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Inflation Dynamics in D-8 Countries: Evidence from Panel Quantile Regression (2000–2024)*D-8 Ülkelerinde Enflasyon Dinamikleri: Panel Kantil Regresyon Analizinden Kanıtlar (2000–2024)*Zehra Yalnız^{a,*}, Figen Büyükakın^b^a Dr., Independent Researcher, Kocaeli/Türkiye
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ÖZ

Bu çalışma, D-8 ülkelerinde enflasyon dinamiklerini 2000–2024 dönemi için panel kantil regresyon yöntemiyle incelemektedir. Enflasyon tüketici fiyat endeksi ile temsil edilirken, açıklayıcı değişkenler para arzı, kamu harcamaları, dış borç, kişi başına GSYH, reel efektif döviz kuru ve işsizlik oranından oluşmaktadır. Bulgular, döviz kuru hareketlerinin düşük ve orta enflasyon kantillerinde güçlü ve anlamlı etkiler yarattığını göstermektedir. Kişi başına GSYH çoğu kantilde pozitif etki gösterirken, kamu harcamaları ve işsizlik daha çok yüksek enflasyon rejimlerinde anlamlıdır. Sonuçlar, D-8 ülkelerinde enflasyonla mücadelede tek tip politikalar yerine rejime özgü yaklaşımların gerekli olduğunu ortaya koymaktadır.

ABSTRACT

Inflation dynamics in the D-8 countries are analyzed over the period 2000–2024, with a focus on the role of macroeconomic determinants across different inflation regimes. Inflation is proxied by the consumer price index, while explanatory variables include money supply, government expenditure, external debt, GDP per capita, the real effective exchange rate, and unemployment. The results indicate that exchange rate movements exert a strong and statistically significant impact in lower and middle inflation quantiles, highlighting the importance of exchange rate pass-through. GDP per capita shows a consistently positive effect across most quantiles, suggesting demand-driven pressures. The findings reveal that inflation dynamics in D-8 economies vary across inflation regimes and underscore the importance of adopting context-specific policy approaches rather than uniform policy prescriptions.

1. Introduction

Inflation is defined in the economic literature as a persistent and sustained increase in the general price level and is regarded as one of the most critical indicators of

macroeconomic stability (Blanchard, 2017, p. 51). The key feature that distinguishes inflation from temporary price fluctuations is its long-term and stable upward trajectory in the price level. For this reason, inflation is not merely considered as momentary price changes but as a continuing macroeconomic phenomenon that directly affects economic

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decision-making processes. The measurement of inflation commonly relies on two main indicators: the Gross Domestic Product (GDP) deflator and the Consumer Price Index (CPI). The GDP deflator captures changes in the overall price of domestically produced goods and services, thereby reflecting broad movements in the price level, while the CPI measures changes in the cost of a fixed basket of goods and services, thus indicating how household purchasing power evolves over time. Together, these indicators provide complementary insights into price dynamics and serve as essential references for the formulation of economic policies.

The theoretical foundations of inflation also underscore its multidimensional nature. The monetarist school conceives inflation as essentially a monetary phenomenon. Friedman emphasized this view with his well-known statement that “inflation is always and everywhere a monetary phenomenon,” arguing that in the long run, increases in money supply affect only the general price level (Friedman, 1963, p. 16). While monetary expansion may exert temporary effects on output and employment in the short run, such effects dissipate over time, leaving behind permanently higher prices. Consequently, effective control of inflation largely depends on disciplined monetary management.

The Keynesian perspective attributes inflation to demand-side pressures. Keynes argued that when aggregate demand exceeds productive capacity, prices rise (Keynes, 1936, p. 289). He further stressed the critical role of government spending and private consumption in shaping price dynamics. According to this view, expansionary fiscal policies can stimulate effective demand, thereby generating inflationary pressures. Accordingly, controlling inflation requires managing government expenditure and fiscal policy instruments (Keynes, 1937, p. 217).

Phillips identified an inverse relationship between unemployment and wage growth, which soon became associated with inflation, giving rise to what is known as the Phillips curve (Phillips, 1958, p. 283). However, the stagflation of the 1970s revealed that this relationship was conditional rather than absolute. Samuelson and Solow (1960) suggested that while policymakers may face a short-run trade-off between inflation and unemployment, no such trade-off exists in the long run. Lipsey (1960) extended the theoretical framework by incorporating the cost-of-living factor, showing that rising living costs increase wage demands, thereby reinforcing the wage–price spiral. Thus, while Phillips’ (1958) original formulation explained the link between unemployment and wage growth, subsequent contributions by Lipsey (1960), Samuelson, and Solow (1960) broadened the model into a framework that explained the short-term interaction between unemployment and inflation.

Romer (1993) argued that openness to international trade intensifies competition and constrains firms’ pricing power, thereby alleviating inflationary pressures. While in closed

economies cost increases can be more easily transferred to prices, in open economies competition functions as a restraining mechanism. Moreover, exchange rate pass-through and import prices are key channels through which openness influences inflation, especially in economies dependent on imported inputs.

The relationship between fiscal discipline and inflation has also long been debated in the literature. Sargent and Wallace (1984), in their “unpleasant monetarist arithmetic” framework, contended that if budget deficits are monetized, inflationary pressures become unavoidable. Similarly, Catao and Terrones (2005), in their empirical study on developing countries, demonstrated a statistically significant and positive relationship between fiscal deficits and inflation. In economies with fragile macroeconomic structures, unsustainable debt levels tend to increase the likelihood of deficit monetization, thereby aggravating inflationary pressures.

In the economics literature, it is broadly recognized that inflation is fundamentally a monetary phenomenon; the issuance of unbacked money represents the primary source of persistent increases in the general price level (Keynes, 1923, p. 235; Friedman, 1963, p. 17). However, the genesis of inflation cannot be reduced to a single factor, as it may operate through multiple transmission channels. Within this framework, the literature distinguishes four principal forms of inflation: demand-pull inflation, cost-push inflation, expectations-driven inflation, and structural inflation:

i. Demand-pull inflation arises when aggregate demand exceeds productive capacity, exerting upward pressure on prices (Keynes, 1936, p. 148).

ii. Cost-push inflation emerges when rising input prices, such as wages or energy, reduce aggregate supply and drive up the general price level (Lipsey, 1960; Samuelson & Solow, 1960; Blanchard, 2017).

iii. Expectations-based inflation emphasizes the critical role of inflation expectations in perpetuating price increases, as highlighted by Friedman (1968), Phelps (1968), and Blanchard (2017).

iv. Structural inflation results from economic rigidities, relative price misalignments, and downward price stickiness, which are often reinforced by accommodative monetary expansion (Canavese, 1982).

The economic consequences of inflation are equally multifaceted. First, the impact on income distribution is notable: price increases erode the purchasing power of fixed-income groups while transferring wealth from creditors to debtors (Fischer & Modigliani, 1978, p. 815). Tanzi (1977, p. 154) further demonstrated that during periods of high inflation, delays in tax collection erode real revenues, exacerbating inequality through fiscal channels. Second, inflation influences saving and investment behavior. Unanticipated and volatile inflation erodes the real value of savings and undermines investment decisions by

heightening uncertainty (Feldstein, 1983, p. 189). Third, it weakens external competitiveness, as higher domestic prices reduce the ability of local producers to compete in international markets (Balassa, 1964, p. 587). Finally, the relationship between inflation and growth remains contested. While low and predictable inflation may encourage growth, high and volatile inflation exerts destabilizing effects on long-run economic performance (Barro, 1996, p.158). Taken together, inflation emerges not only as a problem of price stability but also as a complex macroeconomic phenomenon that significantly affects income distribution, investment–savings dynamics, external trade, and macroeconomic stability.

In contemporary debates, inflation is increasingly viewed as a process shaped not only by monetary expansion, demand shocks, or cost pressures but also by broader institutional and social dynamics. Blanchard (2017, p. 79) underscored the role of income distribution and labor–employer bargaining processes, stressing that price increases are also the outcome of social conflicts and wage–price negotiations. From a heterodox perspective, Brancaccio and Saraceno (2017, pp. 353–354) criticized this framework for treating prices and income distribution as exogenous variables, arguing that such an approach overlooks the structural and class dimensions of inflation. Instead, the heterodox view highlights power relations, institutional frameworks, and social bargaining as central to explaining inflation, thereby offering a more comprehensive perspective.

These adverse effects are particularly pronounced in developing economies, where underdeveloped financial markets, external vulnerability, institutional weaknesses, and exchange rate volatility constrain efforts to maintain price stability. Empirical studies demonstrate that inflation in developing countries tends to be more volatile and persistent.

For instance, Edwards and Cabezas (2022) found that exchange rate pass-through and monetary policy interactions significantly influenced inflation dynamics in Iceland during the 2008 crisis. Similarly, Ji (2022) showed that exchange rate pass-through to domestic inflation is shaped by the structure of distribution chains, highlighting the complex transmission mechanisms of price shocks. These findings suggest that the effects of monetary and fiscal policies are heterogeneous and contingent upon the prevailing inflationary regime.

Recent contributions in the empirical literature increasingly emphasize that inflation dynamics exhibit substantial heterogeneity across the conditional distribution, which cannot be adequately captured by mean-based econometric approaches. In this context, studies published in *Empirical Economics* provide important evidence supporting distribution-sensitive frameworks. For instance, Fang, Miller, and Yeh (2010) employ quantile-based inference to examine inflation behavior and demonstrate that inflation variability differs markedly across quantiles, pointing to nonlinear and distribution-dependent dynamics. More

recently, Nazlıoğlu et al. (2025) analyze global inflation co-movements using a quantile factor model and show that inflation dependence structures vary significantly across different parts of the distribution. These findings underscore the relevance of quantile-based empirical approaches for analyzing inflation dynamics, particularly in emerging and developing economies characterized by structural heterogeneity and pronounced macroeconomic volatility.

Against this backdrop, the focus of this study is the D-8 countries (Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Turkey), which attract attention due to their large populations, strategic positions, and considerable economic potential. Established in 1997, the D-8 seeks to promote economic cooperation among its members. Although not identical in terms of macroeconomic indicators, these countries all belong to the group of developing economies and face similar structural challenges.

This study analyzes the determinants of inflation in the D-8 countries over the period 2000–2024 using a balanced panel dataset and employing the panel quantile regression approach. Unlike traditional panel models that focus on mean effects, this method allows for the examination of heterogeneous impacts of policy variables across different points of the conditional inflation distribution (lower, middle, and upper quantiles). The dependent variable is the annual CPI inflation rate, while the explanatory variables include money supply (M2), government expenditure (GOV), external debt stock (DEBT), GDP per capita (GDP), real effective exchange rate (REER), and unemployment rate. Methodologically, cross-sectional dependence was tested using the Breusch–Pagan LM test, while the CIPS unit root test was applied to assess stationarity. To obtain reliable standard errors in quantile estimates, the bootstrap method was employed. Considering the external vulnerability of the D-8 countries, these methodological choices enhance both the statistical robustness of the results and the validity of the policy implications.

This study contributes to the literature in several important ways. First, by focusing on the D-8 countries over the period 2000–2024, it provides new evidence from a group of emerging and developing economies that have not been extensively examined in previous inflation research. Second, it advances the methodological framework by employing the panel quantile regression approach, which captures heterogeneous effects across different inflation regimes and thereby overcomes the limitations of conventional mean-based models. Third, by identifying the role of key macroeconomic variables under low-, medium- and high-inflation conditions, the study offers valuable insights for policymakers in designing more targeted and effective anti-inflationary strategies. The remainder of the study is organized as follows: Section 2 reviews the literature, Section 3 presents the theoretical framework and model, Section 4 explains the dataset and methodology, Section 5 reports the empirical findings, and Section 6

concludes with policy implications.

2. Literature Review

Panel quantile regression analysis has emerged in recent years as a significant development in the econometric literature, offering a powerful methodology for analyzing the effects of inflation determinants across different quantiles. This section reviews the main contributions that constitute the theoretical and methodological foundation of the study. The foundations of quantile regression methodology were laid by Koenker and Bassett (1978). This pioneering study went beyond the traditional ordinary least squares method by enabling the examination of relationships at different points of the conditional distribution of the dependent variable. Koenker (2004) made important contributions to adapting this methodology to panel data structures, developing quantile regression techniques for longitudinal data analysis. In the field of panel quantile regression, Canay (2011) proposed a simple and feasible approach for fixed-effects panel data models. Galvão (2011) extended quantile regression techniques to dynamic panel data models and analyzed the impact of lags in fixed-effects models. Kato, Galvão, and Montes-Rojas (2012) presented the asymptotic theory for panel quantile regression with individual effects, while Galvão and Kato (2016) developed the smoothed panel quantile regression method to improve estimation efficiency.

Harding and Lamarche (2009) addressed endogeneity problems in panel quantile regression models through the use of instrumental variables, whereas Hagemann (2017) provided more reliable statistical tests for panels affected by cross-sectional dependence through cluster-robust bootstrap inference. Arellano and Bonhomme (2016) broadened the scope of the methodology by addressing quantile regression approaches in nonlinear panel data estimation. These contributions significantly strengthened the theoretical foundations of panel quantile regression.

Beyond methodological advances, solutions to forecasting and inference problems have also been developed in the literature. Rosen (2012) proposed the set identification approach through quantile restrictions in short panels. Chernozhukov, Fernández-Val, and Galichon (2010) developed the methodology of intersecting quantile and probability curves to preserve the monotonicity properties of estimates. Belloni, Chernozhukov, and Fernández-Val (2019) addressed conditional quantile processes with a large number of regressors. Chen, Dolado, and Gonzalo (2014) developed methods to detect structural breaks in large factor models, while Galvão and Wang (2015) proposed an efficient minimum distance estimator for fixed-effects panel quantile regression. Chernozhukov, Fernández-Val, and Melly (2013) demonstrated the potential of quantile methods for inference on counterfactual distributions. Powell (2022) provided significant theoretical contributions to nonadditive fixed-effects quantile regression models.

The analysis of inflation dynamics in D-8 countries has undergone a remarkable transformation in recent years with the widespread use of panel quantile regression methods. Unlike traditional panel data methods, panel quantile regression approaches can capture heterogeneous effects across different points of the inflation distribution, thus providing policymakers with more detailed insights. This literature review prioritizes studies employing panel quantile regression in the analysis of inflation in D-8 countries and similar groups of developing economies, evaluating both methodological contributions and empirical findings.

2.1. Empirical Studies on the Determinants of Inflation

The determinants of inflation have constituted a broad area of debate in the economics literature, and it has been observed that different macroeconomic factors have come to the fore across diverse country experiences. The monetarist approach identifies the expansion of the money supply as the fundamental source of inflation, whereas the Keynesian perspective emphasizes government expenditure and aggregate demand growth. Exchange rate dynamics exert a particularly strong influence on prices in open economies, while external debt stock and fiscal deficits amplify inflationary pressures through the channel of monetization. Increases in per capita income and economic growth play a role in price dynamics through demand-driven pressures, whereas the unemployment rate interacts with inflation within the framework of the Phillips curve. Consequently, the empirical literature demonstrates that inflation cannot be explained by a single variable; rather, macroeconomic indicators operate jointly and generate heterogeneous effects across different inflation regimes. In this context, the following section summarizes the principal empirical studies that examine the determinants of inflation:

Romer (1993) examined the relationship between openness and inflation using data from 114 countries over the period 1973–1988. The findings showed that more open economies were more successful in controlling inflation and that openness supported price stability.

Goldberg and Knetter (1997) conducted a comprehensive literature review and empirical analysis covering the period 1970–1990 to investigate the relationship between goods prices and exchange rates. The study found that exchange rate pass-through varied significantly across time, sectors, and countries.

Campa and Goldberg (2005) analyzed exchange rate pass-through in OECD countries for the period 1975–2003. Their panel data analysis emphasized the sensitivity of import prices to exchange rate changes and revealed substantial cross-country differences in pass-through.

Catão and Terrones (2005) used a panel dataset of 107 developing countries for the period 1960–2001 to examine the relationship between fiscal deficits and inflation. The study found that the monetization of fiscal deficits was strongly and statistically significantly associated with

inflation.

Choudhri and Hakura (2006) analyzed exchange rate pass-through using data from 71 countries between 1979 and 2000. Their panel regression results showed that exchange rate shocks had a stronger impact on prices in high-inflation environments, while the effect was limited under low-inflation regimes.

Ca' Zorzi, Hahn, and Sánchez (2007) studied exchange rate pass-through in 12 emerging economies. Their findings revealed that pass-through was higher in developing countries and that monetary policy responses to exchange rate shocks determined inflation dynamics.

De Gregorio, Landerretche, and Neilson (2007) examined the impact of oil price changes on inflation for different country groups during 1970–2005. Their results indicated that oil prices reinforced inflationary pressures, particularly in developing countries.

López-Villavicencio and Mignon (2017) analyzed exchange rate pass-through for 27 emerging economies over the period 1994–2014. Their findings demonstrated that the monetary policy regime and inflation environment significantly influenced the extent to which exchange rate shocks passed through to prices.

Aydın (2017) studied the relationship between inflation and growth in D-8 countries using panel data from 1990–2014. The results of dynamic panel threshold regression indicated that low inflation levels supported growth, while high inflation levels negatively affected growth.

Cheikh (2018) examines the role of business cycles in exchange rate pass-through using quantile-based nonlinear methods. The analysis demonstrates that the degree of pass-through varies across macroeconomic conditions and is particularly stronger at lower and middle segments of the conditional inflation distribution. The findings highlight that the exchange rate–inflation relationship is inherently nonlinear and depends on both cyclical dynamics and distributional characteristics of inflation.

Dreyer and Schmid (2020) investigate inflation dynamics in the Eurozone with a particular focus on institutional arrangements such as monetary union membership. Their panel data analysis shows that Euro membership contributes to price stability by reducing inflation, underscoring the importance of institutional and structural factors alongside monetary and real variables in shaping inflation outcomes.

Banerjee, Mehrotra, and Zampolli (2020) employed BIS data for more than 40 countries during 1990–2018 to analyze inflation dynamics using the “inflation-at-risk” approach. Their findings revealed that tightening financial conditions reduced inflation in the lower quantiles but increased upward risks in the higher quantiles.

Hasan and Ahmed (2025) examined the reciprocal relationship between inflation and unemployment in Iraq for the period 2003–2023 using the ARDL-ECM model. Their

results indicated that the short- and long-term effects of unemployment on inflation were stronger than the reverse. In the short run, a 1% increase in unemployment reduced inflation by approximately 3.84 units. In the long run, however, the direction of the relationship partially reversed, with higher unemployment leading to a limited increase in inflation. The study emphasized that job-creating policies, investment promotion, and the expansion of goods and services supply were necessary to control both inflation and unemployment.

2.2. Studies Employing Panel Quantile Regression Approaches

In recent years, the methods employed to analyze the determinants of inflation have become increasingly diversified, with quantile regression approaches gaining prominence for their ability to overcome the limitations of traditional mean-effect models. Whereas conventional panel data techniques capture only changes in the mean of the dependent variable, quantile regression methods reveal the effects at different points of the distribution, thereby enabling the identification of distinct dynamics under low-, medium-, and high-inflation regimes. With this advantage, quantile regression provides more reliable results particularly in developing and fragile economies. In the literature, this method has found wide application, ranging from the money supply–inflation nexus to exchange rate pass-through, and from expectation channels to the heterogeneous effects of fiscal policies on inflation. In this context, the following section summarizes empirical studies that employ the panel quantile regression approach and present significant findings on inflation dynamics:

Bağcı (2021) tested the money supply–inflation relationship in Turkey for the period 2008–2020 using the Quantile-on-Quantile Regression (QQR) approach. The study showed that the relationship varied in both direction and magnitude across quantiles. The findings highlighted that increases in money supply did not necessarily raise inflation under all conditions, with interactions displaying asymmetry across different segments of the distribution.

Mehrotra and Zampolli (2022) in a review section discussing post-pandemic monetary–fiscal interactions, emphasized that monitoring inflation risks in emerging market economies (EMEs) through quantile-based panel approaches contributed to policy design. Their assessment suggested that external factors such as exchange rates and energy prices, combined with fiscal stance, heightened risks in the upper quantiles of the inflation distribution.

Abdullahi et al. (2023) employ a dynamic panel quantile regression framework to analyze the relationship between financial integration and economic development. Their findings indicate that the effects of financial integration are not homogeneous but vary across countries depending on their level of development. The study highlights the usefulness of quantile-based approaches in capturing cross-country heterogeneity and providing more nuanced policy-

relevant insights.

Akyüz (2023) compared the Fixed Effects model with Panel Quantile Regression in the renewable energy consumption–growth relationship for BRICS-T countries during 1990–2021, incorporating inflation and population growth as control variables. The results demonstrated that coefficients varied significantly across quantiles and underscored that the panel quantile approach better captured heterogeneity in growth dynamics.

Mitchell, Misztal, and Sinclair (2023) analyzed the relationship between realized inflation distribution and household, firm, market, and professional expectations in the United States using quantile regression. The study showed that professional forecasts had stronger predictive power in the middle quantiles, while household expectations were more influential in the upper quantiles. Combining different expectation measures with quantile-specific weights improved the assessment of inflation risks.

Banerjee, Contreras, Mehrotra, and Zampolli (2024) applied fixed-effects quantile panel regression techniques to a broad panel of advanced and emerging economies, generating “inflation-at-risk” indicators. Their study demonstrated that the determinants of inflation risks varied across quantiles, with policy and external shocks exerting particularly strong effects in the upper quantiles.

Ge and Sun (2024) disentangled the effects of oil supply, demand, and risk shocks on inflation using the Quantile-on-Quantile Regression (QQR) method. Their findings revealed that when inflation was positive, supply shocks reduced inflation, while demand shocks had asymmetric effects depending on the quantile, predominantly raising inflation.

Mansouri, Liouaeddine, and Laamire (2024) analyzed the exchange rate–inflation nexus using quantile regression, focusing on food inflation. Their results highlighted that exchange rate pass-through effects differed across quantiles and became positive and statistically significant in the upper quantiles.

Doh, Lee, and Park (2024) applied conditional quantile regression using U.S. Household Expectations (SCE) data. Their study showed that monetary policy shocks lowered expectations across the entire distribution—particularly in the upper quantiles. The findings indicated heterogeneity across income groups, with “high inflation expecters” in the upper quantiles responding more strongly to policy actions.

Garrón, Rodríguez-Caballero, and Ruiz (2024) employed a multilevel dynamic factor model to extract international factors from the monthly inflation data of more than 115 countries between 1999 and 2022. Using factor-augmented quantile regression, they produced Inflation-at-Risk and Deflation-at-Risk measures. Their findings indicated that international factors were more decisive in the higher inflation quantiles of advanced economies, whereas the effect was more limited in low-income countries.

Aydın (2025) applied quantile regression to cross-sectional data for 148 countries in 2022 to examine the effects of inflation and unemployment on per capita income across income groups. The results showed that inflation reduced per capita income across all quantiles, while the effect of unemployment varied by quantile and income group—being more adverse in the upper quantiles. The findings also pointed to the phenomenon of jobless growth.

Lenza, Moutachaker, and Paredes (2025) generated inflation density forecasts for the Euro Area using the Quantile Regression Density approach. Their results captured nonlinear relationships and provided significant improvements in forecasting headline and core inflation distributions. The findings emphasized that gains in predictive performance at the tail quantiles were critical for policy evaluation.

Nazlıoğlu, Gürel, Güneş, Akın, Karul, and Kar (2025) developed a quantile factor model using a global sample of 151 countries from 1970–2023. Their results showed that inflation co-movement followed a quantile-dependent factor structure. The findings indicated that co-movement decreased during both low and high inflation periods, while commodity prices became key determinants of latent quantile factors in the upper inflation quantiles.

Previous studies have examined inflation dynamics from different perspectives; however, their scope and analytical focus vary considerably. Cheikh (2018) employs quantile-based methods to demonstrate the nonlinear nature of exchange rate pass-through and its dependence on business cycle phases, yet the analysis remains largely confined to cyclical conditions. Dreyer and Schmid (2020) investigate the impact of Eurozone membership on inflation using panel data techniques, but their contribution is limited to the institutional context of advanced economies. Akarsu and Gharehgozli (2024) examine the distributional consequences of inflation for income inequality in the European Union using panel data methods, but do not adopt a quantile-based approach to inflation itself. While these studies offer valuable insights into specific dimensions of inflation-related phenomena, systematic evidence on the quantile-specific effects of core macroeconomic determinants of inflation in developing economies remains limited. Accordingly, a panel quantile regression analysis focusing on D-8 countries provides a complementary contribution by explicitly capturing heterogeneity across different segments of the conditional inflation distribution.

Recent contributions highlight that inflation dynamics are shaped not only by macroeconomic fundamentals but also by nonlinear structures and expectation-driven mechanisms. Glawe and Wagner (2024) provide evidence of threshold effects, showing that the relationship between inflation and income distribution exhibits a nonlinear pattern. Similarly, Law and Goh (2024) emphasize the role of information flows and media in shaping inflation expectations, underlining the importance of expectation channels in the inflation process. These findings suggest that inflation

cannot be adequately explained by uniform or mean-based models, but instead displays varying dynamics across different conditions. However, despite these advances, empirical evidence remains limited regarding how core macroeconomic variables affect inflation across different levels of its distribution, particularly in developing country groups such as the D-8. In this context, this study employs a panel quantile regression approach to examine the heterogeneous effects of macroeconomic variables across different inflation regimes, thereby providing a distribution-sensitive perspective on inflation dynamics.

3. Methodology and Data

The fundamental theoretical assumption of this study is that

the determinants of inflation are not homogeneous but exhibit distinct effects across different levels of inflation. For this reason, the panel quantile regression method is employed. Focusing on the D-8 countries, the study examines the role of macroeconomic variables at different inflation levels, accounts for the heterogeneity that traditional approaches tend to overlook, and provides a theoretical foundation for policymakers to design targeted responses under low- and high-inflation regimes. The analysis uses an annual balanced panel dataset covering the period 2000–2024 for the D-8 countries (Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Turkey). The dependent variable is the annual inflation rate (CPI, %), while the explanatory variables are as follows, as presented in Table 1.

Table 1: Dataset Information

Variable Name	Abbreviation	Definition	Source
Money Supply	M	Broad money supply (M2), % of GDP or local currency units	www.databank.worldbank.org
Government Expenditure	GOV	General government final consumption expenditure (% of GDP)	www.databank.worldbank.org
External Debt Stock	DEBT	Total external debt stocks (current US\$)	www.databank.worldbank.org
Gross Domestic Product per Capita	GDP	GDP per capita (constant 2015 US\$)	www.databank.worldbank.org
Real Effective Exchange Rate	REER	Real effective exchange rate index (2010 = 100)	www.databank.worldbank.org
Unemployment Rate	UNEMP	Unemployment, total (% of total labor force)	www.databank.worldbank.org

The dataset, which covers 200 observations for 8 countries, was obtained entirely from the World Bank's World Development Indicators (WDI) database. Since the external debt stock variable included negative values, the inverse hyperbolic sine (IHS) transformation was applied, while the natural logarithmic transformation (ln) was used for GDP. These adjustments ensured that the series were appropriately prepared for econometric analysis. The expected theoretical effects of the variables used in this study on inflation can be summarized as follows:

Money Supply (M): In line with the monetarist theory, an increase in money supply is expected to raise inflation. Friedman emphasized this relationship with his well-known assertion that "inflation is always and everywhere a monetary phenomenon" (Friedman, 1963, p. 17).

Government Expenditure (GOV): According to the Keynesian approach, when aggregate demand exceeds productive capacity, prices rise (Keynes, 1936, p. 289). While government spending accelerates this process, fiscal discipline can simultaneously support price stability.

External Debt (DEBT): High levels of debt may generate inflationary pressures due to loss of confidence and the risk of monetizing fiscal deficits. Catao and Terrones, in their

analysis of developing countries, found a strong and statistically significant positive relationship between fiscal deficits and inflation (Catao & Terrones, 2005, p. 532).

GDP per Capita (GDP): Economic growth may create inflationary pressures through rising demand, although realized growth may moderate the magnitude of this effect. Moreover, the relationship between growth and inflation is not unidirectional. Barro (1996, p. 153) found that a 10-percentage-point increase in annual inflation reduces the rate of economic growth by approximately 0.3–0.4 percentage points. This evidence indicates that persistently elevated inflation constrains growth, whereas low and stable inflation exerts only limited effects.

Exchange Rate (REER): Exchange rate depreciation increases inflation through higher import prices. This "exchange rate pass-through" effect has been extensively discussed in the literature (Goldberg & Knetter, 1997, p. 1248).

Unemployment (UNEMP): Phillips (1958, p. 283) identified an inverse relationship between unemployment and wage growth, a finding that was subsequently extended to inflation and established in the literature as the Phillips curve. Accordingly, as unemployment decreases, inflation is

expected to rise.

3.1. Panel Quantile Regression Analysis

Traditional regression models evaluate the relationships between variables by estimating the conditional mean of the dependent variable. However, macroeconomic indicators such as inflation often exhibit different dynamics across various levels. In this context, the quantile regression method offers a solution to the heterogeneity problem by estimating the effects of explanatory variables at specific points of the conditional distribution (e.g., lower, median, upper quantiles) separately (Koenker & Bassett, 1978, p. 36). Compared to the classical Ordinary Least Squares (OLS) method, quantile regression provides more robust results due to its resistance to outliers and does not rely on the assumption of normally distributed error terms.

In the panel data literature, Koenker (2004) extended quantile regression to longitudinal data; Canay (2011) proposed a practical approach for fixed effects; and Galvao (2011) introduced the dynamic panel quantile regression model. These advancements made it possible to account for both cross-country heterogeneity and temporal dynamics. Panel quantile regression has thus emerged as a powerful analytical tool, particularly in samples characterized by asymmetry and volatility, such as those from developing countries.

Powell (2020) further advanced the methodology by developing the Generalized Quantile Regression (GQR) framework for the estimation of unconditional quantile treatment effects (QTEs). GQR offers a flexible structure in which the interpretation of parameters remains unaffected when covariates are added to the quantile function. As a generalized estimator encompassing both QR and IVQR approaches, it provides broad applicability. Simulation results demonstrate the strong performance of this method, while empirical applications highlight its ability to capture heterogeneity in labor earnings resulting from temporary versus direct hiring. From a methodological perspective, GQR has significantly enriched the quantile regression literature. By uncovering the differential effects of explanatory variables across lower, median, and upper quantiles of the conditional inflation distribution, it also equips policymakers with the tools to design strategies more closely aligned with diverse economic conditions.

3.2. Econometric Tests

Before proceeding with panel quantile regression analysis, it is essential to examine the structural properties of the dataset and test the underlying model assumptions. Although quantile regression is more flexible than mean-based methods, disregarding fundamental econometric concerns—such as cross-sectional dependence, stationarity, normality, cointegration, or multicollinearity—within a panel data context may undermine the reliability of the estimates. Accordingly, this study first conducts tests for cross-sectional dependence, stationarity, normality, multicollinearity, and long-run cointegration relationships.

Furthermore, to ensure the reliability of standard errors in the quantile estimates, a bootstrap procedure is applied.

Tests conducted to detect cross-sectional dependence and unit-specific correlations are commonly referred to as Cross-Sectional Dependence (CD) tests (Pesaran, 2004). The CD test evaluates whether correlations exist across cross-sectional units. In this study, cross-sectional dependence was assessed using the Breusch–Pagan LM test. The test statistic is computed as follows (Breusch & Pagan, 1980, p. 247):

$$LM = \sum_{i=1}^{N-1} \sum_{j=i+1}^N r_{ij}^2 \quad (1)$$

In this equation, r_{ij} represents the correlation between the residuals of units i and j . Under the null hypothesis of cross-sectional independence, the test statistic follows a chi-squared distribution with $2(1/2m \times (m-1))$ degrees of freedom. Moreover, the LM statistic can be expressed as the sum of two components, denoted as LM1 and LM2 (Baltagi, 2008, p. 60).

$$LM_1 = (NT / 2(T-1)) [1 - (\bar{\mu}' \mu^- / \bar{\mu}' \mu)]^2 \quad (2)$$

$$LM_2 = (NT / 2(N-1)) [1 - (\bar{\mu}' \mu^- / \bar{\mu}' \mu)]^2 \quad (3)$$

$$LM = LM_1 + LM_2 \quad (4)$$

According to Equation (4), if the null hypothesis (H_0) is accepted, there is no cross-sectional dependence among panel units. In other words, no correlation exists across units. However, if the null hypothesis is rejected in favor of the alternative, cross-sectional correlation is present. In such cases, employing second-generation panel unit root tests yields more reliable estimates. The stationarity of the series was examined using the Cross-sectionally Augmented IPS (CIPS) test developed by Pesaran (2007). This test accounts for cross-sectional dependence and is expressed by the following equation (Pesaran, 2007, pp. 271–272):

$$CIPS = N^{-1} \sum_{i=1}^N CADF_i \quad (5)$$

Equation (5), N denotes the total number of cross-sectional units in the panel, such as countries or firms, while $tiCADF$ represents the Cross-sectionally Augmented Dickey–Fuller (CADF) test statistic for each individual cross-section (ti). The normality of the error terms was assessed using the Shapiro–Wilk (1965) and Jarque–Bera (1980) tests. The Shapiro–Wilk test is expressed as follows (Shapiro & Wilk, 1965, p. 593):

$$W = (\sum_{i=1}^n \ln(x_i - x^-)) / ((\sum_{i=1}^n \ln a_i(x_i))^2) \quad (6)$$

The test statistic of the Jarque–Bera test is presented in Equation (7) (Jarque & Bera, 1980, p. 256):

$$JB = n/6 (S^2 + (K - 3)^2)/4 \quad (7)$$

where n denotes the sample size, S represents skewness, and K indicates kurtosis. Under the null hypothesis of normality, the test statistic follows a chi-squared distribution with two degrees of freedom.

Multicollinearity among the explanatory variables was assessed using the Pearson correlation coefficient (Pearson, 1896, p. 302):

$$r_{xy} = (\sum (x_i - \bar{x})(y_i - \bar{y})) / (\sqrt{(\sum (x_i - \bar{x})^2) \sum (y_i - \bar{y})^2}) \quad (8)$$

Long-run relationships among the variables were examined using panel cointegration tests developed by Pedroni (1999) and Westerlund (2007). The Pedroni test is residual-based in nature, and the regression model used to test for long-run relationships is specified as follows (Pedroni, 1999, p. 660):

$$y_{it} = \alpha_i + \delta_{it} + \beta_1 x_{1it} + \beta_2 x_{2it} + \beta_m x_{mit} + \epsilon_{it} \quad (9)$$

In this model, y_{it} represents the dependent variable, while x_{mit} denotes the explanatory variables. α_i captures the unit-specific effects, δ_{it} indicates the time trend, and ϵ_{it} represents the regression residuals. Pedroni (1999) developed a set of panel cointegration test statistics based on these residuals, tailored to the panel data structure. If the residuals do not contain a unit root, cointegration is confirmed (Pedroni, 1999, pp. 656–660). The Westerlund test, on the other hand, is based on the Error Correction Model (ECM) framework and evaluates the speed of adjustment toward long-run equilibrium (Westerlund, 2007, p. 711).

Finally, in the panel quantile regression analysis conducted in this study, the standard errors of the estimated parameters were obtained using the bootstrap method. The bootstrap procedure, originally developed by Efron (1979), provides more reliable and robust standard error estimates in models where parametric assumptions are weak, such as quantile regressions. By repeatedly resampling from the observed data, it empirically approximates the distribution of standard errors. Particularly in the presence of outliers, heteroskedasticity, and distributional deviations, the bootstrap method yields more accurate and robust results compared to classical approaches. In this respect, the bootstrap enhances the reliability of parameter estimates in the context of quantile regression and supports the overall validity of the model (Efron, 1979, pp. 3–5).

4. Empirical Results

Before conducting the panel quantile analysis, the presence of cross-sectional dependence in the panel was examined using the Breusch–Pagan LM test. Subsequently, the stationarity properties of the series were investigated through the Pesaran CIPS panel unit root test and the Augmented Dickey–Fuller (ADF) unit root test. Non-stationary variables were transformed into stationary form by taking their first differences where necessary. In the panel quantile regression analysis, the quantiles of 0.20, 0.40, 0.60, and 0.80 were selected to capture the determinants of inflation at different points of the conditional inflation distribution. These quantiles correspond to lower, lower-middle, upper-middle, and upper conditional inflation quantiles, respectively.

The selected quantiles also have a clear economic interpretation in terms of inflation regimes. Since quantile regression allows the effects of explanatory variables to be examined at different points of the conditional distribution rather than only at the conditional mean, the selected quantiles make it possible to capture regime-specific inflation dynamics (Koenker & Bassett, 1978; Koenker, 2004). In this framework, the 0.20 quantile represents relatively low-inflation conditions, where price increases are limited and macroeconomic stability is comparatively stronger. The 0.40 quantile can be interpreted as a lower-middle inflation regime, reflecting a transition zone in which inflationary pressures begin to emerge but have not yet become dominant. The 0.60 quantile corresponds to an upper-middle inflation regime, where inflationary pressures become more visible and macroeconomic variables may exert stronger effects on prices. Finally, the 0.80 quantile represents a high-inflation regime, capturing periods in which price instability is more pronounced and policy responses become more critical. This interpretation is also consistent with the view that inflation dynamics may differ across the conditional distribution and cannot be fully captured by mean-based approaches (Fang et al., 2010; Nazloğlu et al., 2025). Therefore, the use of these quantiles enables the analysis to distinguish whether the determinants of inflation operate differently under low, moderate, and high inflation environments rather than assuming a uniform average effect.

Prior to model estimation, potential multicollinearity among the explanatory variables was assessed using Pearson correlation analysis (pwcrr). The normality assumption of the error terms was tested, and robust standard errors were obtained through the application of the bootstrap method. Accordingly, the estimated model is specified as follows:

$$\text{INF}_i = \beta_0 + \beta_1 \text{Mi}_i + \beta_2 \text{GOV}_i + \beta_3 \ln_ \text{DEBT}_i + \beta_4 \ln_ \text{GDP}_i + \beta_5 \text{REER}_i + \beta_6 \text{UNEMP}_i + \epsilon_{it} \quad (10)$$

The model was estimated for the following quantiles:

$\tau_1 = \{0.20, 0.40, 0.60, 0.80\}$, Table 2 presents the descriptive statistics of the variables.

Table 2: Descriptive Statistics of the Variables

Statistic	INF	M	GOV	LN_DEBT	LN_GDP	REER	UNEMP
Mean	11.641	59.042	9.971	3.707	8.076	106.708	6.416
Standard Deviation (SD)	11.628	32.403	3.124	1.353	0.787	56.075	3.608
Skewness	2.440	1.126	-0.150	-2.320	0.020	6.062	0.411
Kurtosis	9.833	3.395	1.886	9.936	2.113	48.880	1.939
Minimum	-1.139	11.301	4.200	-2.805	6.431	38.700	0.398
Maximum	72.309	140.092	16.062	5.372	9.626	624.569	14.026

Variable Definitions: INF: Inflation rate (annual, % change in CPI); M: Money supply (M2); GOV: Government expenditure; ln_DEBT: External debt (natural logarithm); ln_GDP: Gross Domestic Product per capita (natural

logarithm); REER: Real Effective Exchange Rate; UNEMP: Unemployment rate (%). Table 3 presents the results of the Breusch–Pagan LM test conducted to detect cross-sectional dependence.

Table 3: Summary of Breusch–Pagan LM Test Results

Model	Chi-square	Degrees of Freedom	p-value
Model	69.866	28	0.0000***

Note: *** denotes statistical significance at the 1% level

According to Table 3, since the Breusch–Pagan LM test statistic exceeds the critical value ($p < 0.01$), the null hypothesis (H_0) is rejected. This result indicates the presence of cross-sectional dependence in the panel. Therefore, the Cross-Sectionally Augmented Im–Pesaran–Shin (CIPS)

test, which accounts for cross-sectional dependence, was employed for the panel unit root tests. Table 4 presents the results of the CIPS test conducted to examine the stationarity properties of the variables used for the D-8 countries.

Table 4: Panel Unit Root Test Results (CIPS Test)

Variable	Test Statistic	Critical Value (10%)	Critical Value (5%)	Critical Value (1%)	Decision (at 5% level)
inf	-2.715	-2.21	-2.33	-2.57	Stationary
m	-2.045	-2.21	-2.33	-2.57	Unit Root
dm	-4.048	-2.21	-2.33	-2.57	Stationary
gov	-1.770	-2.21	-2.33	-2.57	Unit Root
dgov	-4.002	-2.21	-2.33	-2.57	Stationary
ln_debt	-2.623	-2.21	-2.33	-2.57	Stationary
ln_gdp	-2.357	-2.21	-2.33	-2.57	Stationary
reer	-0.963	-2.21	-2.33	-2.57	Unit Root
dreer	-3.649	-2.21	-2.33	-2.57	Stationary
unemp	-1.302	-2.21	-2.33	-2.57	Unit Root
dunemp	-4.078	-2.21	-2.33	-2.57	Stationary

Source: Calculated by the author(s).

In Table 4, the null hypothesis (H_0) is formulated as “ $b_i = 0$ for all i (homogeneous non-stationarity).” If the test statistic is smaller than the critical values, the null hypothesis is rejected and the series is concluded to be stationary. Variables that became stationary after first differencing are denoted with the prefix “d.” These variables were

transformed into their first differences to achieve stationarity. Normality tests (Shapiro–Wilk and Jarque–Bera) were conducted as preliminary diagnostics. As expected, deviations from normality were observed; however, this does not affect the validity of quantile regression estimates (see Appendix Table A1).” Table 5

reports the Pearson correlation test conducted to detect multicollinearity.

Table 5: Pearson Correlation Matrix

Variable	INF	M	GOV	LN_DEBT	LN_GDP	REER	UNEMP
INF	1.0000						
M	-0.2744*	1.0000					
GOV	0.1720*	0.4133*	1.0000				
LN_DEBT	-0.2357*	0.4669*	0.2008*	1.0000			
LN_GDP	0.2083*	0.4745*	0.7341*	0.2176*	1.0000		
REER	0.2667*	-0.1579*	0.1524*	-0.1318	0.0301	1.0000	
UNEMP	0.3427*	-0.0056	0.5232*	-0.1509*	0.4644*	0.0953	1.0000

Note: * denotes significance at the 5% level.

According to Table 5, a strong negative correlation was detected between GOV and ln_GDP (-0.734^*), indicating a relatively strong correlation that may warrant caution, although quantile regression is generally less sensitive to multicollinearity than mean-based estimators. While this strong relationship is consistent with the predictions of Wagner's Law, it also carries the potential to generate multicollinearity problems in econometric analyses. The negative correlations between inflation and money supply (-0.2744) and external debt (-0.2357) may reflect short-run macroeconomic adjustments or policy responses rather than a stable theoretical relationship. In contrast, the positive relationship between inflation and unemployment (0.3427) may be associated with stagflation dynamics. The strong positive correlations of money supply with GDP (0.4745) and external debt (0.4669) support the stimulating effects of

expansionary monetary policy on economic activity, while the positive correlation between government expenditure and unemployment (0.5232) reflects the functioning of the automatic stabilizer mechanism. Overall, the correlation matrix provides findings that are consistent with macroeconomic theory.

Panel cointegration tests are conducted to assess whether the macroeconomic variables share a common long-run equilibrium relationship. These tests are intended to provide supporting evidence on long-run associations rather than to model long-run adjustment dynamics. Tables 6a and 6b present the results of the cointegration tests (Pedroni and Westerlund tests) conducted to determine whether there is a long-run relationship among the variables.

Table 6a: Pedroni Cointegration Test Results

Test Statistic	Statistic Value	<i>p-value</i>
Modified Phillips-Perron t	2.3100	0.0104**
Phillips-Perron t	-1.8718	0.0306**
Augmented Dickey-Fuller t	-1.3895	0.0823*
Number of Panels: 8	Number of Periods: 24	Kernel: Bartlett

Note: ** $p < 0.05$, * $p < 0.10$ indicate statistical significance. H_0 : No cointegration, H_a : Cointegration exists.

Table 6b: Westerlund Cointegration Test Results

Test Statistic	Statistic Value	<i>p-value</i>
Variance Ratio	0.8685	0.1926
Number of Panels: 8	Number of Periods: 25	H_0 : No cointegration

As shown in Tables 6a and 6b, the Pedroni cointegration tests provide strong evidence of a long-run relationship among the macroeconomic variables. Specifically, the Modified Phillips-Perron *t*-statistic (2.3100 , $p = 0.0104$) and the Phillips-Perron *t*-statistic (-1.8718 , $p = 0.0306$) are statistically significant at the 5% level, while the Augmented Dickey-Fuller *t*-statistic (-1.3895 , $p = 0.0823$) supports cointegration at the 10% level. By contrast, the Westerlund

cointegration test (Variance Ratio = 0.8685 , $p = 0.1926$) does not provide statistically significant evidence in favor of cointegration. This divergence stems from methodological differences: whereas the Pedroni test follows a residual-based approach, the Westerlund test relies on an error-correction model framework, which may yield different outcomes. Taken together, the fact that two out of the three Pedroni statistics are significant at the 5% level provides

sufficient evidence of a long-run cointegration relationship among the variables. This result indicates the presence of stable long-run associations, while the empirical analysis is conducted within a panel quantile regression framework that captures distributional heterogeneity rather than relying on error-correction dynamics.

In the panel quantile regression analysis, the bootstrap method was employed to enhance the reliability of parameter estimates and obtain more accurate standard errors. Bootstrap resampling, particularly valuable in nonparametric estimation methods such as quantile regression, provides robust standard error estimates without

relying on asymptotic distributional assumptions. In this study, bootstrap analysis with 1,000 replications was conducted using Stata 19, which reduces small-sample bias and ensures a more robust assessment of the statistical significance of the estimated coefficients. Furthermore, the bootstrap method generates standard errors that are resilient to heteroskedasticity and autocorrelation, thereby strengthening the reliability of quantile regression results. For the D-8 countries over the period 2000–2024, the bootstrap quantile regression results across different quantiles ($\tau = 0.20$, $\tau = 0.40$, $\tau = 0.60$, $\tau = 0.80$) are reported in Table 7.

Table 7: Panel Quantile Regression Estimates for Inflation Across Conditional Quantiles (2000–2024)

Variables	$\tau=0.20$	$\tau=0.40$	$\tau=0.60$	$\tau=0.80$
Money Supply (M)	0.055 (0.063)	0.047 (0.065)	0.033 (0.088)	0.008 (0.144)
Government Expenditure (GOV)	-0.772 (0.582)	-1.045 (0.637)	-1.539* (0.833)	-2.365* (1.228)
External Debt Stocks/ logarithmic (LN_DEBT)	-0.467 (0.595)	-0.326 (0.590)	-0.070 (0.696)	0.355 (1.00)
GDP per capita/ logarithmic (LN_GDP)	4.627* (2.677)	5.613* (3.058)	7.404* (4.258)	10.391 (6.495)
Real Effective Exchange Rate (REER)	0.034* (0.018)	0.036* (0.019)	0.040* (0.020)	0.046 (0.029)
Unemployment Rate (UNEMP)	-0.359 (0.605)	-0.737 (0.630)	-1.114* (0.625)	-1.927** (0.783)

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Bootstrap standard errors are reported in parentheses. The number of bootstrap replications is 1,000. The sample consists of 200 observations. **Source:** Author's calculations.

According to the results reported in Table 7, the estimated effects of the explanatory variables across the selected quantiles ($\tau = 0.20, 0.40, 0.60, 0.80$) can be summarized as follows:

Money Supply (M): Positive coefficients are observed across all quantiles, though none are statistically significant. The coefficients range between 0.008 and 0.056, with higher values at lower quantiles ($\tau = 0.20: 0.056$; $\tau = 0.40: 0.048$; $\tau = 0.60: 0.033$; $\tau = 0.80: 0.008$). This suggests that the impact of money supply on inflation varies across quantiles, but lacks statistical significance.

Government Expenditure (GOV): Negative coefficients are found at all quantiles, with the absolute magnitude increasing as the quantile rises (from -0.773 to -2.365). The coefficients are statistically significant at the 10% level in the $\tau = 0.60$ quantile ($p = 0.065$) and the $\tau = 0.80$ quantile ($p = 0.054$). These results indicate that the deflationary effect of government expenditure becomes more pronounced during high-inflation periods.

External Debt (LN_DEBT): The coefficients are negative in the lower quantiles ($\tau = 0.20: -0.467$; $\tau = 0.40: -0.327$; $\tau = 0.60: -0.071$) and turn positive in the highest quantile ($\tau = 0.80: 0.356$). However, none of the coefficients are statistically significant. This pattern suggests that the effect

of external debt on inflation shifts sign across quantiles, though without statistical support.

GDP per Capita (LN_GDP): Positive coefficients are found at all quantiles, with values increasing as the quantile rises (from 4.628 to 10.391). The coefficients are statistically significant at the 10% level in the $\tau = 0.20$, $\tau = 0.40$, and $\tau = 0.60$ quantiles ($p = 0.084$, $p = 0.066$, $p = 0.082$, respectively). These results indicate that the positive impact of GDP on inflation strengthens in higher inflation regimes.

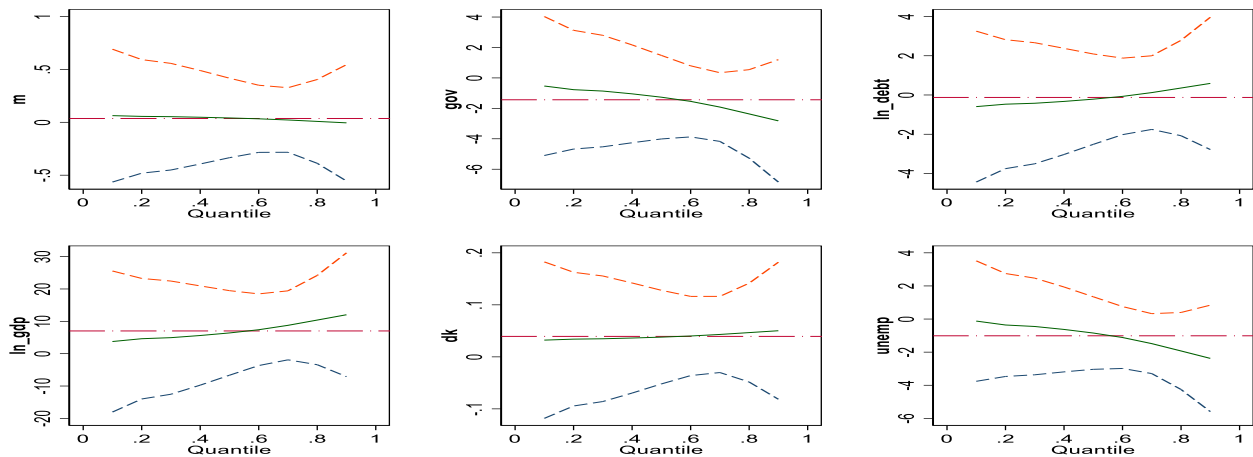
Real Effective Exchange Rate (REER): Positive coefficients are observed across all quantiles, ranging between 0.034 and 0.047, with higher values at higher quantiles ($\tau = 0.20: 0.034$; $\tau = 0.40: 0.037$; $\tau = 0.60: 0.040$; $\tau = 0.80: 0.047$). The coefficients are statistically significant at the 10% level in the $\tau = 0.20$, $\tau = 0.40$, and $\tau = 0.60$ quantiles ($p = 0.068$, $p = 0.061$, $p = 0.053$, respectively). This implies that exchange rate pass-through exerts a statistically significant inflationary effect particularly in low- and medium-inflation regimes.

Unemployment (UNEMP): Negative coefficients are found across all quantiles, with the absolute magnitude increasing as the quantile rises (from -0.359 to -1.928). The coefficients are statistically significant at the 10% level in the $\tau = 0.60$ quantile ($p = 0.075$) and at the 5% level in the τ

= 0.80 quantile ($p = 0.014$). These findings suggest that the negative effect of unemployment on inflation becomes stronger and more statistically significant in high-inflation regimes. In addition, Figure 1 illustrates the quantile-based

graphical representation of inflation determinants for the D-8 countries over the 2000–2024 period.

Figure 1: Quantile Effects of Macroeconomic Variables on Inflation



Notes: The solid green lines represent the estimated coefficients from the panel quantile regression at different quantiles. The dashed blue and dashed orange lines denote the lower and upper bounds of the corresponding confidence intervals, respectively. The horizontal red dashed line indicates the zero-effect benchmark. **Source:** Compiled by the author(s) based on analytical results.

Figure 1 illustrates how the effects of macroeconomic variables on inflation vary across different levels in the D-8 countries. Inflation, as is well known, refers to the sustained increase in the general price level of an economy and is considered one of the key indicators of macroeconomic stability. In the figure, the lower quantiles ($\tau = 0.20$, $\tau = 0.40$) represent relatively stable price level performances, while the higher quantiles ($\tau = 0.60$, $\tau = 0.80$) capture periods of heightened inflationary pressures. The evolution of quantiles over time can be summarized as follows:

1. 2000–2008: General trend of stability, shift toward lower quantiles.
2. 2008–2009 global financial crisis: Sharp shift toward higher quantiles.
3. 2010–2019: Mixed performance with country-specific heterogeneities.
4. 2020–2024 (COVID-19 and geopolitical tensions): Renewed tendency toward higher quantiles.

According to Figure 1, GDP per capita exerts a positive effect on inflation across all quantiles. The effect ranges from 4.63 to 5.61 in the lower quantiles and from 7.40 to 10.39 in the upper quantiles. A 1% increase in GDP per capita raises inflation by approximately 4.6–10.4%, with the impact becoming more pronounced at higher quantiles. The exchange rate also exhibits a strong positive effect in the lower quantiles (0.034–0.037), which remains consistent in the upper quantiles (0.040–0.047). Money supply, however,

shows diminishing effects as the quantile rises: 0.056 in the lower quantiles compared to 0.008 in the upper quantiles, though statistically insignificant across all quantiles. Government expenditure exhibits the opposite pattern: weaker in the lower quantiles (-0.77 to -1.04) but stronger in the upper quantiles (-1.54 to -2.37). In the most vulnerable group, a 1% increase in government spending reduces inflation by 2.37%. The effect of unemployment strengthens as the quantile rises. Unemployment reduces inflation by -0.36 to -0.74 in the lower quantiles, and by -1.11 to -1.93 in the upper quantiles. Accordingly, macroeconomic environments associated with lower conditional inflation quantiles are more sensitive to changes in exchange rates and GDP, whereas those corresponding to upper conditional inflation quantiles are more strongly influenced by government spending and unemployment. Debt stock remains statistically insignificant across all quantiles, shifting from negative (-0.47) to positive (0.36) effects.

The findings align closely with existing literature. The strong exchange rate channel in low- and medium-inflation regimes corroborates studies emphasizing exchange rate pass-through as a structural feature of developing economies (Taylor, 2000; Goldfajn & Werlang, 2000). The insignificance of money supply, while deviating from monetarist perspectives, is consistent with Mishkin (2001), who argues that the monetary transmission mechanism operates only weakly in developing countries. The unstable and insignificant debt stock results parallel Panizza and Presbitero (2014), who highlight that the inflationary impact

of debt is not direct but mediated by maturity structure, currency composition, and institutional factors.

The results underscore the need for a differentiated policy approach to inflation control across quantile levels. In low- and medium-inflation regimes, limiting exchange rate pass-through becomes a priority. This requires a predictable exchange rate policy consistent with inflation targeting, adequate reserves, efficient liquidity management, and development of local currency hedging instruments. Additionally, strategies to reduce import dependence and promote local supply chains can weaken the transmission of exchange rate shocks to consumer prices.

At higher inflation levels, fiscal policy gains importance. The findings indicate that the composition of government expenditures and fiscal discipline play a restraining role on inflationary pressures. Promoting efficiency-enhancing investments, eliminating inefficient subsidies, and prioritizing targeted transfers are crucial. Establishing a medium-term fiscal framework aligned with fiscal rules and debt dynamics will also support price stability. To address demand–inflation interactions, measures such as restricting credit growth, implementing macroprudential policies, and supporting supply-oriented public investments (infrastructure, logistics, agriculture–food, and energy efficiency) are recommended. In the labor market, wage increases should align with productivity growth, and collective bargaining should take into account forward-looking inflation targets.

For the D-8 countries specifically, policy requirements vary. In resource-exporting economies (e.g., Iran and Nigeria), sudden surges in oil and gas revenues may boost spending and demand, creating inflationary pressures. Thus, stabilization funds and sterilization mechanisms are essential. In energy-importing countries (e.g., Turkey, Bangladesh, and Pakistan), regulatory measures, inventory management, and energy efficiency investments are key to mitigating energy price shocks. Finally, the insignificance of money supply (M2) indicates that inflation is shaped less by monetary aggregates directly and more by the interest rate–credit channel and expectations management. Consequently, the coordination of monetary and fiscal policies plays a decisive role in achieving single-digit and sustainable inflation levels.

5. Discussion

The findings of this study indicate that the macroeconomic determinants of inflation in D-8 countries do not exert uniform effects across the inflation distribution. Rather than affecting inflation in the same way under all conditions, the direction, magnitude, and statistical significance of these effects vary across inflation regimes. This result is important because it suggests that inflation cannot be adequately explained through average relationships alone. In developing economies, price dynamics are shaped not only by monetary conditions but also by structural vulnerabilities, exchange rate pressures, fiscal responses, and inflation

expectations. In this respect, panel quantile regression provides a more realistic framework than conventional mean-based models, since it captures how macroeconomic variables behave under different inflation environments.

Among the explanatory variables, the real effective exchange rate appears to be one of the most influential factors, especially in the lower and middle quantiles. This finding is highly consistent with the recent global macroeconomic environment. In the post-pandemic period, supply chain disruptions, energy and commodity price volatility, geopolitical tensions, and tighter global financial conditions have increased exchange rate pass-through in many developing economies (IMF, 2024; World Bank, 2025). In import-dependent countries, exchange rate movements are transmitted to domestic prices through imported intermediate inputs, energy costs, and final consumption goods. Therefore, the strong role of the exchange rate in low- and medium-inflation regimes suggests that price stability in D-8 countries remains closely linked to external cost shocks and currency-related transmission mechanisms (OECD, 2024).

Another notable finding is the positive and increasing impact of GDP per capita across most quantiles. Although this relationship may initially seem counterintuitive, it can be interpreted within the structural features of developing economies. Income growth in these countries is often accompanied by stronger domestic demand, credit expansion, import growth, and consumption pressures. When productive capacity and supply-side flexibility remain limited, such demand expansion may translate into upward pressure on prices. Thus, the inflationary impact of income growth should be evaluated not only through productivity gains but also through aggregate demand conditions and structural supply constraints. Recent international assessments similarly emphasize that the quality, composition, and inclusiveness of growth are critical for macroeconomic stability in emerging economies (World Bank, 2025; OECD, 2025).

The fact that government expenditure and unemployment become statistically significant mainly in the higher inflation quantiles suggests that fiscal conditions and labor market dynamics become more influential when inflationary pressures intensify. This implies that high inflation should not be interpreted solely as a monetary phenomenon, but also as a multidimensional process associated with fiscal burdens, public spending responses, labor market rigidities, and expectation formation. In recent years, many developing economies have experienced rising fiscal pressures due to social support measures, post-crisis recovery programs, and energy-related subsidies, all of which have complicated inflation management (IMF, 2024). Likewise, labor market imbalances and wage adjustments have contributed to inflation persistence in several countries. The results of this study are therefore consistent with the view that anti-inflation policy in high-inflation regimes must rely not only on monetary tightening but also on credible fiscal discipline

and structural labor market measures.

By contrast, the lack of consistent statistical significance for money supply and external debt suggests that inflation in D-8 countries cannot be reduced to a purely monetary expansion or debt accumulation story. This does not mean that these variables are irrelevant; rather, their effects may be indirect, country-specific, or conditional upon broader institutional and macroeconomic settings. In a heterogeneous country group such as D-8, the inflationary consequences of money growth and external borrowing are likely mediated by exchange rate regimes, central bank credibility, fiscal institutions, and the composition of external financing (IMF, 2024; OECD, 2025). This finding reinforces the argument that inflation is a complex process and that policy design should take structural differences across countries into account.

Overall, the empirical evidence suggests that inflation dynamics in D-8 countries have become more complex in a period marked by global uncertainty, geopolitical fragmentation, supply-side shocks, and tighter financial conditions. Energy and food price volatility, disruptions in global trade routes, and exchange rate instability have made inflation management particularly challenging for developing economies in recent years (World Bank, 2025; IMF, 2024).

The quantile regression results also suggest that policy implications should be interpreted in light of the structural differences among D-8 countries. The positive and statistically significant effect of the real effective exchange rate in the lower and middle quantiles indicates that exchange rate movements are an important inflationary channel, especially when inflation is relatively low or moderate. This finding is particularly relevant for energy-importing and import-dependent economies such as Türkiye, Bangladesh, and Pakistan, where exchange rate depreciation may rapidly increase imported input costs and consumer prices. On the other hand, the significance of government expenditure and unemployment in the upper quantiles shows that fiscal conditions and labor market dynamics become more influential during high-inflation periods. This result is also important for countries where public spending pressures, labor market rigidities, commodity dependence, or energy-related revenue fluctuations are more pronounced. In this respect, Erdoğan, Çevik, and Gedikli (2020) show that oil price volatility may affect inflation dynamics in energy-dependent economies, emphasizing the importance of structural characteristics in shaping macroeconomic outcomes. Accordingly, while exchange rate management appears to be more critical in low- and medium-inflation regimes, fiscal discipline, labor market-oriented policies, and supply-side measures become more important in high-inflation regimes. Therefore, the results of this study support a differentiated policy approach rather than a uniform anti-inflation strategy for all D-8 countries.

The main contribution of this study is therefore to show that

the determinants of inflation differ systematically across inflation regimes. This implies that anti-inflation policies should not follow a one-size-fits-all approach. While exchange rate stability appears more critical in low- and medium-inflation environments, fiscal discipline and labor market conditions become more decisive under high-inflation regimes. In this sense, the study offers a regime-sensitive analytical perspective for understanding and managing inflation in D-8 economies.

6. Conclusion

Inflation remains one of the most fundamental macroeconomic challenges confronting developing economies. This study investigated the determinants of inflation in the D-8 countries using an annual balanced panel dataset covering the period 2000–2024. Employing the panel quantile regression method, the analysis moves beyond conventional approaches that capture only average effects and instead reveals how explanatory variables influence inflation differently across its lower, middle, and upper quantiles. The variables included in the model were money supply (M2), government expenditure (GOV), external debt stock (DEBT), GDP per capita (GDP), real effective exchange rate (REER), and unemployment (UNEMP).

The results demonstrate that exchange rate movements and GDP per capita exert a significant and increasing upward pressure on inflation, while government expenditure and unemployment become influential primarily in higher inflation regimes. By contrast, the effects of money supply and external debt were not found to be statistically significant across quantiles. These findings imply that policymakers need to adopt distribution-sensitive and regime-specific approaches in designing anti-inflation strategies. The findings of the panel quantile regression analysis can be summarized along six main axes:

i. Exchange Rate: The exchange rate variable is positive and significant in the lower and middle quantiles ($\tau = 0.20-0.60$), with coefficients increasing as quantiles rise. This indicates that exchange rate pass-through constitutes a persistent and powerful channel of price formation in the D-8 countries. Particularly in import-dependent economies, exchange rate depreciation transmits directly through import prices and indirectly through higher production costs. The evidence suggests that exchange rate shocks are rapidly transmitted to prices even under low and moderate inflation regimes, underscoring the structural sensitivity of inflation to exchange rate fluctuations. Consequently, the effectiveness of the monetary transmission mechanism is largely conditioned by the exchange rate channel, increasing vulnerability to reserve adequacy, capital flow volatility, and global price shocks.

ii. Government Expenditure: Government expenditure carries a negative coefficient across all quantiles, becoming statistically significant in the upper quantiles ($\tau = 0.60-0.80$). This finding highlights the disinflationary role of

fiscal discipline and efficient expenditure allocation under conditions associated with upper conditional inflation quantiles. Expenditures directed toward productivity-enhancing areas (e.g., infrastructure, capacity-building investments) can counterbalance price pressures, while maintaining fiscal discipline strengthens expectations and contributes to price stability. These results underscore the importance of fiscal policy as a tool for combating inflation, particularly under high-inflation conditions.

iii. GDP per Capita: GDP per capita is consistently positive across all quantiles, significant in the lower and middle quantiles ($\tau = 0.20\text{--}0.60$), and increasing in magnitude as quantiles rise. This suggests that demand pressures on inflation persist across regimes and intensify at higher inflation levels. Economic growth raises income, thereby stimulating consumption and investment, which exert upward pressure on prices through aggregate demand. While this relationship is relatively modest in low-inflation regimes, it strengthens as inflation levels increase. The result indicates that the growth–inflation nexus is not unidirectional: inflation above a certain threshold may hinder growth, whereas growth itself can fuel inflationary pressures.

iv. Unemployment: Unemployment shows a negative and statistically significant relationship with inflation in the upper quantiles. This provides evidence of the Phillips curve relationship—where higher unemployment dampens inflation—becoming more prominent under high-inflation regimes. Rising unemployment restrains aggregate demand, thereby alleviating price pressures. This effect is stronger in high-inflation environments, where weaker labor market conditions reduce household incomes and suppress consumption demand, ultimately mitigating inflationary pressures.

v. Money Supply (M2): Although money supply coefficients are positive across quantiles, they are statistically insignificant. This result suggests that inflation cannot be explained solely by monetary expansion, with other macroeconomic factors—such as exchange rate pass-through, demand pressures, and fiscal discipline—playing more dominant roles. In developing economies, limited financial depth and weak monetary transmission mechanisms may prevent the money supply–inflation link from becoming statistically significant.

vi. External Debt: The external debt variable alternates between negative and positive coefficients across quantiles and remains statistically insignificant. This indicates that debt influences inflation indirectly through channels such as exchange rate volatility, risk premia, or budget financing needs, rather than directly. Differences in debt composition, maturity structure, and currency denomination make the debt–inflation relationship heterogeneous across countries and difficult to capture consistently.

The findings of this study partly converge with and partly diverge from different strands of economic theory. First, the

strong transmission of exchange rate movements to inflation, particularly under low- and medium-inflation regimes, corroborates the structuralist view that exchange rate pass-through constitutes a structural feature of developing economies (Taylor, 2000; Goldfajn & Werlang, 2000). This result is also consistent with structuralist approaches that emphasize the role of cost-push rather than demand-pull factors in driving inflation. The negative effect of government expenditure during high-inflation regimes highlights the importance of fiscal discipline and expenditure efficiency. This finding supports the fiscal approach, which emphasizes the relationship between budget deficits, fiscal sustainability, and inflation, and is in line with the evidence reported by Catao & Terrones (2005).

The positive coefficient of GDP indicates that growth exerts upward pressure on prices through the aggregate demand channel. This is consistent with Keynesian demand-pull inflation theories and the aggregate demand–aggregate supply framework. Similarly, the negative and significant unemployment effect at upper quantiles confirms the Phillips curve relationship under high-inflation regimes. However, considering Friedman's (1968) and Phelps's (1967) natural rate of unemployment (NAIRU) hypothesis, which argues that the trade-off weakens in the long run, the results should be interpreted as reflecting short- and medium-term dynamics.

The insignificance of the money supply (M2) departs from the monetarist view that “inflation is always and everywhere a monetary phenomenon.” Instead, it supports works such as Mishkin (2001), which argue that monetary transmission mechanisms operate weakly in developing economies. Finally, the inconsistent and insignificant debt results across quantiles suggest that debt influences inflation indirectly through channels such as exchange rate volatility, risk premia, and budget financing, rather than directly. This aligns with Panizza & Presbitero (2014), who highlight the importance of debt composition in shaping inflation outcomes.

Overall, the findings demonstrate that no single theoretical framework fully explains inflation in the D-8 countries. Instead, a hybrid perspective is more applicable: the exchange rate channel reflects structuralist views; growth and unemployment results are consistent with Keynesian and Phillips curve theories; the fiscal impact of government spending supports the fiscal approach; and the insignificance of money supply aligns with critiques of monetarism. Thus, inflation emerges as a multidimensional and regime-specific phenomenon.

For the D-8 countries, the findings reveal distinct policy priorities between resource-exporting and energy-importing economies. In resource exporters (e.g., Iran and Nigeria), sudden increases in oil and gas revenues generate rapid growth in government expenditure and private consumption, creating strong demand-pull pressures. This accelerates inflationary dynamics, necessitating the establishment of stabilization funds, sterilization mechanisms, and reinforced

fiscal discipline as critical anti-inflationary tools.

By contrast, in energy-importing countries (e.g., Turkey, Bangladesh, and Pakistan), global energy price fluctuations directly raise import costs and feed inflation. Accordingly, regulatory measures, improvements in inventory management, and prioritization of energy efficiency investments are essential for maintaining price stability. Since exchange rate volatility is felt more strongly through the cost channel in these economies, implementing policies that strengthen exchange rate stability is equally important. Structural reforms aimed at enhancing competition, strengthening supply flexibility, and improving food security (e.g., competition policies, customs and logistics efficiency, agricultural and food supply chain improvements) are needed across the D-8. Such reforms can reduce inflationary pressures from both import and export channels and provide a stronger foundation for long-term price stability.

Moreover, the results emphasize that combating inflation requires not only short-term measures but also an institutional roadmap. First, policy thresholds should be clearly defined, with automatic stabilization tools triggered once these thresholds are exceeded. Such a framework would allow policymakers to respond more swiftly and predictably to uncertainty. Second, a high-frequency indicator set should be established to monitor exchange rate pass-through. Indicators such as import dependency ratios, wage indexation levels in contracts, and unit labor costs would provide early signals of pricing behavior. Third, updating the medium-term fiscal framework and institutionalizing expenditure ceilings and fiscal rules are vital for sustaining fiscal discipline. Such rules would align public finances with market expectations and long-term price stability. Finally, policy coherence must be communicated transparently and credibly to the public. Consistent reporting on the alignment of monetary, fiscal, exchange rate, and wage policies with inflation targets through regular impact assessment reports would strengthen both expectations management and policy credibility.

The analysis period of 2000–2024 was chosen because D-8 data became more comparable and accessible from this period onward, and because this timeframe encompasses major global shocks directly affecting inflation (post-2001 stabilization efforts, the 2008 global financial crisis, post-2013 capital flow volatility, and the COVID-19 pandemic). This allows the study to capture both long-term structural trends and the effects of recent global shocks within an integrated framework. Future research could further enrich this framework. For instance, shorter-period data could be employed to examine crisis episodes in greater detail, or comparative analyses could be conducted with country groups beyond the D-8. Moreover, extended models that incorporate institutional structures and differences in policy regimes may provide valuable insights into the impact of these factors on inflation across different levels. This study contributes to the literature by providing regime-dependent

evidence on inflation dynamics in D-8 economies using panel quantile regression, highlighting how macroeconomic variables affect inflation differently across the conditional distribution.

References

- Abdullahi, A., Ibrahim, S., Hook, L. S., & Ngah, W. A. S. W. (2023). Impact of financial integration on economic development. *Journal of Economic Integration*, 38(4), 628–645.
- Akarsu, M. Z., & Gharehgozli, O. (2024). The inflation–inequality connection in the European Union. *Journal of Economic Integration*, 39(2), 296–318.
- Akyüz, H. E. (2023). Sabit etkiler modeli ve panel kantil regresyon karşılaştırması: BRICS-T ülkelerinde ekonomik büyüme üzerinde yenilenebilir enerji tüketimi etkisinin incelenmesi [Comparison of fixed effects model and panel quantile regression: Examining the impact of renewable energy consumption on economic growth in BRICS-T countries]. In *Ekonomi ve finans politikaları üzerine çalışmalar* (pp. 59–83). Özgür Yayın Dağıtım Ltd. Şti.
- Arellano, M., & Bonhomme, S. (2016). Nonlinear panel data estimation via quantile regressions. *Econometrics Journal*, 19(3), C61–C94. <https://doi.org/10.1111/ectj.12076>
- Aydın, A. (2025). Enflasyon ve işsizliğin kişi başına gelir üzerindeki etkileri: Kantil regresyon analizi [The effects of inflation and unemployment on per capita income: A quantile regression analysis]. *Beykoz Akademi Dergisi*, 13(1), 1–23.
1. Aydın, C. (2017). The inflation-growth nexus: A dynamic panel threshold analysis for D-8 countries. *Romanian Journal of Economic Forecasting*, 20(4), 134–151.
2. Bağcı, B. (2021). Türkiye’de para arzı ve enflasyon oranı ilişkisine yeni bir bakış: Kantil-kantil regresyon analizi [A new perspective on the relationship between money supply and inflation in Turkey: Quantile-on-Quantile regression analysis]. *Finansal Araştırmalar ve Çalışmalar Dergisi*, 13(25), 309–322.
- Balassa, B. (1964). The purchasing-power parity doctrine: A reappraisal. *Journal of Political Economy*, 72(6), 584–596.
- Baltagi, B. H. (2008). *Econometric analysis of panel data* (3rd ed.). Wiley.
- Banerjee, R., & Mehrotra, A. N. (2020). *Inflation at risk in advanced and emerging market economies* (SSRN Electronic Journal). <https://doi.org/10.2139/ssrn.3783174>
- Banerjee, R., Contreras, J., Mehrotra, A., & Zampolli, F. (2024). Inflation at risk in advanced and emerging

- market economies. *Journal of International Money and Finance*, 142, Article 103025.
- Barro, R. J. (1996). Inflation and growth. *Federal Reserve Bank of St. Louis Review*, 78(3), 153–169.
- Belloni, A., Chernozhukov, V., Chetverikov, D., & Fernández-Val, I. (2019). Conditional quantile processes based on series or many regressors. *Journal of Econometrics*, 213(1), 4–29. <https://doi.org/10.1016/j.jeconom.2019.04.009>
- Blanchard, O. (2017). *Macroeconomics* (7th ed.). Pearson.
- Brancaccio, E., & Saraceno, F. (2017). Evolutions and contradictions in mainstream macroeconomics: The case of Olivier Blanchard. *Review of Political Economy*, 29(3), 345–359.
- Breusch, T. S., & Pagan, A. R. (1980). The Lagrange multiplier test and its applications to model specification in econometrics. *Review of Economic Studies*, 47(1), 239–253. <https://doi.org/10.2307/2297111>
- Ca' Zorzi, M., Hahn, E., & Sánchez, M. (2007). *Exchange rate pass-through in emerging markets* (ECB Working Paper No. 739). European Central Bank.
- Campa, J. M., & Goldberg, L. S. (2005). Exchange rate pass-through into import prices. *Review of Economics and Statistics*, 87(4), 679–690. <https://doi.org/10.1112/003465305775098189>
- Canavese, A. J. (1982). The structuralist explanation in the theory of inflation. *World Development*, 10(7), 523–529.
- Canay, I. A. (2011). A simple approach to quantile regression for panel data. *Econometrics Journal*, 14(3), 368–386.
- Catão, L. A. V., & Terrones, M. E. (2005). Fiscal deficits and inflation. *Journal of Monetary Economics*, 52(3), 529–554. <https://doi.org/10.1016/j.jmoneco.2004.06.003>
- Cheikh, N. B., Zaied, Y. B., Bouzgarrou, H., & Nguyen, P. (2018). Nonlinear exchange rate pass-through: Does business cycle matter? *Journal of Economic Integration*, 33(2), 1234–1260.
- Chen, L., Dolado, J. J., & Gonzalo, J. (2014). Detecting big structural breaks in large factor models. *Journal of Econometrics*, 180(1), 30–48.
- Chernozhukov, V., Fernández-Val, I., & Galichon, A. (2010). Quantile and probability curves without crossing. *Econometrica*, 78(3), 1093–1125. <https://doi.org/10.3982/ECTA7880>
- Chernozhukov, V., Fernández-Val, I., & Melly, B. (2013). Inference on counterfactual distributions. *Econometrica*, 81(6), 2205–2268. <https://doi.org/10.3982/ECTA10582>
- Choudhri, E. U., & Hakura, D. S. (2006). Exchange rate pass-through to domestic prices: Does the inflationary environment matter? *Journal of International Money and Finance*, 25(4), 614–639.
- De Gregorio, J., Landerretche, O., Neilson, C., Broda, C., & Rigobon, R. (2007). Another pass-through bites the dust? Oil prices and inflation [with comments]. *Economia*, 7(2), 155–208.
- Doh, T., Lee, T., & Park, I. (2024). *Heterogeneity in household inflation expectations and monetary policy shocks* (Federal Reserve Bank of Kansas City Research Working Paper No. 24-06). Federal Reserve Bank of Kansas City.
- Dreyer, J. K., & Schmid, P. A. (2020). Inflation and Euro membership. *Journal of Economic Integration*, 35(2), 264–281.
- Edwards, S., & Cabezas, L. (2022). Exchange rate pass-through, monetary policy, and real exchange rates: Iceland and the 2008 crisis. *Open Economies Review*, 33(2), 197–230.
- Efron, B. (1979). Bootstrap methods: Another look at the jackknife. *Annals of Statistics*, 7(1), 1–26. <https://doi.org/10.1214/aos/1176344552>
- Erdoğan, S., Çevik, E., & Gedikli, A. (2020). Petrol fiyatlarındaki oynaklığın iktisadi büyüme ve enflasyon üzerindeki etkisi: GCC ülkeleri örneği. *Kafkas Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 11(21), 306–330.
- Fang, W. S., Miller, S. M., & Yeh, C.-C. (2010). Does a threshold inflation rate exist? Quantile inferences for inflation and its variability. *Empirical Economics*, 39, 619–641.
- Feldstein, M. (1983). Inflation and the stock market. In *Inflation, tax rules, and capital formation* (pp. 186–198). University of Chicago Press.
- Fischer, S., & Modigliani, F. (1978). Towards an understanding of the real effects and costs of inflation. *Review of World Economics*, 114(4), 810–833.
- Friedman, M. (1963). *Inflation: Causes and consequences*. Asia Publishing House.
- Friedman, M. (1968). The role of monetary policy. *American Economic Review*, 58(1), 1–17.
- Galvão, A. F. (2011). Quantile regression for dynamic panel data with fixed effects. *Journal of Econometrics*, 164(1), 142–157. <https://doi.org/10.1016/j.jeconom.2011.02.016>
- Galvão, A. F., & Kato, K. (2016). Smoothed quantile regression for panel data. *Journal of Econometrics*, 193(1), 92–112.
- Galvão, A. F., & Wang, L. (2015). Efficient minimum distance estimator for quantile regression fixed effects panel data. *Journal of Multivariate Analysis*, 133, 1–26.

- Garrón, I., Rodríguez-Caballero, C. V., & Ruiz, E. (2024). *International vulnerability of inflation* (arXiv preprint arXiv:2410.20628). arXiv.
- Ge, Z., & Sun, Y. (2024). Asymmetric impact of oil price shocks on inflation: Evidence from quantile-on-quantile regression. *International Review of Financial Analysis*, 92, Article 103097.
- Glawe, L., & Wagner, H. (2024). Inflation and inequality: New evidence from a dynamic panel threshold analysis. *International Economics and Economic Policy*, 21(2), 297–309.
- Goldberg, P. K., & Knetter, M. M. (1997). Goods prices and exchange rates: What have we learned? *Journal of Economic Literature*, 35(3), 1243–1272.
- Goldfajn, I., & Werlang, S. R. (2000). *The pass-through from depreciation to inflation: A panel study* (Texto para discussão No. 423). Departamento de Economia PUC-Rio.
- Hagemann, A. (2017). Cluster-robust bootstrap inference in quantile regression models. *Journal of the American Statistical Association*, 112(517), 446–456.
- Harding, M., & Lamarche, C. (2009). A quantile regression approach for estimating panel data models using instrumental variables. *Economics Letters*, 104(3), 133–135.
- Hasan, N. A., & Ahmed, Y. A. (2025). Measuring and analyzing the interchangeable relationship between inflation and unemployment in Iraq: Phillips curve: Analyzing the interchangeable relationship between inflation and unemployment. *Academic Journal of International University of Erbil*, 2(2), 107–119.
- International Monetary Fund. (2024). *World economic outlook: Policy pivot, rising threats*. International Monetary Fund.
- Jarque, C. M., & Bera, A. K. (1980). Efficient tests for normality, homoscedasticity and serial independence of regression residuals. *Economics Letters*, 6(3), 255–259. [https://doi.org/10.1016/0165-1765\(80\)90024-5](https://doi.org/10.1016/0165-1765(80)90024-5)
- Ji, J. (2022). Exchange rate pass-through to domestic inflation in a pricing model incorporating distribution chain structure. *Journal of Applied Economics*, 25(1), 432–453.
- Kato, K., Galvão, A. F., Jr., & Montes-Rojas, G. V. (2012). Asymptotics for panel quantile regression models with individual effects. *Journal of Econometrics*, 170(1), 76–91.
- Keynes, J. M. (1923). *A tract on monetary reform*. Macmillan.
- Keynes, J. M. (1936). *The general theory of employment, interest, and money*. Macmillan.
- Keynes, J. M. (1937). The general theory of employment. *Quarterly Journal of Economics*, 51(2), 209–223.
- Koenker, R. (2004). Quantile regression for longitudinal data. *Journal of Multivariate Analysis*, 91(1), 74–89. <https://doi.org/10.1016/j.jmva.2004.05.006>
- Koenker, R., & Bassett, G. (1978). Regression quantiles. *Econometrica*, 46(1), 33–50. <https://doi.org/10.2307/1913643>
- Law, C. H., & Goh, K. H. (2024). A systematic literature review of the implications of media on inflation expectations. *International Economics and Economic Policy*, 21(2), 311–340.
- Lenza, M., Moutachaker, I., & Paredes, J. (2025). Density forecasts of inflation: A quantile regression forest approach. *European Economic Review*, Article 105079.
- Lipsey, R. G. (1960). The relation between unemployment and the rate of change of money wage rates in the United Kingdom, 1862–1957: A further analysis. *Economica*, 27(105), 1–31.
- López-Villavicencio, A., & Mignon, V. (2017). Exchange rate pass-through in emerging countries: Do the inflation environment, monetary policy regime and central bank behavior matter? *Journal of International Money and Finance*, 79, 20–38.
- Mansouri, Z., Liouaeddine, M., & Laamire, J. (2024). *The analysis of the link between the exchange rate and inflation: Evidence from a quantile regression approach* (SSRN Working Paper No. 4707059). SSRN.
- Mehrotra, A., & Zampolli, F. (2022). The monetary-fiscal policy nexus and inflation-at-risk. In *The monetary-fiscal policy nexus in the wake of the pandemic* (BIS Papers No. 122, pp. 49–62). Bank for International Settlements.
- Mishkin, F. S. (2001). *The transmission mechanism and the role of asset prices in monetary policy* (NBER Working Paper No. 8617). National Bureau of Economic Research.
- Mitchell, J., Misztal, M., & Sinclair, T. M. (2023). *The distributional predictive content of measures of expected inflation* (Federal Reserve Bank of Cleveland Working Paper No. 23-31). Federal Reserve Bank of Cleveland.
- Nazlioglu, S., Gurel, S. P., Gunes, S., Akin, T., & Kar, M. (2025). Inflation co-movement: New insights from quantile factor model. *Empirical Economics*. Advance online publication. <https://doi.org/10.1007/s00181-025-02586-0>
- Organisation for Economic Co-operation and Development. (2024). *OECD economic outlook* (Vol. 2024, Issue 2). OECD Publishing.
- Organisation for Economic Co-operation and Development. (2025). *OECD economic outlook: Interim report*. OECD Publishing.

- Panizza, U., & Presbitero, A. F. (2014). Public debt and economic growth: Is there a causal effect? *Journal of Macroeconomics*, 41, 21–41. <https://doi.org/10.1111/j.1468-0084.2007.00477.x>
- Pearson, K. (1896). Mathematical contributions to the theory of evolution. III. Regression, heredity, and panmixia. *Philosophical Transactions of the Royal Society of London. Series A, Containing Papers of a Mathematical or Physical Character*, 187, 253–318.
- Pedroni, P. (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. *Oxford Bulletin of Economics and Statistics*, 61(S1), 653–670.
- Pesaran, M. H. (2004). *General diagnostic tests for cross section dependence in panels* (Cambridge Working Papers in Economics No. 0435). University of Cambridge.
- Pesaran, M. H. (2007). A simple panel unit root test in the presence of cross-section dependence. *Journal of Applied Econometrics*, 22(2), 265–312. <https://doi.org/10.1002/jae.951>
- Phelps, E. S. (1968). Money-wage dynamics and labor-market equilibrium. *Journal of Political Economy*, 76(4, Part 2), 678–711.
- Phillips, A. W. (1958). The relation between unemployment and the rate of change of money wage rates in the United Kingdom, 1861–1957. *Economica*, 25(100), 283–299.
- Powell, D. (2020). Quantile treatment effects in the presence of covariates. *Review of Economics and Statistics*, 102(5), 994–1005.
- Romer, D. (1993). Openness and inflation: Theory and evidence. *Quarterly Journal of Economics*, 108(4), 869–903.
- Rosen, A. M. (2012). Set identification via quantile restrictions in short panels. *Journal of Econometrics*, 166(1), 127–137.
- Samuelson, P. A., & Solow, R. M. (1960). Analytical aspects of anti-inflation policy. *American Economic Review*, 50(2), 177–194.
- Sargent, T. J., & Wallace, N. (1984). Some unpleasant monetarist arithmetic. In *Monetarism in the United Kingdom* (pp. 15–41). Palgrave Macmillan.
- Shapiro, S. S., & Wilk, M. B. (1965). An analysis of variance test for normality complete samples. *Biometrika*, 52(3–4), 591–611.
- Tanzi, V. (1977). Inflation, lags in collection, and the real value of tax revenue. *IMF Staff Papers*, 24(1), 154–167.
- Taylor, J. B. (2000). Low inflation, pass-through, and the pricing power of firms. *European Economic Review*, 44(7), 1389–1408.
- Westerlund, J. (2007). Testing for error correction in panel data. *Oxford Bulletin of Economics and Statistics*, 69(6), 709–748. <https://doi.org/10.1111/j.1468-0084.2007.00477.x>
- World Bank. (2025a). *Global economic prospects*. World Bank.
- World Bank. (2025b). *World development indicators*. Retrieved July 20, 2025, from <https://databank.worldbank.org/source/world-development-indicators>

Appendix

Table A1: Normality Test Results of The Variables

Variable	Shapiro-Wilk W	p-value	Result	Description
INF	0.73368	0.0000***	Not Normal	Inflation Rate
M	0.86300	0.0000***	Not Normal	M2 Money Supply
GOV	0.95361	0.0000***	Not Normal	Government Expenditure
LN_DEBT	0.77547	0.0000***	Not Normal	External Debt Stock (logarithmic)
LN_GDP	0.97838	0.00353***	Not Normal	GDP per Capita (logarithmic)
REER	0.46337	0.0000***	Not Normal	Real Exchange Rate
UNEMP	0.91518	0.0000***	Not Normal	Unemployment Rate

Note: *** denotes statistical significance at the 1% level.

Table A2: Normality Test Results across Quantiles

Quantile	Shapiro-Wilk W	SW <i>p-value</i>	SW result	Jarque-Bera	JB <i>p-value</i>	JB result
Q20	0.88595	0.0000***	Not Normal	112.7	0.0000***	Not Normal
Q40	0.94637	0.0000***	Not Normal	29.99	0.0000***	Not Normal
Q60	0.98924	0.13798***	Normal	2.001	0.3677***	Normal
Q80	0.96450	0.0000***	Not Normal	10.44	0.0054***	Not Normal

Note: *** denotes statistical significance at the 1% level.