10% significance level based on the alternative specifications between (2) and (6), respectively. The alternative specifications have some common points. First, contractionary monetary policy consistently generates the price puzzle and increases inflation rates. The price puzzle even appears when we include commodity prices in the base specification as suggested by Sims (1992). When considering the statistically significant quantile regression estimates, we see that the destabilizing impact of contractionary monetary policy tends to be less prominent at the left tail of the inflation distribution. Similarly, the impact of inflation expectations on the inflation rate is almost always positive and statistically significant. Second, the quantile estimations of inflation with respect to changes in the nominal exchange rate are always negative and mostly statistically different from zero. On the other hand, the demand changes again do not generate significant inflation responses in parallel with the base specification (1). Third, an increase in both world energy and commodity prices drives production costs and generates statistically significant increases in the domestic inflation in tandem with economic expectations. Finally, monetary policy contraction in the US produces significant positive impacts on quantiles of inflation. As a result, we can verify that changes in the objective variables in the base and alternative specifications produce almost the same statistical and economical inferences on inflation rates no matter what the selected control variables are.

Before closing this section, apart from determining whether the estimated quantile regression coefficients from the base (1) and alternative specifications are statistically significant, we also analyze whether the quantile regression estimates are significantly different from the estimated OLS coefficients. At this stage, we aim to provide evidence in favor of the

validity of our results over mean-based estimation techniques. Since our main interest is the behavior of objective variables on consumer inflation, Figures 4 and 5 show the quantile and OLS plots of different specifications concerning the changes in the CBRT monetary policy rate and inflation expectations. If quantile estimations fall out of the OLS confidence intervals, then quantile coefficients are said to be significantly different from the OLS coefficients. The results from Figure 4 and 5 can be summarized as follows:

i) The quantile responses of inflation with respect to the changes in objective variables for all specifications drift away substantially from the OLS estimates across quantiles. For example, the deviations from the OLS estimations in all specifications are around 30% for the monetary policy

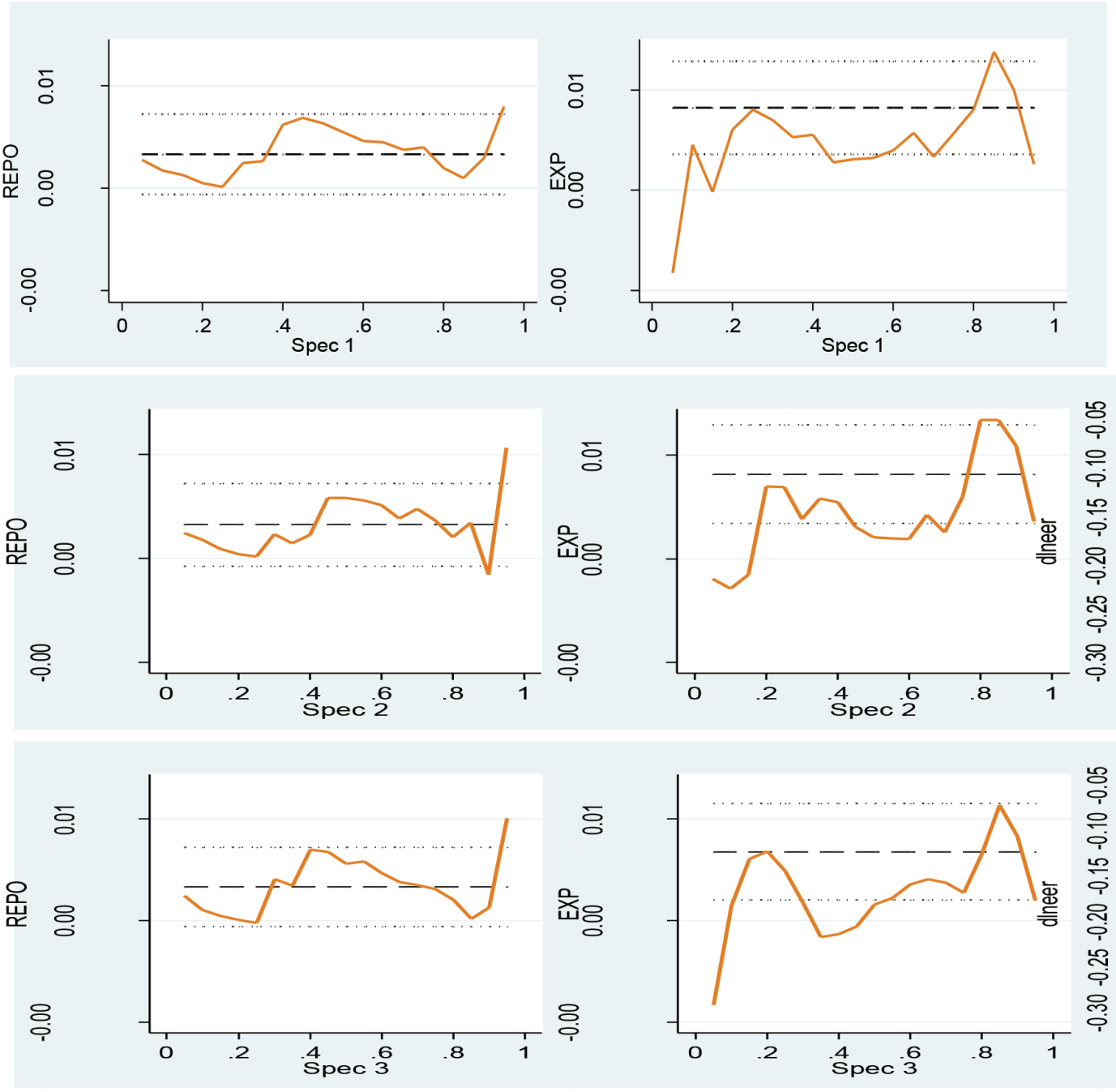

Figure 4: Quantile and OLS Plots, Specifications 1 (Base), 2 and 3

Notes: Vertical axes report the quantile and OLS estimates of inflation with respect to objective variables while horizontal axes represent quantiles of inflation distribution. The dashed straight lines represent the OLS estimates while the spotted straight lines around the OLS estimates are their confidence intervals. The solid straight lines plot how quantile regression estimates evolves across various quantiles.

variable at the 45th quantile. The size of the deviations reveals that the OLS coefficients significantly underestimate the destabilizing effects of the monetary policy rate on inflation. In addition, the deviations from the OLS estimations in all specifications at the 45th quantile are around 38% for inflation expectations variable and even bigger than monetary policy variable.

ii) We observe that quantile estimates of the objective variables often appear out of the boundary of OLS confidence intervals at 10% significance level which indicates that quantile regression estimates produce statistically significant differences from the OLS estimates.

iii) The results summarized in (i) and (ii) showed that the impacts of the objective variables differ with a dependency over quantiles of the conditional distribution of inflation

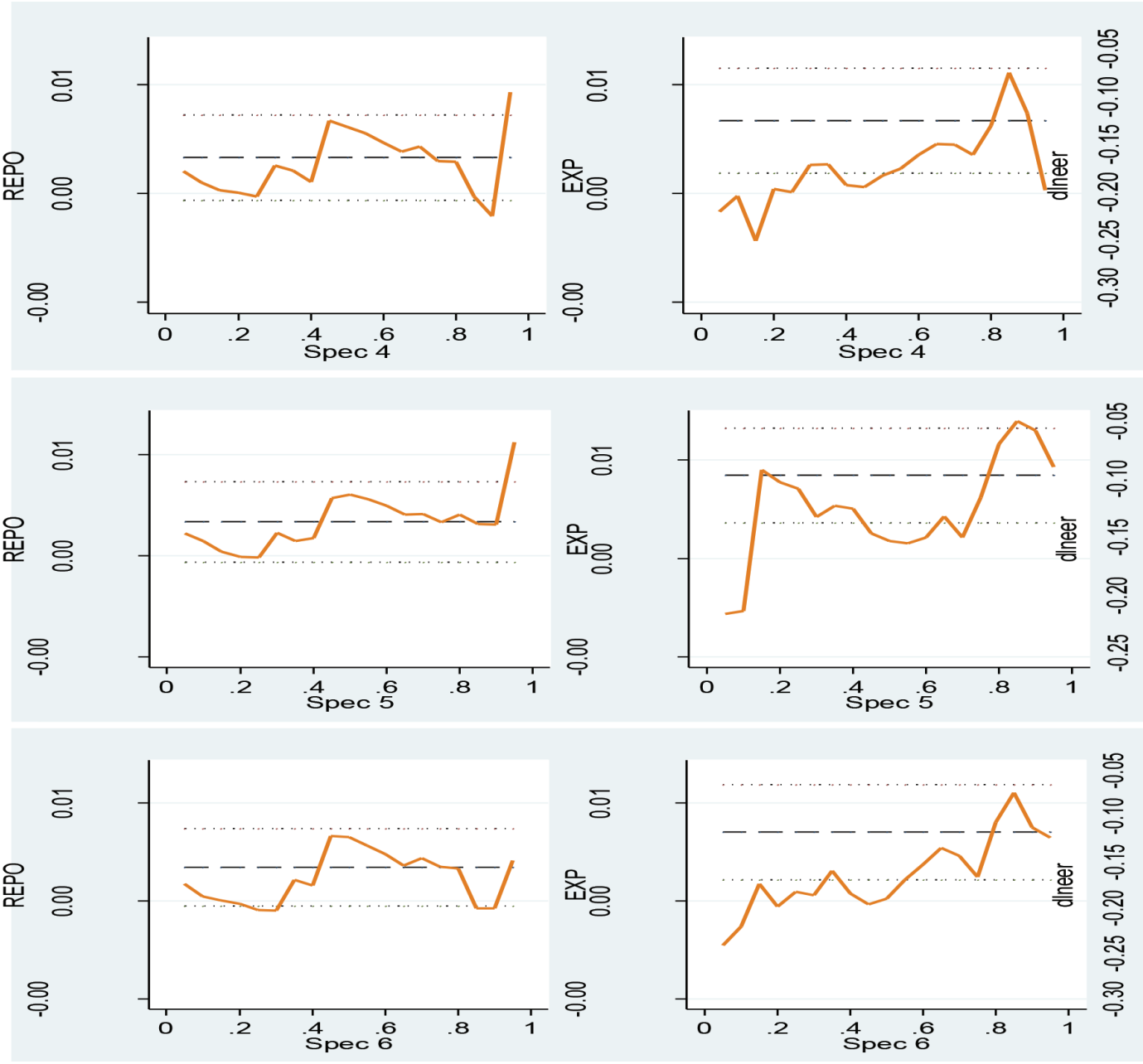

Figure 5: Quantile and OLS Plots, Specifications 4, 5 and 6

Notes: Vertical axes report the quantile and OLS estimates of inflation with respect to objective variables while horizontal axes represent quantiles of inflation distribution. The dashed straight lines represent the OLS estimates while the spotted straight lines around the OLS estimates are their confidence intervals. The solid straight lines plot how quantile regression estimates evolves across quantiles.

data. We also empirically presented significant deviations of quantile estimations from corresponding OLS estimation. Therefore, we can confirm the existence of previously suspected asymmetry between consumer inflation and objective variables. This result also implies that policymakers should be cautious when making decisions based on mean-based estimation techniques.

3.1. Additional Robustness Checks

We have already showed that our results are robust to use of alternative control variables. Now, additional robustness tests are performed. First, we control our base specification estimation results with respect to use of another monetary policy instrument, WAFC rate over the subperiod of 2015M1-2018M6. Second, as structural breaks have not controlled so far, we also consider structural breaks and control them.

3.1.1. WAFC Rate and Quantile Plots

In this section, we run the base specification with the WAFC rate and compare the results. Figure 6 shows how both interest rates evolved during our sample period. As seen in Figure 6, both policy instruments are on the same path since 2018M6 as the CBRT has followed a single policy rate since then. However, it is seen that both rates have differed before 2018M6 since the CBRT policy rate reflects the combination of various interest rates including the weekly repo rate. Now, we analyze whether these differences in both policy indicators can change the previously obtained statistical and economical inferences. Figure 7 reports the estimation results when the WAFC is the indicator of the CBRT's monetary policy. Our results show that the coefficients of the objective and control variables still maintain their signs with similar statistical inferences.

3.1.2. Structural Breaks and Quantile Plots

This section explores whether experienced structural breaks over the analysis period change the estimated coefficients. First, we run Clemente et al., (1998) test, which is known in the time series literature as the "unit root test under two structural breaks", to determine break points in the data endogenously. The test results are presented in Table 2A in Appendix. We first identify the break points for each variable in the base specification (1) and then generate dummy variables by attaining "1" for the break dates and "0" for the rest of the data. Finally, the base specification (1) is estimated with the generated dummy variables. Figure 8 reports the plots of the quantile estimates. Accordingly, the results represented by REPO, EXP, EXRATE and OUT variables exhibit quite similar statistical and economical patterns depicted in Figure 3 where the breaks are not controlled for. In addition, Clemente et al., (1998) test results also showed that our variables still maintain their orders of integration under two structural breaks.

4. Conclusion

This paper analyzes the impacts of the monetary policy rate and inflation expectations on consumer inflation in Türkiye over the monthly period of 2015M1-2024M8. Since the inflation data exhibits tail dynamics, traditional mean-based estimation techniques may not grasp the whole picture of the patterns in the data. By quantile regressions, we can capture the asymmetry in the data and allow the impacts of the coefficients to differ with a dependency over quantiles of the conditional distribution of inflation. Our results can be summarized as follows:

i) Our data strongly confirm the existence of the price puzzle in Türkiye. This result naturally implies that the demand channel of the monetary policy transmission mechanism does not perform as desired by the bank and consumer prices do not drop following a contractionary policy. When the CBRT conducts a contractionary monetary policy, the different channels of the monetary policy transmission mechanism such as the cost channel, fiscal channel or information

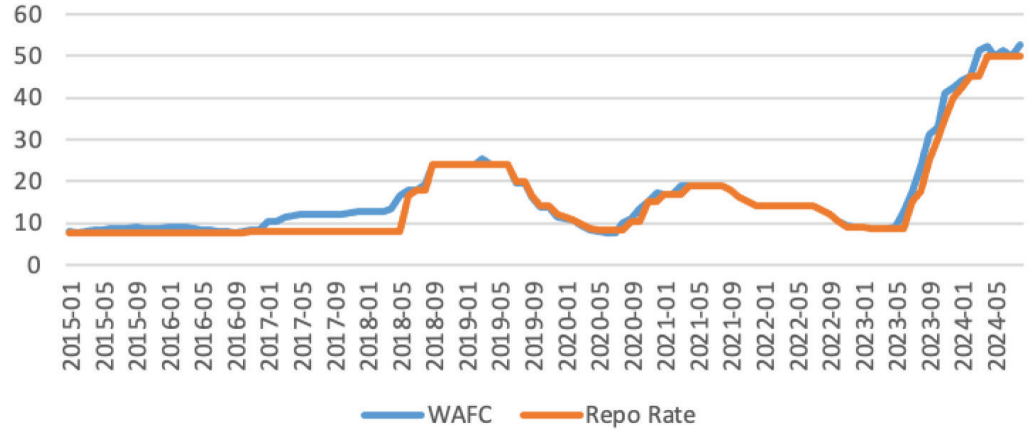

Figure 6: WAFC and Weekly Repo Rate, Monthly

Source: *The Central Bank of Republic of Türkiye*

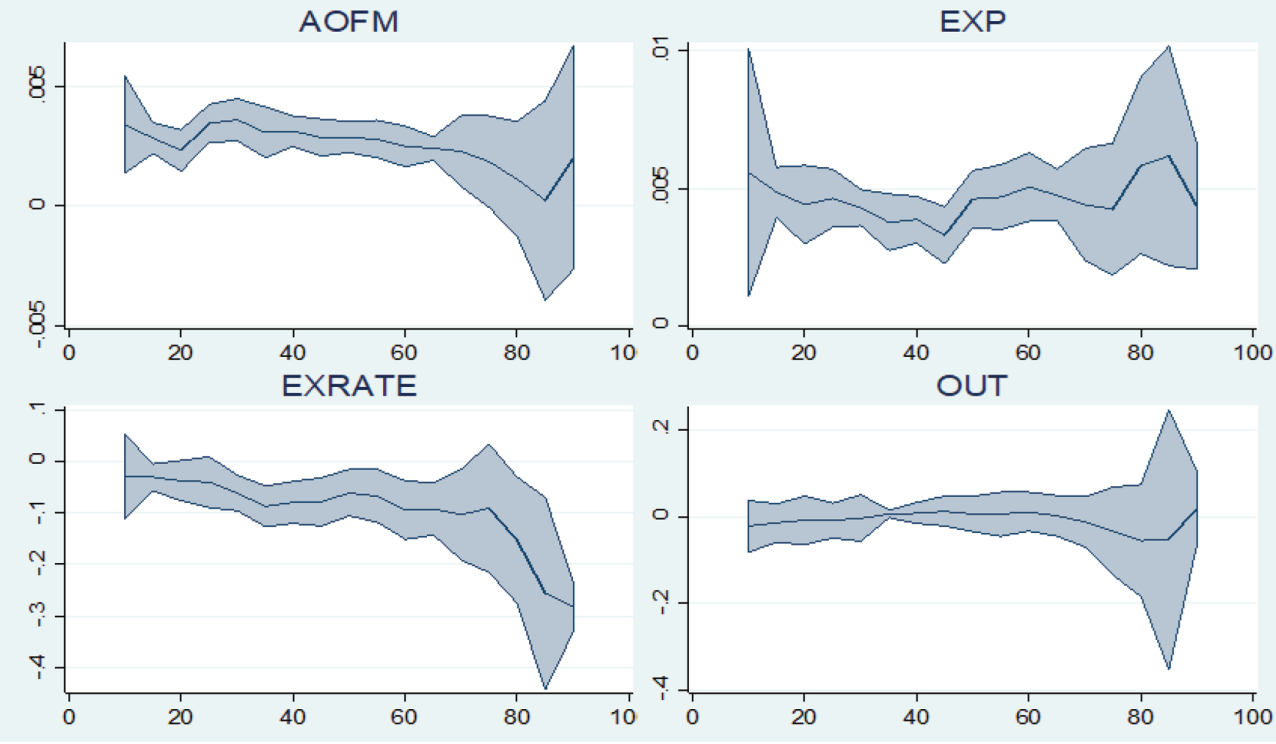

Figure 7: Quantile Plots, Monetary Policy and WAFC Rate

Notes: The solid line depicts the quantile estimates, while the gray area around the estimates are the confidence intervals at 10% significance level. We follow Huber (1967) and employed sandwich variance-covariance matrix for heteroskedastic errors in the quantile estimations

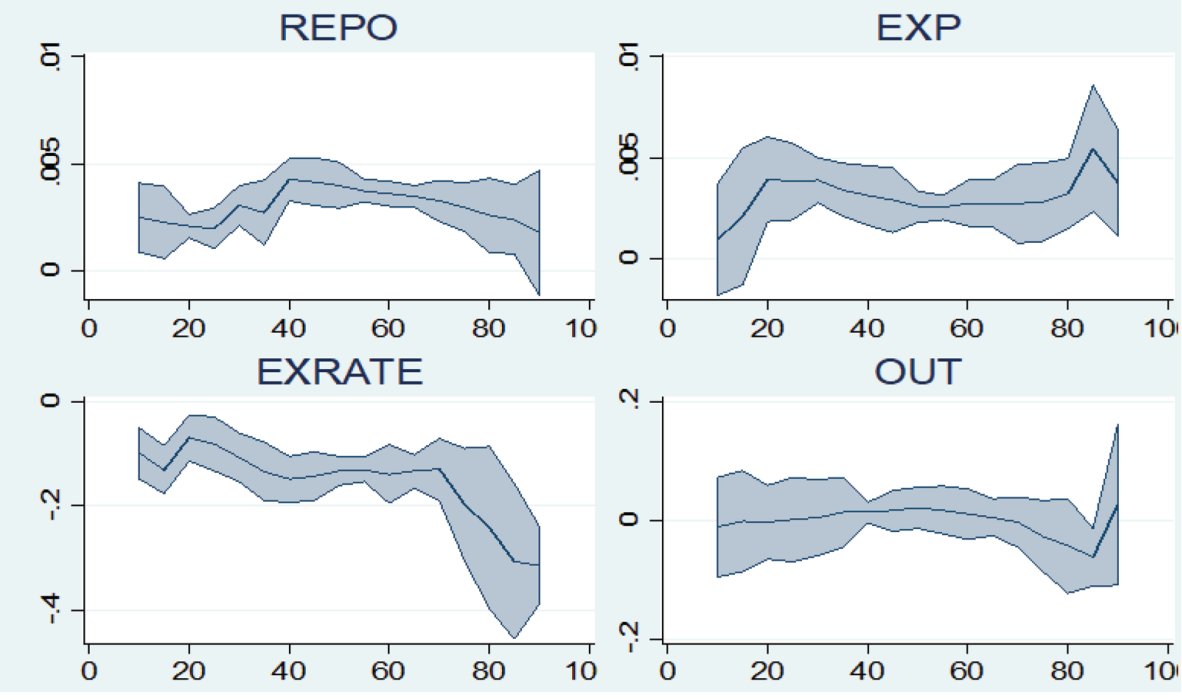

Figure 8: Quantile Plots, Structural Breaks

Notes: The solid line depicts the quantile estimates, while the gray area around the estimates are the confidence intervals at 10% significance level. We follow Huber (1967) and employed sandwich variance-covariance matrix for heteroskedastic errors in the quantile estimations.

asymmetry channel outperform the demand channel, which in turn induces an increase in consumer prices. Hence, a contractionary monetary policy destabilizes consumer inflation. We also showed that inflation expectations are a crucial factor in the fight against inflation. However, demand changes do not significantly drive consumer prices in Türkiye.

These results imply that there is a challenging road ahead of the CBRT in the fight against inflation dynamics due to the documented price puzzle in Türkiye. Since the CBRT has not traditionally achieved price stability and consistently missed the target rates, the monetary policies conducted by the CBRT cannot convince economic agents that price stability will be achieved. We cannot empirically confirm that the demand channel performs properly since demand changes do not generate significant inflation responses in Türkiye. The recent upward trend in inflation expectations due to the loss of independence and credibility of the CBRT may dominate price decisions of the agents and raise consumer prices regardless of the demand changes. As a result, the recent distortions of inflation expectations may explain why the demand channel has failed. Finally, the perception in the markets that the CBRT lacks institutional independence and credibility endangers the bank's ability to manage inflation expectations successfully. As a result, the bank needs to take urgent actions which must convince economic agents to ensure price stability. Otherwise, economic agents' future expectations will continue to feed inflation for a while longer.

ii) We also showed that the destabilizing impact of the monetary policy is more pronounced when inflation is relatively high. This outcome is also quite challenging for the CBRT. When the bank increases the monetary policy rate to fight against inflation, the destabilizing impact of the policy will be more pronounced since Türkiye has traditionally been a high-inflation country.

iii) We provided evidence that monetary the policy rate and inflation expectations deviate substantially from OLS estimations. We also documented that quantile estimates of objective variables often move outside of OLS confidence bands. These results confirm the asymmetry between inflation and objective variables. Policymakers should be cautious when taking decisions based on the mean-based estimation techniques since the OLS coefficients misestimate the effects of the monetary policy rate and inflation expectations on inflation rates.

iv) Our estimation results also indicate that the exchange rate generates negative and statistically significant impacts on consumer inflation. On the other hand, quantiles of the inflation distribution react positively to the changes in the FED monetary policy rate, world commodity and energy prices in tandem with the economic expectations. These results imply that, in addition to the domestic macroeconomic fundamentals such as inflation expectations, monetary policy rate and exchange rate, the lack of a proper international economic environment is also responsible for the price increases.

v) Finally, the results are robust to the use of alternative specifications, different measurements of monetary policy change and the existence of the structural breaks.

Footnote

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Appendix

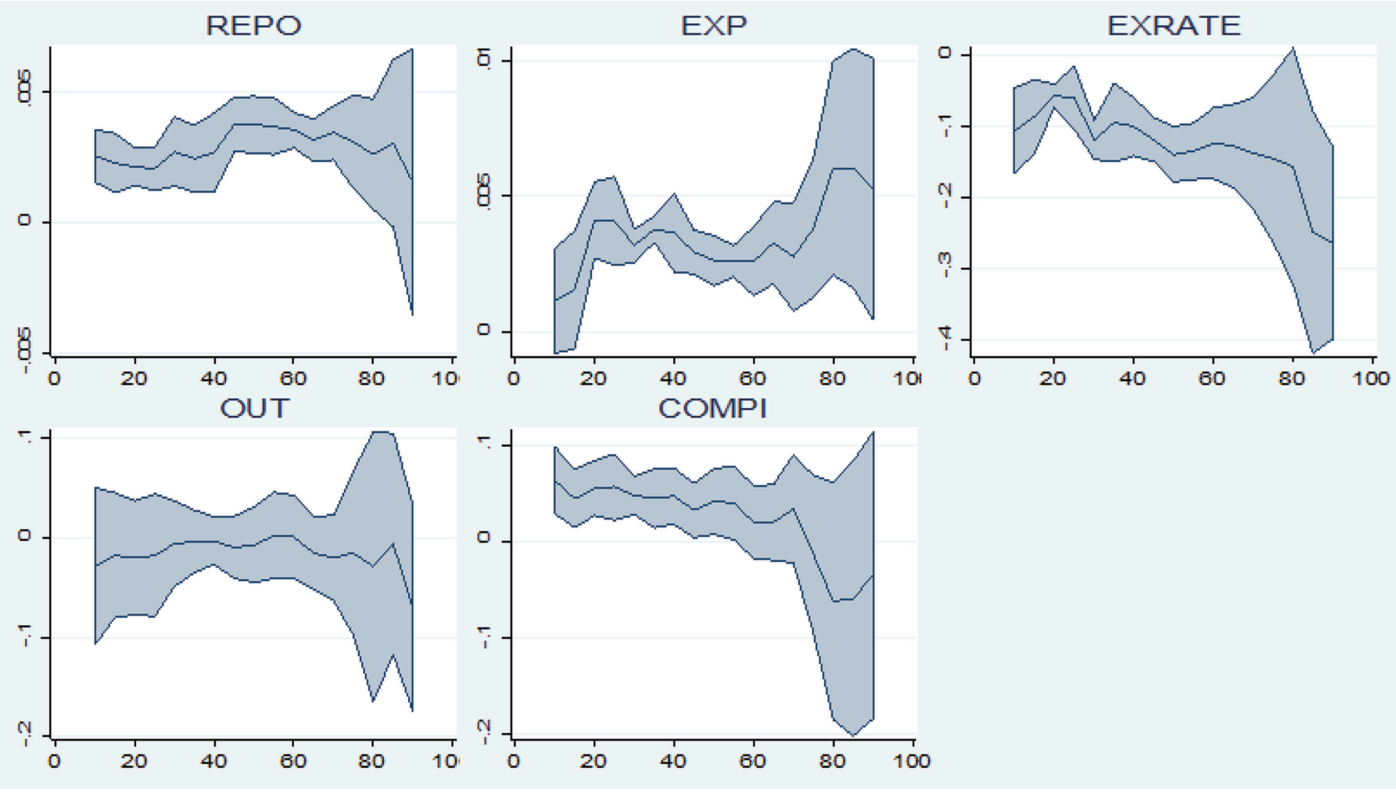

Figure 1A: Quantile Estimations, Specification 2

Figure 2A: Quantile Estimations, Specification 3

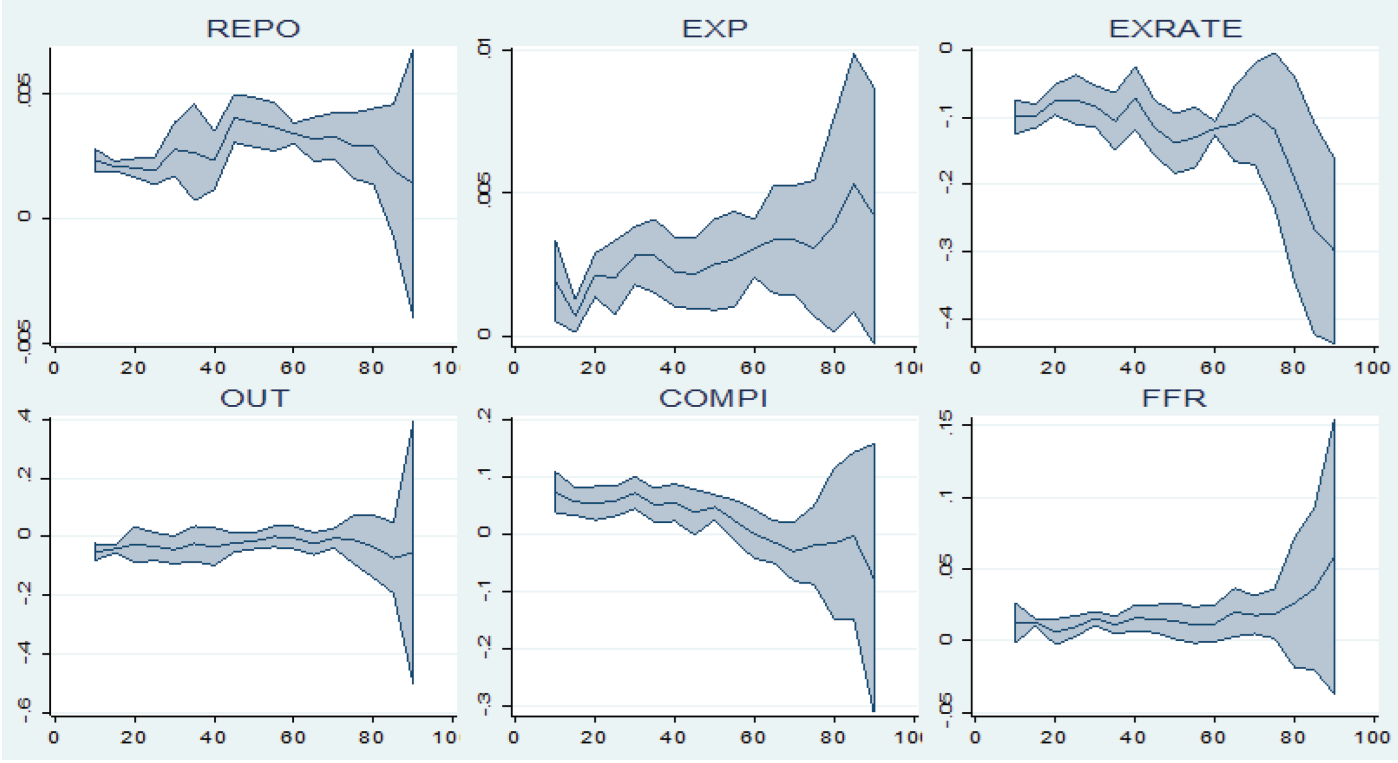

Figure 3A: Quantile Estimations, Specification 4

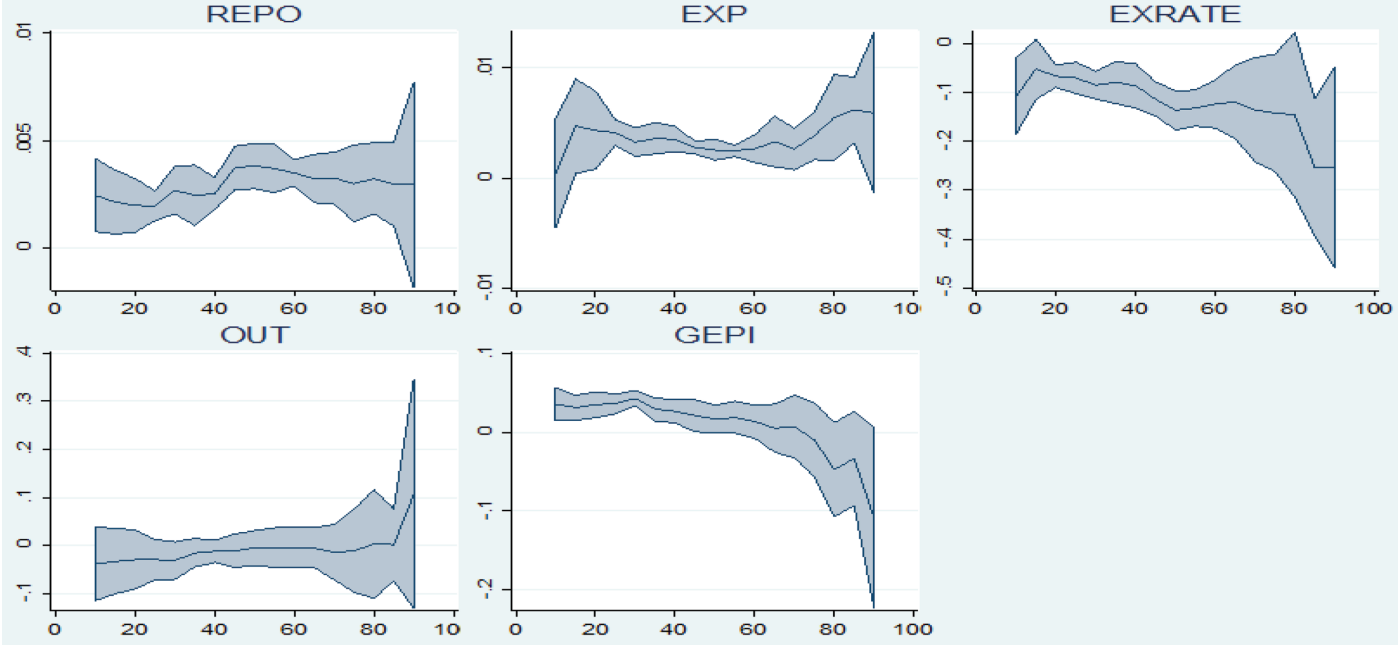

Figure 4A: Quantile Estimations, Specification 5

Figure 5A: Quantile Estimations, Specification 6

Table 1A: Unit Root Tests, ADF and PP Tests

	PP		ADF	
	Level	Δ	Level	Δ
PRICE	-0.252	-4.781	-0.010	-3.225
REPO	-0.806	-7.504	-3.285	---
EXP	-1.880	-5.235	-2.192	-4.418
EXRATE	-1.599	-7.350	-1.712	-6.032
OUT	-2.084	-12.634	-2.715	-6.716
COMPI	-2.035	-7.383	-2.023	-5.520
FFR	-0.947	-4.849	-2.047	-3.248
GEPI	-2.121	-7.153	-2.166	-5.921

Notes: Null hypothesis states the existence of unit root. A time trend and a constant are added in level while only a constant is used in first differences. The critical value at 10% significance level in trend with constant and only constant models are -3.148 and -2.579, respectively. The optimum lag length most often selected by the three criteria, AIC, SIC and HQIC was included in the ADF unit root tests. The optimum lag lengths are four for REPO, OUT and FFR; two for PRICE, COMPI and GEPI; and three for EXRATE. PP test uses Newey-West heteroscedasticity and autocorrelation consistent (HAC) variance-covariance estimator. The number of Newey-West lags are four for all variables.

Table 2A: Clemente, Montanes and Reyes Test, Double Breaks

Variables	Level Minimum t statistics	Δ Minimum t statistics	Break Points
PRICE	-2.440	-6.393	2018M11, 2022M5
REPO	-2.847	-6.586	2018M7, 2024M1
EXP	-2.212	-9.144	2018M1, 2022M2
EXRATE	-2.233	-7.197	2018M10, 2022M1
OUT	-3.659	-8.259	2017M3, 2020M2
COMPI	-3.460	-7.184	2021M11,2022M12
FFR	-1.350	-6.088	2020M5, 2023M1
GEPI	-3.273	-9.320	2021M11, 2023M4

Notes: Null hyphothesis states the existence of unit root when double structural breaks occur. Critical value is -5.490 at 5% siginificance level