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Demand vs. Supply Decomposition of Inflation: Cross-Country Evidence with Applications

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Demand vs. Supply Decomposition of Inflation: Cross-Country Evidence with Applications*

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ABSTRACT: What are the contributions of demand and supply factors to inflation? To address this question, we follow Shapiro (2022) and construct quarterly demand-driven and supply-driven inflation series for 32 countries utilizing sectoral Personal Consumption Expenditures (PCE) data. We highlight global trends and country-specific differences in inflation decompositions during critical periods such as the great financial crisis of 2008 and the recent inflation surge since 2021. Validating our inflation series, we find that supply-driven inflation is more reactive to oil shocks and supply chain pressures, while demand-driven inflation displays a more pronounced response to monetary policy shocks. Our results also suggest a steeper Phillips curve when inflation is demand-driven, holding significant implications for effective policy design.

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WORKING PAPERS

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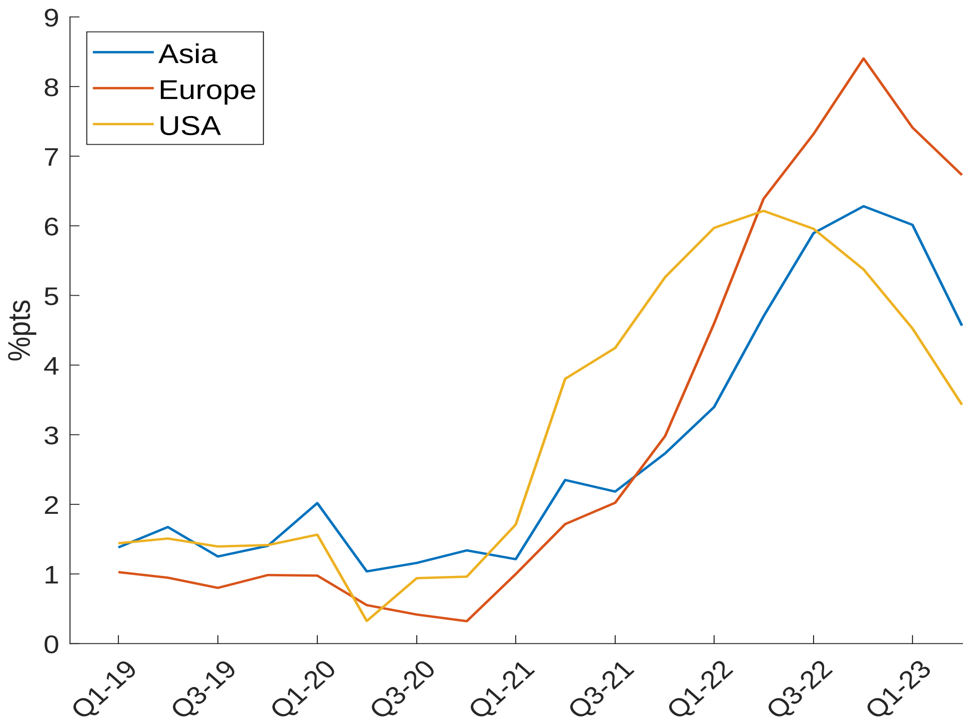
1 Introduction

The global economy has witnessed a historic surge in inflation rates following the COVID-19 pandemic. Inflation has reached levels unseen since the great inflation of 1970s in advanced economies and multi-decade highs in emerging market economies (Figure 1). Thus, both scholars and policymakers have shown significant interest in examining the post-pandemic era and understanding the forces that drove up inflation to its recent peak. (Ball, Leigh, and Mishra (2022), O. J. Blanchard and Bernanke (2023), Dao et al. (2023), and IMF (2021)).

Figure 1: Year-on-year PCE Inflation Rates Since 2019



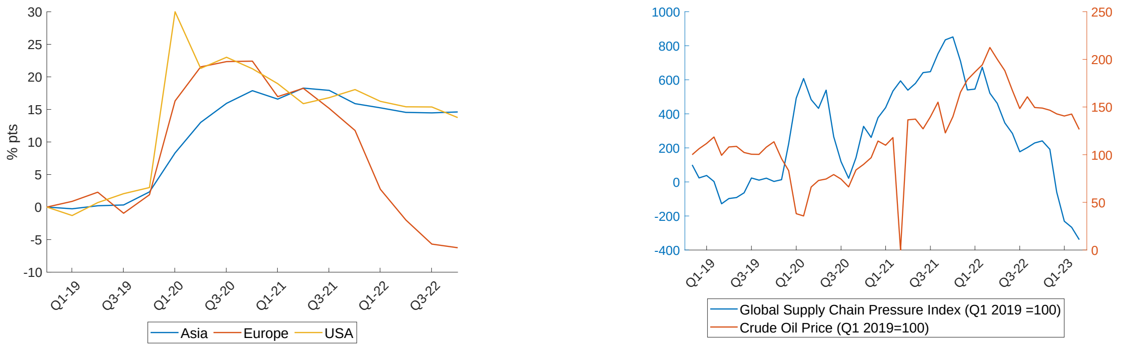
Notes: Figure shows median year-on-year PCE inflation rates. For Asia and Europe median inflation rates are plotted. Europe includes GBR, DEU, FRA, ITA, SWE, DNK. Asia includes AUS, NZL, THA, PHL, KOR, IDN.

It is challenging to attribute the current inflationary environment to a single source, as various factors have contributed to the post-pandemic inflation. On the one hand, it has been argued that accommodative monetary policies and fiscal stimulus measures across regions (Figure 2a) have reignited demand-side pressures (e.g. Furman 2022). On the other hand, supply chain disruptions and sharp increases in commodity prices (Figure 2b) have also been seen as having played a significant role in driving up inflation (Di Giovanni et al. (2022), Carrière-Swallow et al. (2023) and Dao et al. (2023)). For policymakers, understanding the relative importance of demand and supply factors is crucial for tailoring the appropriate policy response. To shed light on this, we provide a cross-country analysis comparing the contributions of demand vs. supply factors to inflation.

Figure 2: Demand-side and Supply-side Narrative for Post-pandemic Inflation

(a) Change in govt debt-to-gdp ratios since 2019Q1

(b) Oil prices and supply chain pressures since 2019Q1



Notes: Panel a) shows percentage point changes in government debt-to-gdp ratios since 2019Q1. For Asia and Europe figure shows median values across countries. Panel b) plots Global Supply Chain Pressure Index (Benigno et al. 2022) and crude oil prices, both indexed to take the value 100 in 2019Q1. Europe includes DEU, FRA, ITA, ESP, NLD. Asia includes AUS, NZL, PHL, IDN.

This paper decomposes aggregate inflation into demand- and supply-driven components across 32 advanced economies (AEs) and emerging market economies (EMEs) over the last three decades. We can therefore compare demand- and supply-side contributions to inflation both across countries and time. We begin by providing a visual exploration of demand- and supply-side inflation during historical episodes such as the Great Financial Crisis (GFC) and the COVID Era. We then delve into an examination of the roles played by demand-side factors (Phillips curve and monetary policy transmission) and supply-side factors (oil price shocks and supply chain pressures) in driving changes in demand- and supply-driven inflation.

We use sectoral PCE data and adopt the methodology from Shapiro (2022) for our inflation decomposition analysis.[1] Inflation in a given sector and time period is classified as either demand-driven or supply-driven depending on the signs of the residuals from a vector autoregression. If residuals in price and quantity equations have the same sign,

[1] We use the terms "item" and "sector" interchangeably throughout the paper.

inflation in an expenditure item is classified as demand-driven, otherwise, if residuals have opposite signs, sectoral inflation is classified as supply-driven. This approach is motivated by the idea that demand shocks should move prices and quantities in the same direction, while supply shocks should move them in opposite directions. Contributions of demand and supply factors to aggregate inflation are then obtained as weighted sums of sectoral inflation rates classified as either demand- or supply-driven.

We find that both demand and supply factors were important in driving recent inflation dynamics. First, the global decline in aggregate inflation at the onset of the COVID-19 pandemic in 2020 was predominantly explained by a reduction in demand-side inflation. This reduction in demand-driven inflation coincided with the implementation of lockdown measures that curtailed economic activity. Starting from early 2021, both demand and supply-side factors contributed to the surge in inflation. In the U.S. and Asia, demand-driven and supply-driven inflation made roughly equal contributions to headline inflation. Furthermore, both demand-driven and supply-driven inflation began to decelerate towards the end of 2022. However, rising inflation in Europe was mostly supply-driven, intensifying this impact since mid-2022.

In our applications, we investigate how the decomposed inflation series are related to different demand and supply channels. On the demand side, we first examine variations in the slope of the Phillips curve and the transmission of monetary policy. Using data from a panel of 28 countries, we estimate a hybrid Phillips curve and discover that the Phillips curve is steeper when supply-side factors are removed from aggregate inflation. The higher and more significant Phillips curve coefficient observed in estimations with demand-driven inflation suggest that the increasing role of supply side factors leads to a flattening of the Phillips curve relationship.

As another demand side application, we use a local projections specification and find that a monetary policy tightening shock leads to a significant and persistent decline in demand-driven inflation, while its effects on supply-driven are limited and insignificant.[2] Our findings suggest that monetary policy transmission tends to be weaker during episodes when supply-driven inflation plays a more significant role.

We also examine two supply-side factors: (i) Oil price shocks, and (ii) Global supply chain pressures. Using the oil shocks from Baumeister and Hamilton (2019), we observe a substantial increase in supply-driven inflation across 32 countries following a negative oil supply shock, while the response of demand-driven inflation is insignificant. Similarly,

[2]We use quarterly monetary policy shocks from Deb et al. (2023) since they provide shocks for 33 AEs and EMs which allow us to provide a cross-country examination.

in response to global supply chain pressures from Benigno et al. (2022), supply-driven inflation shows a significant positive response, whereas demand-driven inflation remains largely unaffected by these pressures.

The remainder of the paper is organized as follows. In the next section, we discuss the relevant literature. Section 2 describes the data, while Section 3 explains the inflation decomposition methodology, provides historical narrative representation, and presents robustness checks. Section 4 presents results from demand- and supply-side applications. Finally, in Section 5, we conclude.

1.1 Literature Review

There is a growing literature analyzing the decomposition of inflation into demand and supply components, primarily motivated by post-pandemic inflation dynamics. One of the pioneering papers in this literature is Shapiro (2022), which introduced a novel methodology for inflation decomposition, a methodology we adopt in our study. Shapiro (2022) decomposed U.S. inflation into demand and supply components using monthly PCE data spanning from 1990 to 2023. Their findings were substantiated through examples drawn from various historical episodes. Building upon Shapiro (2022) methodology, Sheremirov (2022) further categorized inflation into transitory and persistent demand-driven and supply-driven components within the U.S. context. In our contribution to this literature, we extend this approach to provide a cross-country examination of inflation decomposition. Thus far, this approach has been implemented in a more limited cross-country setting by Gonçalves and Koester (2022) for aggregate Euro Area inflation and by OECD (2022) for eight advanced economies. In our study, we expand the analysis to include 32 advanced and emerging market economies, allowing us to gain insights into the broader heterogeneities in the forces driving demand-driven and supply-driven inflation across countries.

Our paper also adds to the existing literature by offering new insights on the variation in the slope of the Phillips curve and the impact of monetary policy, contingent on whether demand or supply-side forces dominate. Previous studies on the Phillips curve have primarily focused on the flattening of the Phillips curve due to various structural and macroeconomic factors (Ball and Mazumder (2011), Burya et al. (2023), Firat (2022), Höynck (2020), McLeay and Tenreyro (2020), and Rubbo (2023)). To our knowledge, we are the first to examine how the slope of the Phillips curve varies when inflation is demand-driven vs supply-driven. The closest study, Bergholt, Furlanetto, and Vaccaro-Grange (2023), focused on the U.S. and found that the Phillips curve is steeper when inflation is demand-driven than when it is supply-driven. We show that these findings are evident across 32 countries by estimating a hybrid Phillips curve.

Additionally, we shed light on how the transmission of monetary policy may vary depending on the factors driving aggregate inflation. Macroeconomic theory suggests that monetary policy stabilizes prices by controlling aggregate demand (Clarida, Gali, and Gertler (1999), Smets and Wouters (2003), Christiano, Eichenbaum, and Evans (2005), and Galí (2015)). Using our demand-driven and supply-driven inflation series from 32 countries, we confirm the macroeconomic theory that monetary policy strongly and significantly affects demand-driven inflation, while supply-driven inflation is less responsive to monetary policy shocks.

Our paper also makes a contribution to the literature that explores the role of supply chain pressures in driving inflation. Benigno et al. (2022) introduces a novel indicator, the Global Supply Chain Pressures Index (GSCPI), and demonstrate a close relationship between recent inflationary pressures in producer prices in the U.S. and the Euro Area and the behavior of the GSCPI. Di Giovanni et al. (2022) develops a multi-country, multi-sector model with input-output linkages to examine the impact of the Covid-19 pandemic on Euro Area inflation. Their findings underscores the significance of labor shortages and supply chain bottlenecks in explaining Euro Area inflation trends over 2020-21. Our paper contributes to this literature by demonstrating that supply chain pressures have contributed to inflation across 32 countries. Notably, we find that these pressures lead to an increase specifically in supply-driven inflation, with no significant impact on demand-driven inflation.

2 Data

Our inflation decomposition analysis relies on sectoral PCE data, which we obtained at a quarterly frequency from Haver Analytics and Eurostat.[3] We use PCE data instead of more commonly used Consumer Price Index (CPI) because the inflation decomposition methodology necessitates corresponding sectoral quantity and price series in each sector. Table A2 illustrates the high correlation observed between the aggregate PCE deflator and CPI inflation within countries.

Our dataset covers an extensive time span, from the 1990s to 2023Q2, and encompasses 32 countries, including 23 advanced economies and 9 emerging market economies.[4] The sectoral price deflators and real expenditures are seasonally adjusted, either conducted by

[3]Note that monthly PCE series are available for the U.S. Since the data is available at quarterly frequency for other countries, and to have a cross-country consistency, we use quarterly series for each country.

[4]See Table A1 for sample details.

the data source or by the authors.[5] For seasonal adjustments we use X13-ARIMA-SEATS, allowing for additive outliers and level shifts as necessary.[6] The number of PCE expenditure items varies among countries, for instance, the Bureau of Economic Analysis (BEA) provides 99 corresponding price and quantity items for the U.S., while several European countries have only 4 sectors.

Our validation exercises for the decomposition analysis utilize various data sources: (i) For the Phillips curve exercise, we use quarterly output gap series (computed using the Hodrick-Prescott (HP) filter), one-year ahead inflation expectations from Consensus Forecasts (CF), and import prices from HAVER; (ii) Monetary policy transmission analysis uses quarterly monetary policy shock series from Deb et al. (2023); (iii) Oil shocks transmission exercise relies on oil supply shocks from Baumeister and Hamilton (2019); and (iv) Supply chain pressures analysis utilizes global supply chain pressures index (GSCPI) from Benigno et al. (2022).

3 Inflation Decomposition Methodology

We follow the methodology from Shapiro (2022) and Sheremirov (2022) to classify inflation in each expenditure item as either supply-driven or demand-driven. This classification is based on the assumption that demand shocks move prices and quantities in the same direction, while supply shocks have the opposite effect. To carry out this classification, we estimate a vector autoregressive (VAR) model in first differences with four lags for each expenditure item. This VAR model allows us to examine whether inflation in each individual item can be attributed to supply or demand driven factors. Additionally, for robustness, we also consider a range of alternative models.

3.1 Baseline Empirical Approach

A common characterisation of demand (supply) shocks is that they should move prices and quantities in the same (opposite) direction. Such a feature is generated by common macroeconomic models and has been employed by the SVAR literature in identifying demand and supply shocks in aggregate time series.

In this approach, inflation in an expenditure item is classified as “demand-driven” (supply-driven) if both inflation and output growth exceed (fall below) the expected levels

[5]Quarterly sectoral price deflators are calculated as the ratio of nominal and real expenditure series.

[6]Our implementation in Matlab is based on the toolbox by Yvan Lengwiler: “’X-13 Toolbox for Matlab, Version 1.51’, Mathworks File Exchange, 2014-2021”.

based on their past values. We then calculate the demand-driven and supply-driven components of aggregate inflation by taking the weighted average of the item level inflation rates classified as demand-driven and supply-driven, respectively.

In each country c, for each expenditure item i, we model the price and quantity dynamics with a VAR, separately, as follows:

$$y_{cit} = \sum_{h=1}^{p} C_{cij} y_{ci,t-h} + \nu_{cit}, \tag{1}$$

where the vector $y_{cit} = (\Delta p_{cit}, \Delta q_{cit})$ contains the first differences in the (log) deflator (Δp_{cit}) and real consumption (Δq_{cit}) of item i in country c at quarter t, respectively.[7][8] $\nu_{cit} = (\nu^p_{cit}, \nu^q_{cit})$ denotes the residuals, which will be used to identify expenditure item inflation as demand or supply driven. Also, note that the baseline specification uses $p = 4$ lags of each variable in estimation.

Following Shapiro (2022), we categorize inflation in a given expenditure item as "demand driven" if the residuals of price (ν^p_{cit}) and quantity (ν^q_{cit}) from the Equation (1) have the same sign, and "supply driven" if the residuals have opposite signs as follows:

$$D_{ct} = \{i : \nu^p_{cit} \nu^q_{cit} \geq 0\}$$
$$S_{ct} = \{i : \nu^p_{cit} \nu^q_{cit} < 0\}$$

where D_{ct} and S_{ct} denote the set of demand and supply driven inflation items in country c, respectively.

After categorizing each item, we calculate the demand and supply driven inflation series in country c as the weighted sum of item level inflation rates as follows:

$$\pi^d_{ct} = \sum_i \mathbb{1}_{i \in D_{ct}} \omega_{cit} \pi_{cit}$$
$$\pi^s_{ct} = \sum_i \mathbb{1}_{i \in S_{ct}} \omega_{cit} \pi_{cit}$$

where π^d_{ct} and π^s_{ct} denote the demand and supply driven inflation series in country c. For

[7]Note that the deflator in each item is calculated as $p_{cit} = \frac{q^{Nominal}_{cit}}{q^{Real}_{cit}}$.

[8]Our empirical model is VAR in first differences, motivated by specification tests which generally point to log prices and quantities being I(1) while not indicating a clear cointegrating relation existing between the two variables (see table A4). Modelling the variables in first differences changes the interpretation of our demand and supply shocks relative to those in Shapiro: we require that shocks affect the *rate* of inflation and output growth, not only price and output levels.

item aggregation weights, ω_{cit}, we use the year-to-date expenditure share of item i in country c. Aggregate inflation (π_{ct}) is defined as the sum of demand and supply driven such that $\pi_{ct} = \pi^d_{ct} + \pi^s_{ct}$.

We acknowledge two caveats in this exercise. First, similar to Shapiro (2022) and Sheremirov (2022), the demand/supply categorisation employed here is a noisy measure of the underlying economic shocks. While we categorise a sector in a quarter as either demand or supply driven, in reality supply and demand shocks will simultaneously affect a sector. The approach we employ is underpinned by the idea that the more prevalent shock in a given sector would determine the sign pattern observable in the reduced-form.

The second concern pertains to the limited number of expenditure items used for inflation decomposition analysis in some countries, due to data limitations. In such cases, decomposition results can be highly sensitive to the classification of just one or two sectors. Table A3 displays expenditure shares for the six largest expenditure items across countries. For countries with a small number of sectors, expenditure on just two items may account for over 80% of total expenditure. We report results from these countries separately.

3.2 Validation of Inflation Decomposition: Narrative Evidence

We present our cross-country inflation decompositions primarily for two episodes with strong historical narratives: 1) the COVID-19 pandemic and the subsequent surge in inflation, and 2) the Great Financial Crisis (GFC).

Figure (3a) presents year-on-year demand and supply driven inflation rates for countries and regions since 2019Q1.[9] The decomposition suggests that at the outset of the pandemic (2020Q1), lockdown measures exerted downward pressure on prices primarily through the demand channel. Demand-driven factors had a negative contribution to aggregate inflation throughout 2020 across all regions. However, as countries gradually reopened, lifted pandemic restrictions, and implemented supportive fiscal and monetary policies, demand-driven inflation reversed its trend, surging significantly through the end of 2022.

Meanwhile, supply-driven inflation remained positive and relatively stable through the pandemic. The relative contribution of supply-driven inflation to aggregate inflation was relatively small during the initial pick-up of inflation in 2021, and began rising after 2022Q1. This trajectory in supply-driven inflation can potentially be explained by commodity prices pressures, which became more pronounced towards after Russia's invasion of Ukraine in early 2022.

[9]Decompositions presents the average demand-driven and supply-driven series within regions using all countries in our sample. However, results for individual countries are available upon request.

In the U.S. and Canada, where PCE inflation peaked in early 2022, the slowdown in inflation was due to both supply-driven and demand-driven components. In Asian countries, except Japan, a decline in inflation began towards the end of 2022, accompanied by a decreasing contribution from demand and supply factors.

Figure (3b) reports the results for the GFC. The trajectory of supply-driven inflation across countries aligns with the commodity price cycle that peaked in mid-2008 and subsequently experiencing a sharp decline. A noticeable decline in demand-driven inflation is also evident, starting towards the end of 2008. These findings across the regions support the theoretical argument put forth by Carroll (1997) that buffer-stock saving behavior emerges when consumers face significant income uncertainty. Empirical evidence from Mody, Ohnsorge, and Sandri (2012) indicates that heightened uncertainty during the GFC has substantially increased saving rates, leading to lower consumption and GDP growth.

Additionally, Figure (A3) provides insights into the inflation decomposition during the sharp commodity price drops between 2014 and 2016. During this period, the crude oil prices plummeted to under $30 in February 2016, down from around $106 in June 2014. Similar steep declines were observed in the prices of metals like copper and aluminum, as well as agricultural products such as corn and soybeans. Our decomposition results aligns with these developments, showing a significant decline in supply-driven inflation across all regions. Notably, the strong contribution of supply-driven inflation observed before mid-2014 reversed following commodity price drops.

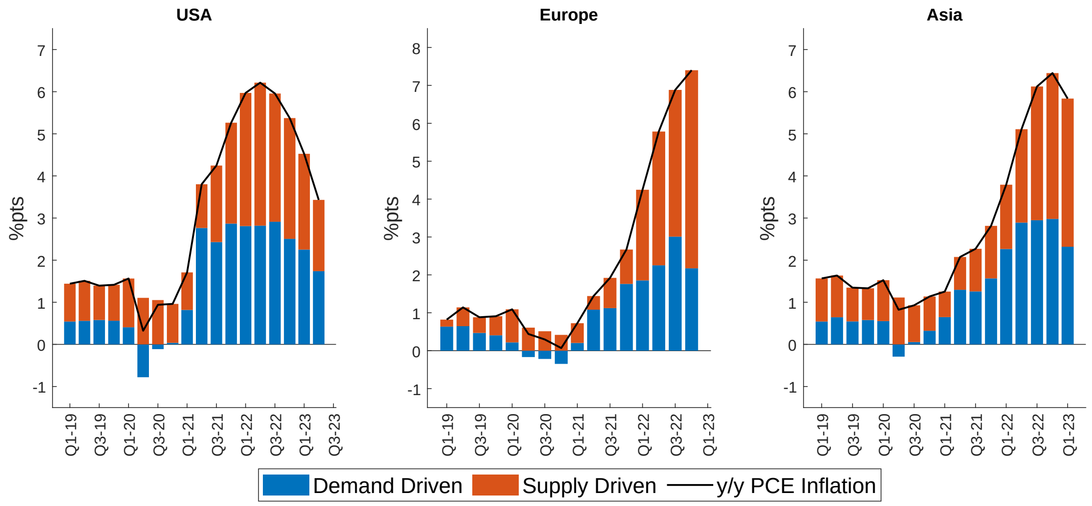
3.3 Robustness Checks

To assess the robustness of our results, we consider the following alternative specifications: *i*) 8 lags in the VAR; *ii*) Lag length chosen by an information criterion (AIC); *iii*) estimation sample ending in 2019Q4; *iv*) 10-year rolling window estimation; *v*) One-step-ahead forecast errors; *vi*) Classifying sectors with either price or quantity residuals smaller 0.1 standard deviations as ambiguous; *vii*) Classifying the smallest 10% of price and quantity residuals as ambiguous; *viii*) Estimation in levels of variables with linear deterministic trend; *ix*) Detrending level series with Hamilton regression filter (Hamilton 2018); *x*) detrending level series with Hodrick-Prescott filter with smoothing parameter 1600.

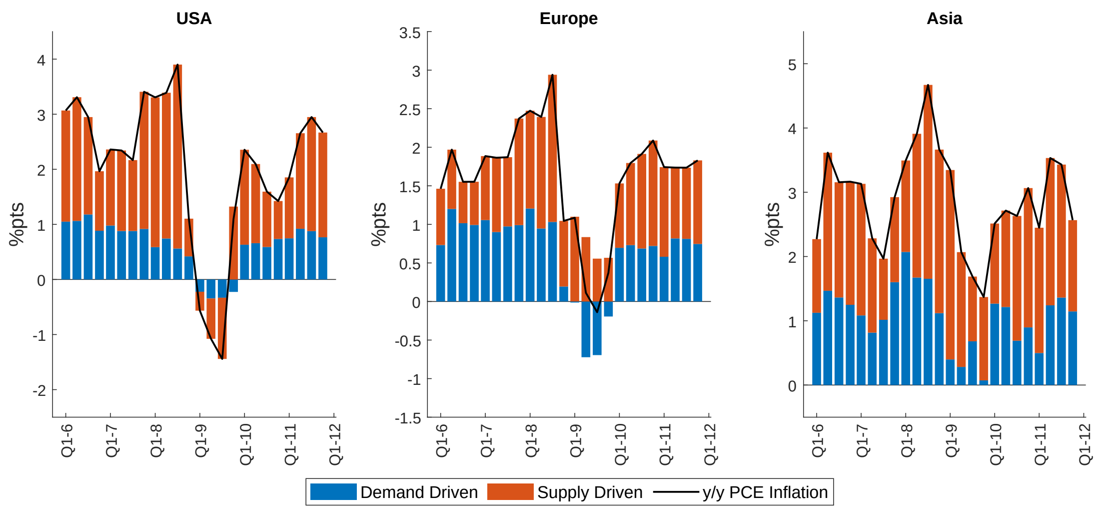
Specifications *i*) and *ii*) are included for checking sensitivity to lag order selection. Specification *iii*) estimates the VAR parameters in a sample ending in Q4 2019 to address concerns about outliers occuring during the pandemic. Specification *iv*) is included to address potential parameter instability. The idea in specification *vi*) is to use only contemporaneously available information in classifying shocks as demand or supply. Specifications *vii*)

Figure 3: Inflation Decomposition: Historical Evidence

(a) Decomposition of y/y PCE inflation during Pandemic Era



(b) Decomposition of y/y PCE inflation during GFC



Notes: Europe includes FRA, GER, ITA, DEN, SWE. Asia includes AUS, NZL, THA, PHL, KOR, IDN in panel a); Asia in panel b) does not include IDN because data is not available.

and *viii*) are similar to robustness checks in Shapiro (2022), and are included to address concerns about items with small residuals driving the decomposition results. Finally, specifications *viii*)-x) are included as alternative specifications of the trend in the level of prices and quantities.

Tables (A5) and (A6) show the correlation between demand and supply driven series from the baseline specification and alternative methods discussed above, for each country. The correlation is substantially high across specifications with the mean across countries exceeding 0.9 for most specifications.

Figures (A1) and (A2) examine the robustness of demand- and supply-driven inflation series for the GFC and the surge in inflation after the pandemic. The figures show point-wise maxima and minima of the decomposed inflation series across different specifications across specifications. The figures suggests that the trends in demand and supply driven series from baseline specification are robust to the alternative specifications described above.

4 Applications

After validating cross-country inflation decomposition series from a historical perspective, we proceed to investigate the role of different channels that may impact demand-driven and supply-driven inflation differently. We explore demand-side channels through the Phillips curve and monetary policy transmission. On the supply side, we examine the effects of oil price shocks and global supply chain pressures.

4.1 Demand Channel 1: Phillips Curve

The Phillips curve serves as an important tool for policymakers in controlling both economic activity and price dynamics. Recent literature has extensively explored how Phillips curve has flattened over time due to various factors such as monetary policy credibility, globalization, market concentration and changes in production networks (Ball and Mazumder (2011), O. Blanchard (2016), Auer, Borio, and Filardo (2017), Höynck (2020), McLeay and Tenreyro (2020), Firat (2022), Heise, Karahan, and Şahin (2022), Rubbo (2023)). In this context, we approach the Phillips curve relationship from a different perspective and examine whether the Phillips curve coefficient varies depending on the shocks driving inflation.

The standard New Keynesian Phillips curve suggests a positive relationship between inflation (π_t) and the output gap (y_t) after controlling for inflation expectations ($E_t\pi_{t+1}$)

and supply shocks (u_t) such that

$$\pi_t = \beta E_t \pi_{t+1} + \kappa y_t + u_t \tag{2}$$

where κ denotes the theoretical Phillips curve coefficient. However, estimating a reduced-form Phillips curve while controlling for supply shocks using aggregate data poses challenges, primarily due to the presence of numerous unobserved supply side disturbances. Importantly, because supply shocks move prices and output in opposite directions, they introduce a downward bias in the empirical Phillips curve coefficient. To mitigate this issue, we use our demand-driven and supply-driven inflation series while estimating Phillips curve.

To examine whether Phillips curve coefficient is different when inflation is demand- or supply-driven, we use the following hybrid Phillips curve:

$$\pi^j_{c,t} = \beta_1 \hat{y}_{c,t} + \beta_2 \pi^E_{c,t} + \beta_3 \pi^m_{c,t} + \Sigma^4_{k=1} \gamma_k \pi^j_{c,t-k} + \epsilon_{c,t} \tag{3}$$

where $j \in \{demand, supply, aggregate\}$ represents whether $\pi^j_{c,t}$ is demand-driven, supply-driven, or aggregate inflation. $\hat{y}_{c,t}$ denotes output gap calculated as the deviation of country i's real GDP from its HP filtered trend and $\pi^E_{c,t}$ is one-year ahead inflation expectations.[10] In addition to country and time fixed effects, our specification contains import prices, $\pi^m_{i,t}$ to control for exchange rate pass-through, and four quarters lags of dependent variables to control for autocorrelation.

Table (1) columns 1-3 present the estimation results from Equation (3) using demand-driven, supply-driven and aggregate inflation, respectively. A comparison between the first two columns reveals that the Phillips curve is steeper and the coefficient is more significant when inflation is demand-driven than supply-driven. There is a positive (0.0536) and statistically significant relationship between demand-driven inflation and the output gap across 28 countries. However, the Phillips curve coefficient turns negative when we estimate Equation (3) using supply-driven component, indicating that our supply-driven inflation series effectively capture supply shocks that drive prices and output in opposite directions.

Column 3 presents a weaker (0.0342) and less significant relationship between the output gap and aggregate inflation compared to demand-driven inflation. This observation supports the argument that supply shocks generates a downward bias in Phillips curve coefficient. Notably, a strong and significant Phillips curve relationship is evident when supply-side

[10] We also estimate the Equation 3 with output gap series generated using Hamilton (2018) filter.

disturbances are removed from aggregate inflation. Furthermore, our findings imply that the empirical Phillips curve relationship weakens during periods characterized by pronounced supply-side shocks, such as the post-pandemic episode.

Estimating Equation (3) by interacting output gap series with AE and EM dummies, Table (A8) presents the variation in the Phillips across different variables for each group of countries. Comparing columns for the first two rows, the table suggests that the Phillips curve relationship is stronger and more significant when supply-side inflation is removed from aggregate inflation, both in AEs and in EMs.

We also examine the time variation in the Phillips curve relationship by estimating Equation (3) with 60-quarters rolling windows. Figure (A9c) shows the weakening in the Phillips curve relationship across countries over time. Notably, Figure (A9a) reveals that the weakening in the aggregate Phillips curve is caused by the declining sensitivity of demand-driven inflation to the output gap, recently.

These findings are robust to further controls including cost pressures from trade partners (Table (1) columns 4-6). Furthermore, the sensitivity of demand-side inflation to output gap is stronger than aggregate inflation even when Hamilton (2018) filters used to calculate country-level output gap series. (Table A7).

4.2 Demand Channel 2: Monetary Policy Transmission

Our second demand side application considers the differential responses of demand-driven and supply-driven inflation to monetary policy shocks. Macroeconomic theory assumes that monetary policy affects inflation by controlling aggregate demand (Clarida, Gali, and Gertler (1999), Smets and Wouters (2003), Christiano, Eichenbaum, and Evans (2005), and Galí (2015)). Therefore, we would expect monetary policy transmission to be stronger when aggregate inflation has been driven by demand-side factors than it would have been driven by supply shocks.

To test this hypothesis, we use externally identified monetary policy shock series from Deb et al. (2023) and match their series with our demand-driven and supply-driven inflation series.[11] After matching, we have a sample of 22 countries for this exercise. Then, we use Jordà (2005) local projections to estimate the responses of demand-driven and supply-driven

[11] Deb et al. (2023) generates shock series following C. D. Romer and D. H. Romer (2004). They first calculate forecast errors of interest rates as the deviation of short-term rates from their forecasted values. Then, they extract shock series as the residuals from the regression of forecast errors on economic conditions such as inflation, real GDP, their forecasts and lagged values.

Table 1: Phillips Curve Slope with Demand- vs. Supply-Driven Inflation

	(1) $\pi^{demand}_{i,t}$	(2) $\pi^{supply}_{i,t}$	(3) $\pi^{aggregate}_{i,t}$	(4) $\pi^{demand}_{i,t}$	(5) $\pi^{supply}_{i,t}$	(6) $\pi^{aggregate}_{i,t}$
$\hat{y}_{i,t}$	0.0536***	-0.0348*	0.0342*	0.0602***	-0.0367*	0.0398*
	(0.0173)	(0.0189)	(0.0185)	(0.0191)	(0.0205)	(0.0197)
$\pi^E_{i,t}$	0.109***	0.280***	0.430***	0.110***	0.282***	0.433***
	(0.00658)	(0.0743)	(0.0656)	(0.00672)	(0.0766)	(0.0662)
$\pi^m_{i,t}$	0.0863	1.012**	0.959**	0.148	0.989**	1.001**
	(0.237)	(0.428)	(0.391)	(0.241)	(0.441)	(0.416)
$\pi^d_{i,t-1}$	0.831***			0.826***		
	(0.0676)			(0.0679)		
$\pi^s_{i,t-1}$		0.618***			0.617***	
		(0.0965)			(0.0984)	
$\pi^{agg}_{i,t-1}$			0.653***			0.649***
			(0.0930)			(0.0924)
$\Delta ppi^w_{i,t}$				0.00143	0.00666	0.0103
				(0.00450)	(0.00673)	(0.00798)
Country FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Number of Observations	2302	2302	2302	2174	2174	2174
No of Country	28	28	28	27	27	27
R^2	0.862	0.894	0.942	0.860	0.895	0.942

Standard errors are clustered in countries.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

inflation series to monetary policy shocks for eight quarters horizon as follows:

$$\pi^j_{c,t+h} = \beta_h Shock^{MP}_{c,t-1} + \gamma_Z Z_{c,t} + \alpha_c + \alpha_t + \epsilon_{c,t} \tag{4}$$

where $\pi^j_{c,t}$ denotes demand-driven or supply-driven inflation ($j \in \{demand, supply\}$) in country c at time t, and $Shock^{MP}_{c,t-1}$ are externally-identified monetary policy shocks from Deb et al. (2023). We control for time-invariant country characteristics (monetary policy credibility, financial development, exchange rate regime etc.) with country fixed effects α_c and common time-varying developments (global financial conditions, supply chain pressures, oil price fluctuations etc.) with the time fixed effects α_t. To address potential autocorrelation issues, we control for 4 quarter lags of dependent variable and the monetary policy shocks in $Z_{c,t}$.

Figure (4) presents the monetary policy transmission on demand-driven (panel A) and supply-driven (panel B) inflation series across 22 countries between 1990Q1 and 2019Q4. Following a monetary policy tightening shock, demand-driven inflation declines gradually over two years. The effects are significant across each horizon and highly persistent. However, Panel B shows that monetary policy shocks have no significant impact on supply-driven inflation series. This result suggests that monetary policy transmission on inflation is stronger when price changes are driven by demand side factors, aligning with macroeconomic theory. Our findings shed light on the role of supply side factors leading to a weakening in monetary policy transmission, especially when these shocks dominate demand side factors.

The results are robust to various controls such as including: (i) change in nominal effective exchange rate to control for exchange rate pass-through (Figure A8); (ii) change in cyclically adjusted primary balance to control for fiscal policy change ((Figure A5)); (iii-iv) output gap and real GDP growth to control for other demand relevant factors (Figures (A6) and (A7)).

4.3 Supply Channel 1: Oil Shocks

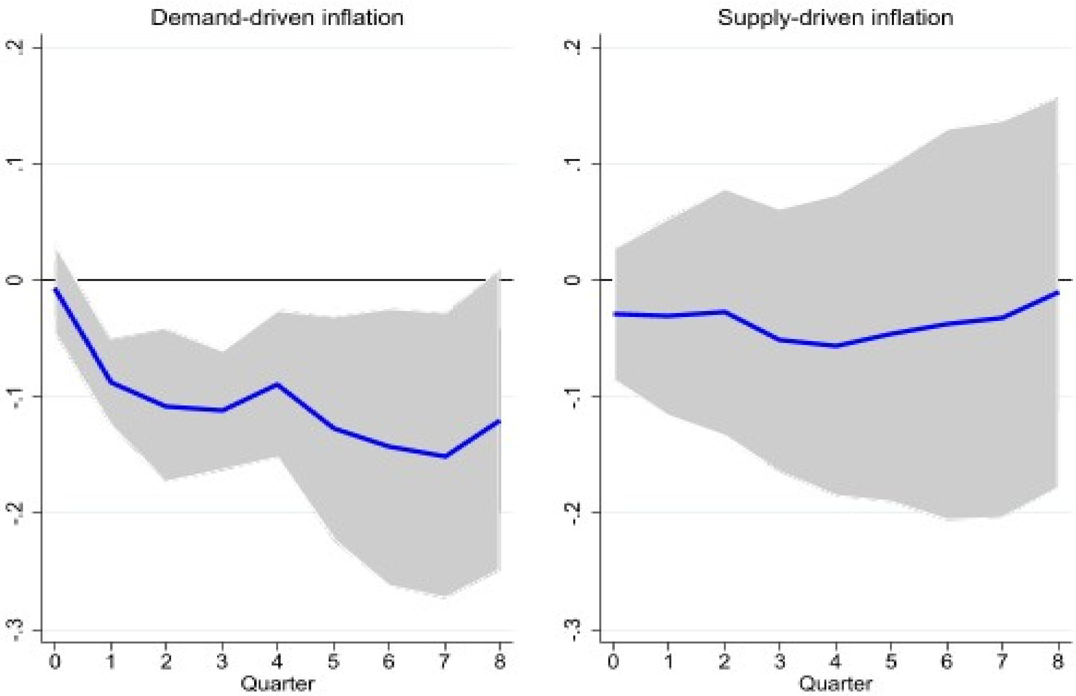
We also consider the role of two supply side channels. First, we examine how our demand-driven and supply-driven inflation series respond to the oil shocks. Specifically, we are using externally identified oil supply shocks from Baumeister and Hamilton (2019) to test whether our supply-driven inflation series are more responsive to oil supply shocks than demand-driven series. Relaxing the previously made assumptions on sign-restrictions in the literature, Baumeister and Hamilton (2019) provide new oil supply shock series, and come to a conclusion that oil supply shocks were more important in accounting for historical oil price movements than oil demand shocks. Using their oil supply shock series, we test the hypothesis that supply-driven inflation series are more responsive to the negative oil supply shocks than demand-driven inflation series.

To formally test this hypothesis, we use a similar approach from Equation (4) as follows:

$$\pi^j_{c,t+h} = \beta_h Shock^{Oil}_{t-1} + \gamma_Z Z_{c,t} + \alpha_c + \epsilon_{c,t} \tag{5}$$

where $Shock^{Oil}_{t-1}$ are externally-identified (negative) oil shocks from Baumeister and Hamilton (2019). Since the shocks are common across countries, we cannot include time fixed effects in this specification. However, the vector of control variables $Z_{c,t}$ includes the change in cyclically-adjusted primary balance (fiscal policy), nominal effective exchange rate (exchange rate pass-through), and real GDP growth (demand-side factors), besides 4 quarter

Figure 4: Monetary Policy Transmission on Demand-driven vs Supply-driven Inflation

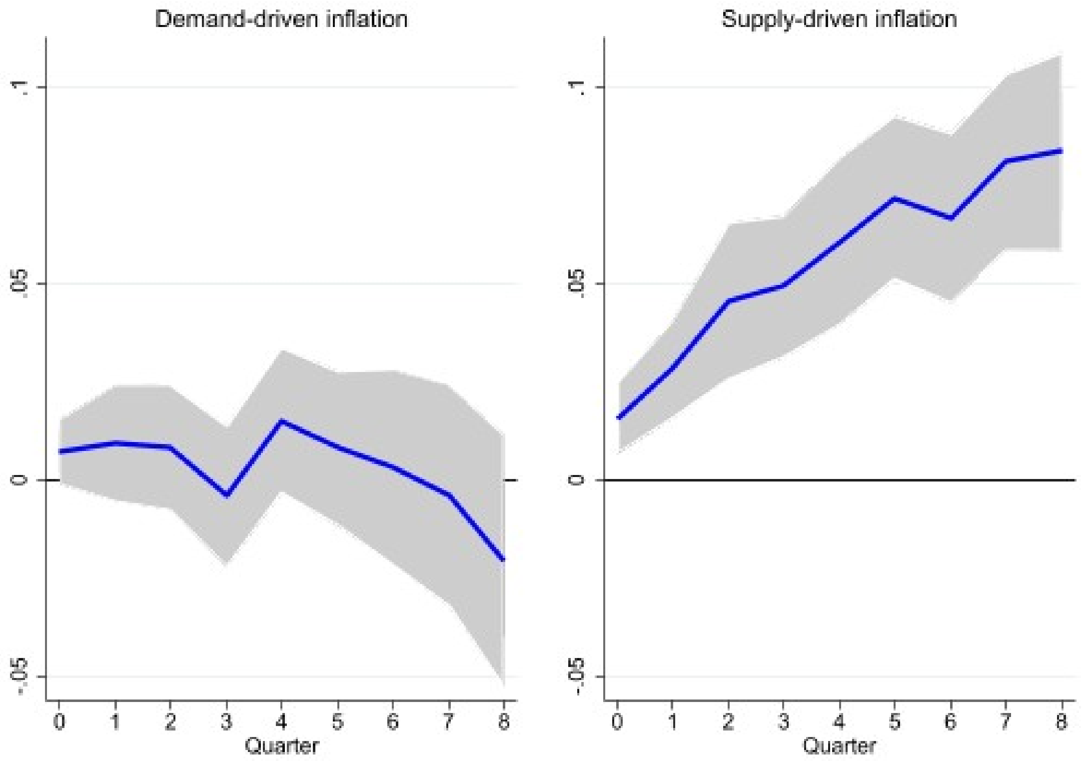


Notes: Y-axis in percentage points. Panel A and B presents the response of demand- and supply-driven inflation against 100 bps monetary policy shocks, respectively. Confidence intervals are at 90 percent and standard errors are clustered in countries.

lags of dependent variables and oil supply shocks.

Figure (5) displays the responses of demand-driven (left) and supply-driven (right) inflation series to oil supply shocks. The results suggest that a negative oil supply shock leads to a significant increase in supply-driven inflation. The inflationary effects are highly persistent over 2 years. However, the effects on demand-driven inflation are muted and insignificant. The results provide another validation to our inflation decomposition, now from a supply side perspective, that our supply-driven inflation series move in the expected direction against externally identified oil supply shocks while demand-driven inflation are not responsive.

Figure 5: Negative Oil Supply Shocks Transmission on Demand vs Supply-Driven Inflation



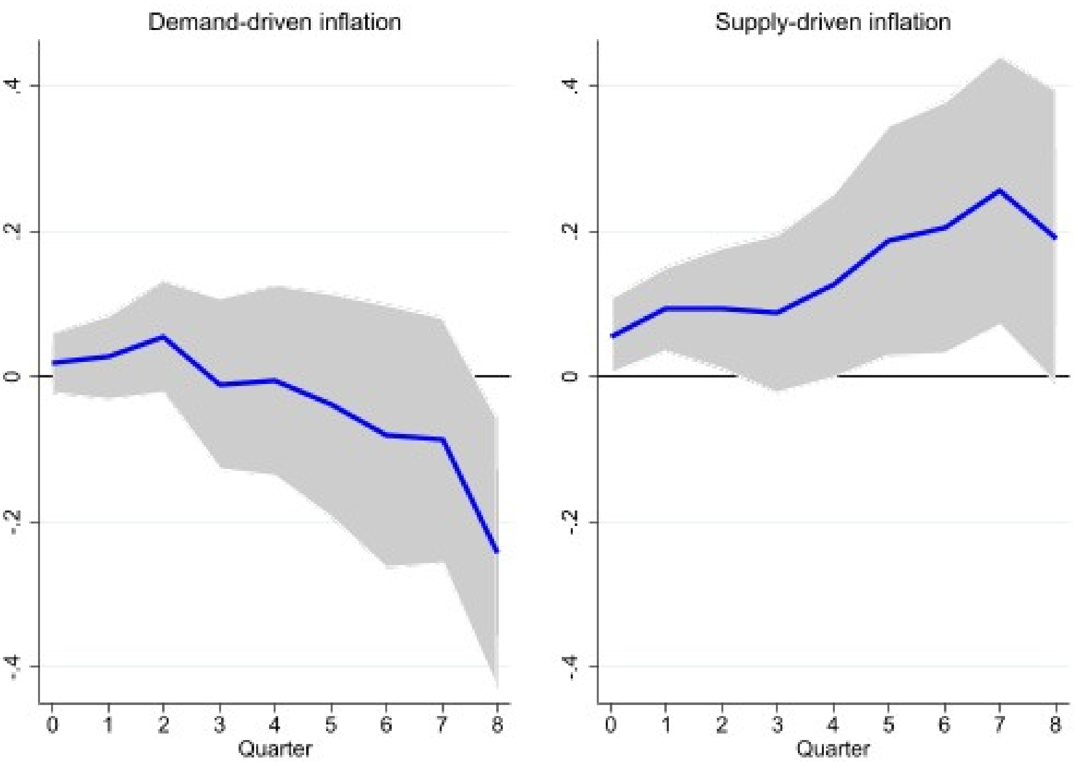
Notes: Y-axis in percentage points. Panel A and B presents the response of demand- and supply-driven inflation against one standard-deviation negative oil supply shocks, respectively. Confidence intervals are at 90 percent and standard errors are clustered in countries.

4.4 Supply Channel 2: Supply Chain Pressures

The second supply side exercise considers the effects of supply-chain pressures on demand- and supply-driven inflation. Specifically, we test whether the supply-driven inflation series are more responsive to supply chain pressures than demand-driven inflation series. To examine this hypothesis, we use Global Supply Chain Pressures Index (GSCPI) from Benigno et al. (2022). They construct a novel measure of supply chain pressures combining information from twenty-seven variables including three country-specific supply chain variables from seven countries and regions, two global shipping rates, and four price indices summarizing airfreight costs between the U.S., Asia and Europe. Benigno et al. (2022) shows that a rise in GSCPI leads to significant and persistent increase in producer and consumer prices in the U.S. and Euro Area. Here, we test whether the responses in supply-driven inflation series have been driving these results.

Using GSCPI instead of oil price shocks in Equation (5), Figure (6) presents the results. Following a rise in supply chain pressures, supply-driven inflation increases instantly, and significantly, and the rise is persistent over two years. However, the effect on demand-driven inflation series are insignificant for 7 quarters, before starting to decline afterwards. We argue that the negative inflation responses after two years is due to a fall in economic activity following supply chain pressures, which requires considerable time to pass-through into demand-driven inflation.

Figure 6: Effects of Supply Chain Pressures on Demand vs Supply-Driven Inflation



Notes: Y-axis in percentage points. Panel A and B presents the response of demand- and supply-driven inflation against one standard-deviation increase in GSCPI, respectively. Confidence intervals are at 90 percent and standard errors are clustered in countries.

5 Conclusion

In this paper, we have sought to understand the drivers behind the inflation dynamics. Our analysis has documented the differential contributions of demand-side and supply-side factors across a broad sample of advanced and emerging market countries over the past three decades.

Our findings reveal that the surge in inflation since 2021 cannot be solely attributed to supply-side factors. A shared feature of the recent inflation across countries has been that demand-side factors made a significant contribution particularly in the initial pick-up of inflation during 2021, while the role of the supply-side in generating inflation started becoming more prominent after from 2022Q1. Beneath this characterisation, there has been a lot of heterogeneity across countries. While the influence of demand-driven and supply-driven inflation is diminishing in the U.S. and Asia, supply-driven inflation remains persistent in Europe.

Moreover, our applications demonstrate that supply-driven inflation is more responsive to oil shocks and supply chain pressures, whereas demand-driven inflation exhibits a more pronounced response to monetary policy shocks. We also find evidence of a steeper Phillips curve when inflation is demand-driven, holding significant implications for effective policy design.

In summary, our cross-country inflation decomposition provides valuable insights for policymakers seeking to grasp the underlying dynamics of inflation. Our applications contribute to a better understanding of how different demand and supply channels affect demand-driven and supply-driven inflation differently, facilitating more effective policy design. Lastly, our inflation decomposition series should serve as a valuable resource for future research aimed at modeling inflation dynamics from both demand and supply perspectives.

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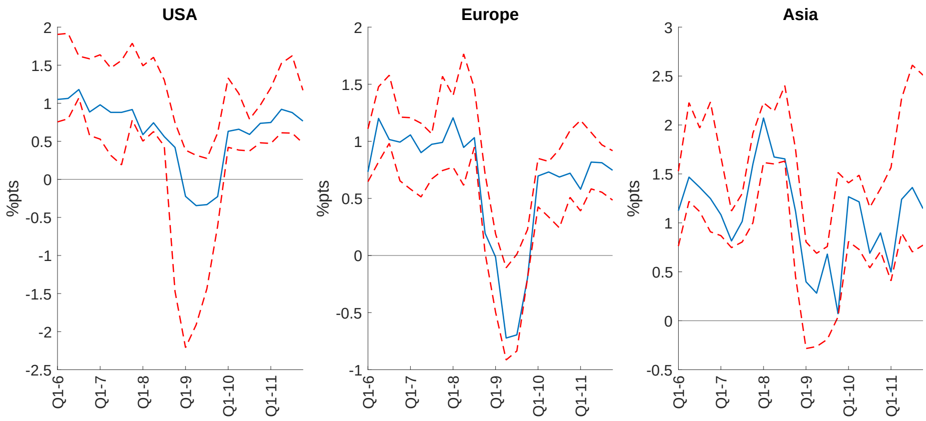
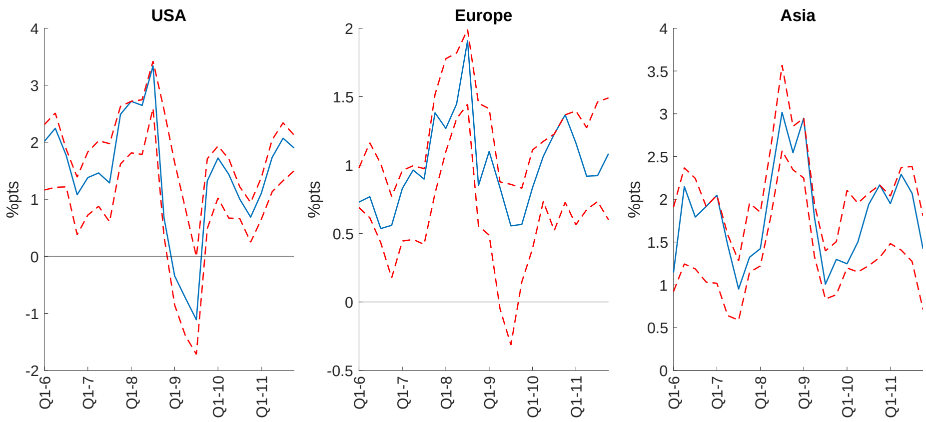
Appendix - Figures

Figure A1: GFC Inflation Decomposition - Robustness

(a) Year-on-year demand-driven inflation



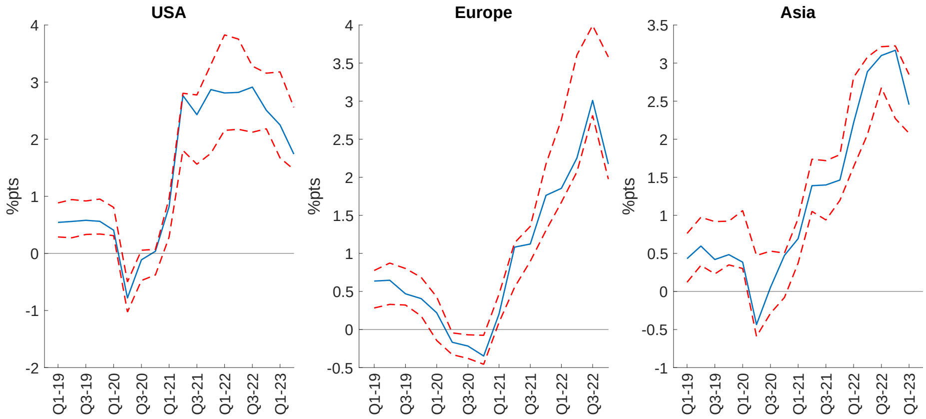
(b) Year-on-year supply-driven inflation



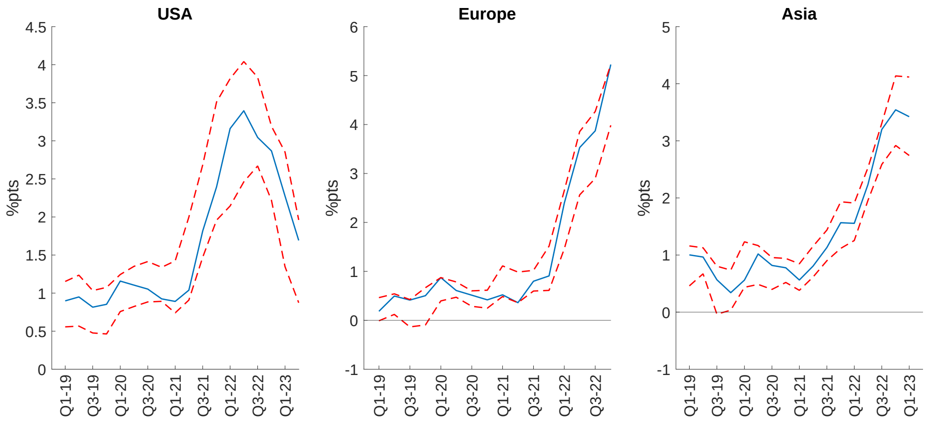
Notes: Solid blue lines show demand- and supply-driven inflation rates from baseline specification. Red dashed bands show pointwise maxima and minima across alternative specifications described in section 3.3. Europe includes FRA, GER, ITA, DEN, SWE. Asia includes AUS, NZL, THA, PHL, KOR.

Figure A2: Post 2019Q1 Inflation Decomposition - Robustness

(a) Year-on-year demand-driven inflation

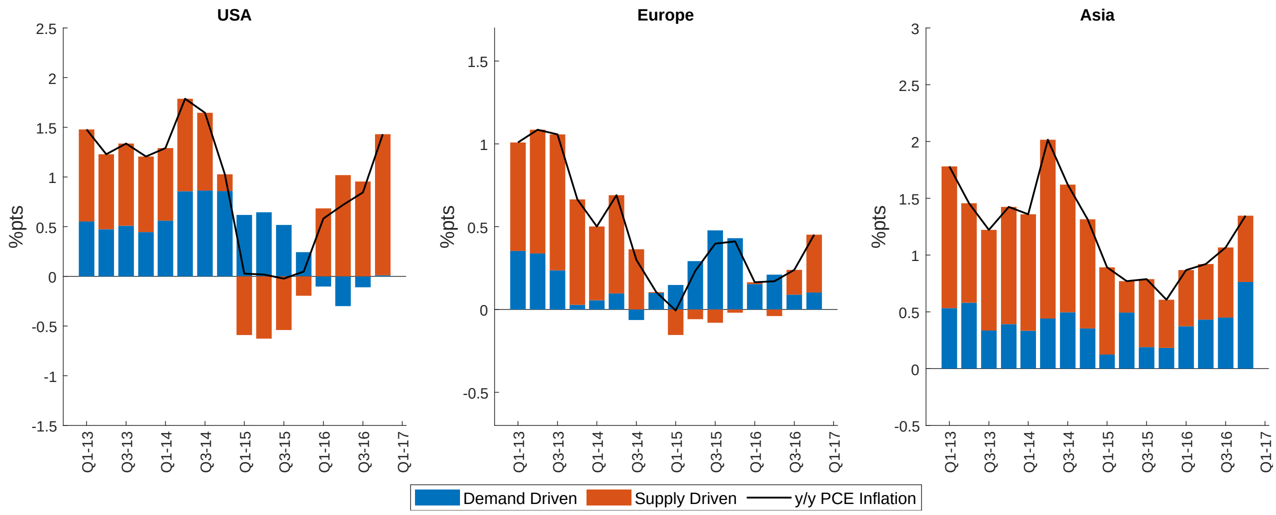


(b) Year-on-year supply-driven inflation



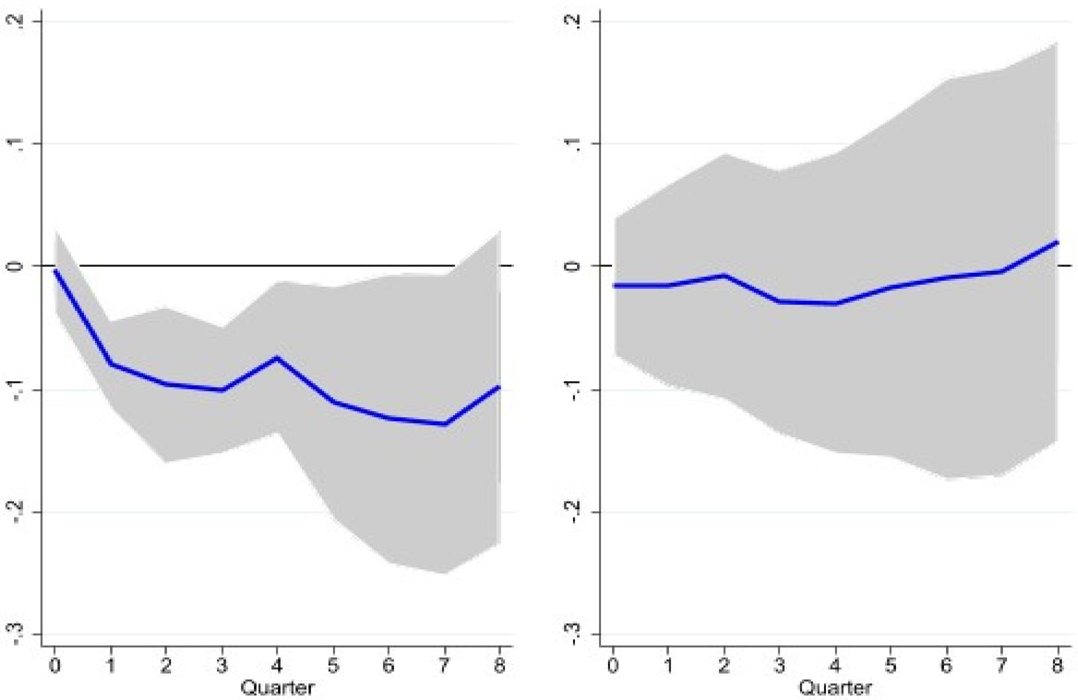
Notes: Solid blue lines show demand- and supply-driven inflation rates from baseline specification. Red dashed bands show pointwise maxima and minima across alternative specifications described in section 3.3. Europe includes FRA, GER, ITA, DEN, SWE. Asia includes AUS, NZL, THA, PHL, KOR, IDN.

Figure A3: Inflation Decomposition For 2015 “mini-recession”



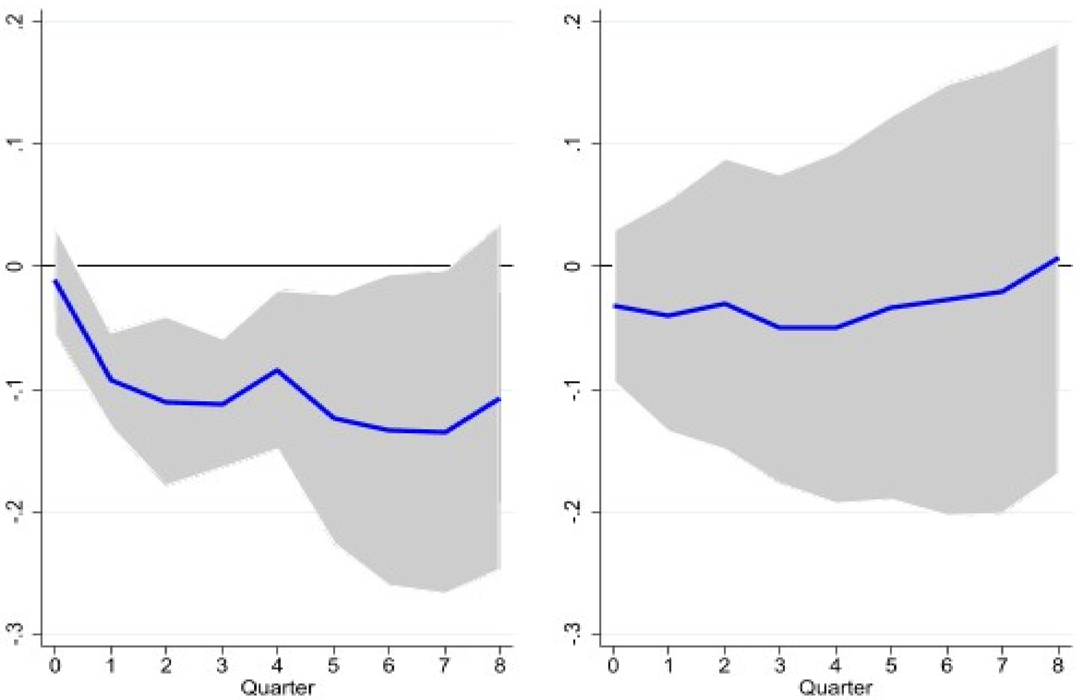
Notes: For Europe and Asia median values across countries are plotted. Europe includes FRA, GER, ITA, DEN, SWE. Asia includes AUS, NZL, THA, PHL, KOR.

Figure A4: Monetary Policy Transmission on Demand- vs Supply-Driven Inflation: Controlling for Exchange rate Fluctuations



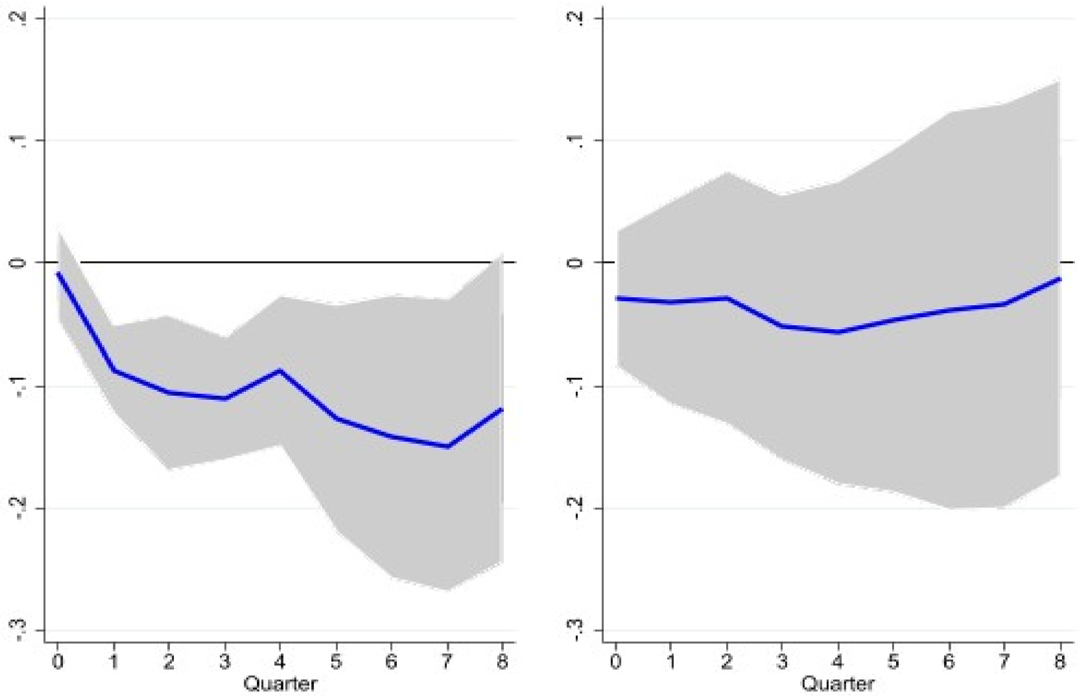
Notes: Y-axis in percentage points. This robustness check controls for the change in net effective exchange rate to control for exchange rate pass-through. Panel A and B presents the response of demand- and supply-driven inflation against monetary policy shocks, respectively. Confidence intervals are at 90 percent and standard errors are clustered in countries.

Figure A5: Monetary Policy Transmission on Demand- vs Supply-Driven Inflation: Controlling for Fiscal Policy



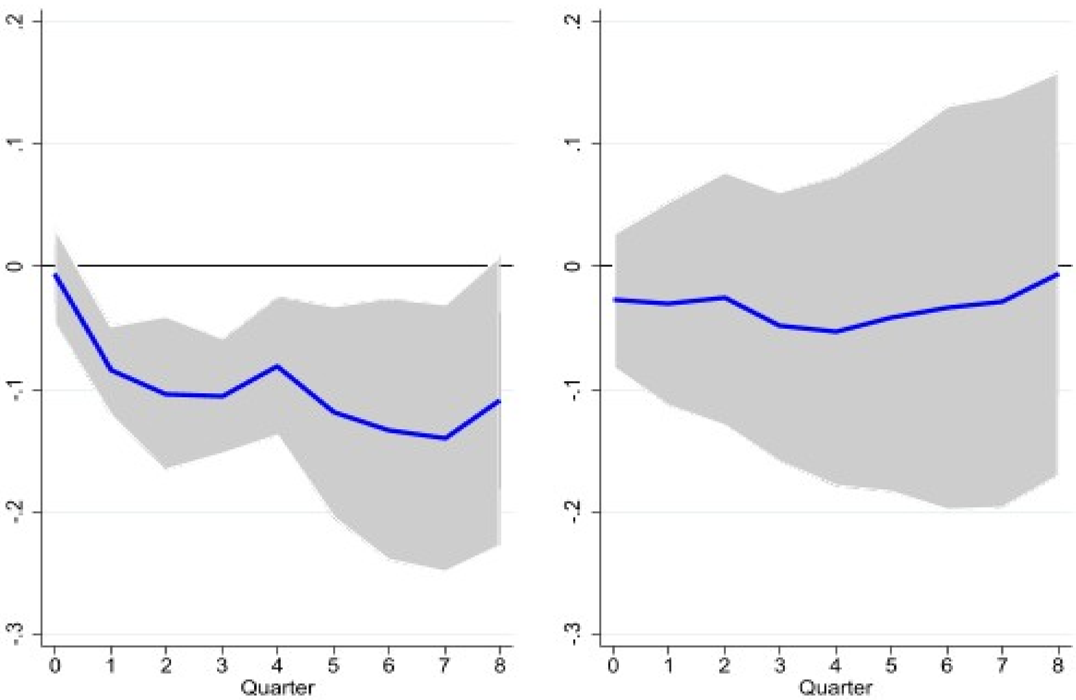
Notes: Y-axis in percentage points. This robustness check includes the change in cyclically-adjusted primary balance to control for the role of fiscal policy. Panel A and B presents the response of demand- and supply-driven inflation against monetary policy shocks, respectively. Confidence intervals are at 90 percent and standard errors are clustered in countries.

Figure A6: Monetary Policy Transmission on Demand- vs Supply-Driven Inflation: Controlling for Output Gap



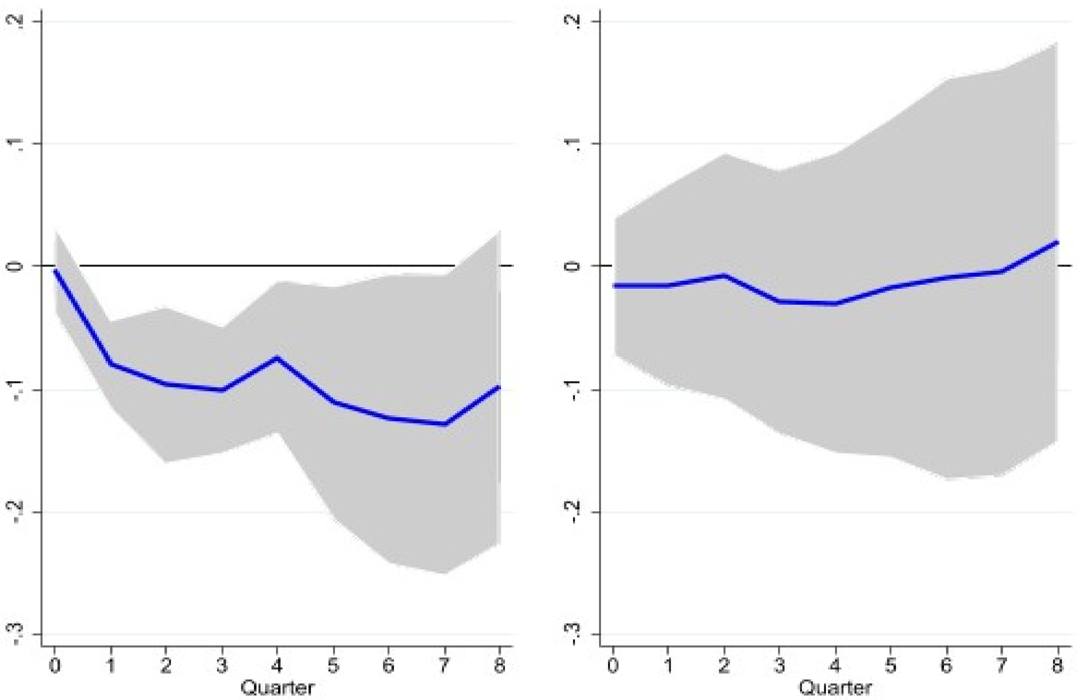
Notes: Y-axis in percentage points. This robustness check includes the country-level output gap series to control for the role of other demand relevant factors. Panel A and B presents the response of demand- and supply-driven inflation against monetary policy shocks, respectively. Confidence intervals are at 90 percent and standard errors are clustered in countries.

Figure A7: Monetary Policy Transmission on Demand- vs Supply-Driven Inflation: Controlling for GDP growth



Notes: Y-axis in percentage points. This robustness check includes the country-level real GDP growth series to control for the role of other demand relevant factors. Panel A and B presents the response of demand- and supply-driven inflation against monetary policy shocks, respectively. Confidence intervals are at 90 percent and standard errors are clustered in countries.

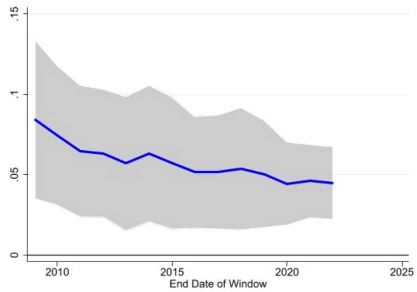
Figure A8: Monetary Policy Transmission on Demand- vs Supply-Driven Inflation: Controlling for Fiscal Policy



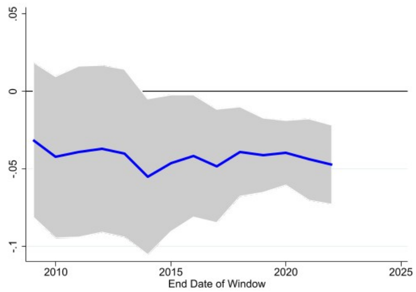
Notes: Y-axis in percentage points. This robustness check includes the change in cyclically-adjusted primary balance to control for the role of fiscal policy. Panel A and B presents the response of demand- and supply-driven inflation against monetary policy shocks, respectively. Confidence intervals are at 90 percent and standard errors are clustered in countries.

Figure A9: Phillips Curve Slope: Rolling Windows

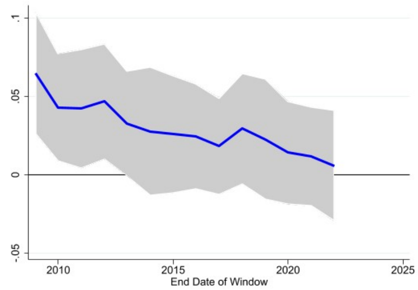
(a) Demand-Driven Inflation



(b) Supply-Driven Inflation



(c) Aggregate Inflation



Notes: Panels show the Phillips curve coefficients in 60-quarters rolling windows. The date on y-axis denotes the end of window. Confidence intervals are at 90 percent and standard errors are clustered in countries.

Table A1: Data Description

Country	PCE DataSource	Seasonal Adjustment	Number of Sectors	Start Date	End Date
Australia	haver	author	26	Q3 1985	Q1 2023
Austria	eurostat	source	4	Q1 1995	Q1 2023
Canada	haver	source	97	Q1 1992	Q1 2023
Cyprus	haver	author	4	Q1 1996	Q1 2023
Czechia	eurostat	source	4	Q1 1996	Q1 2023
Denmark	haver	author	11	Q1 1991	Q1 2023
Estonia	haver	source	4	Q1 1995	Q1 2023
Finland	haver	source	4	Q1 1990	Q1 2023
France	haver	source	18	Q1 1990	Q2 2023
Germany	haver	source	8	Q1 1995	Q1 2023
Hungary	haver	author	4	Q1 1995	Q1 2023
Indonesia	haver	author	7	Q1 2008	Q1 2023
Ireland	eurostat	source	4	Q1 1995	Q1 2023
Italy	haver	source	12	Q1 1996	Q4 2022
Japan	haver	author	13	Q1 1994	Q1 2022
Latvia	haver	source	4	Q1 1996	Q1 2023
Luxembourg	haver	source	4	Q1 1995	Q1 2023
Malta	haver	source	4	Q1 2000	Q1 2023
Mexico	haver	author	8	Q1 1993	Q1 2023
Netherlands	haver	author	4	Q1 2000	Q2 2023
NewZealand	haver	source	10	Q2 1987	Q1 2023
Norway	eurostat	source	4	Q1 1995	Q1 2023
Philippines	haver	author	12	Q1 1998	Q1 2023
Romania	eurostat	author	4	Q1 1995	Q1 2023
Slovakia	eurostat	source	4	Q1 1995	Q1 2023
SouthAfrica	haver	source	4	Q1 1970	Q1 2023
SouthKorea	haver	source	12	Q1 1970	Q1 2023
Sweden	haver	author	9	Q1 2000	Q2 2023
Taiwan	haver	author	12	Q1 1981	Q1 2023
Thailand	haver	source	32	Q1 1993	Q1 2023
UnitedKingdom	haver	author	41	Q1 1988	Q1 2023
UnitedStates	haver	source	99	Q1 1988	Q2 2023

Notes: Start date varies across countries due to data availability.

Table A2: PCE CPI Correlations

Country	CPI-PCE	PCE-PCEapprox
Thailand	0.925	0.995
Philippines	0.89	0.972
Australia	0.938	0.999
NewZealand	0.916	0.997
Japan	0.897	0.999
SouthKorea	0.951	0.999
Taiwan	0.857	0.98
Indonesia	0.714	0.998
Canada	0.839	0.933
UnitedStates	0.956	0.998
UnitedKingdom	0.927	0.994
Germany	0.943	1
France	0.888	0.998
Italy	0.942	1
Sweden	0.972	0.96
Denmark	0.945	0.992
Netherlands	0.779	0.948
Finland	0.932	0.994
Mexico	0.988	0.998
SouthAfrica	0.906	0.977
Austria	0.923	1
Romania	0.937	0.981
Slovakia	0.934	0.986
Norway	0.84	0.925
Ireland	0.782	0.975
Czechia	0.979	1
Estonia	0.96	0.999
Latvia	0.887	0.997
Malta	0.74	0.984
Luxembourg	0.876	0.953
Cyprus	0.888	0.996
Hungary	0.978	0.996
Mean	0.90091	0.98509

Notes: Correlation between annual PCE and CPI inflation. Based on item-level rates, our measure of aggregate PCE inflation is the expenditure share weighted average of item-level inflation rates or, to be exact, a log approximation thereof. This measure of aggregate PCE inflation can in principle be differ from the inflation based on calculating the percentage change in the deflator of aggregate PCE. Discrepancies between the two measures arise from the log approximation, differences in weighting of the sectors, and issues in aggregation caused by the seasonal adjustment. Table reports the high correlations between our measures of aggregate PCE inflation and those reported by national authorities.

Table A3: Mean Cumulative Expenditure Share of 6 Largest Expenditure Items

	1	2	3	4	5	6
Thailand	0.13	0.21	0.27	0.33	0.38	0.43
Philippines	0.34	0.47	0.58	0.69	0.77	0.82
Australia	0.18	0.29	0.37	0.43	0.49	0.54
NewZealand	0.27	0.42	0.55	0.66	0.75	0.81
Japan	0.24	0.39	0.49	0.58	0.65	0.72
SouthKorea	0.24	0.37	0.49	0.59	0.68	0.75
Taiwan	0.19	0.36	0.49	0.61	0.69	0.76
Indonesia	0.39	0.62	0.75	0.85	0.91	0.96
Canada	0.15	0.24	0.29	0.34	0.37	0.41
UnitedStates	0.12	0.19	0.26	0.31	0.35	0.39
UnitedKingdom	0.18	0.27	0.34	0.4	0.45	0.5
Germany	0.24	0.42	0.58	0.72	0.83	0.9
France	0.18	0.34	0.48	0.54	0.61	0.66
Italy	0.21	0.36	0.49	0.59	0.68	0.75
Sweden	0.13	0.25	0.37	0.48	0.6	0.7
Denmark	0.21	0.4	0.51	0.62	0.71	0.78
Netherlands	0.27	0.53	0.77	1	NaN	NaN
Finland	0.5	0.82	0.91	1	NaN	NaN
Mexico	0.45	0.8	0.86	0.91	0.95	0.98
SouthAfrica	0.44	0.76	0.88	1	NaN	NaN
Austria	0.52	0.79	0.9	1	NaN	NaN
Romania	0.51	0.85	0.93	1	NaN	NaN
Slovakia	0.44	0.85	0.93	1	NaN	NaN
Norway	0.47	0.77	0.9	1	NaN	NaN
Ireland	0.5	0.84	0.93	1	NaN	NaN
Czechia	0.44	0.84	0.93	1	NaN	NaN
Estonia	0.43	0.82	0.92	1	NaN	NaN
Latvia	0.48	0.86	0.95	1	NaN	NaN
Malta	0.5	0.82	0.91	1	NaN	NaN
Luxembourg	0.48	0.82	0.92	1	NaN	NaN
Cyprus	0.53	0.84	0.93	1	NaN	NaN
Hungary	0.43	0.84	0.93	1	NaN	NaN

Notes: Table shows the average cumulative mean expenditure shares of the 6 largest PCE items within each country.

Table A4: Specification tests for baseline model

countryname	(1) adf TS p	(2) adf TS q	(3) adf ARD dp	(4) adf ARD dq	(5) JohansenMaxEig	(6) lbtest p	(7) lbtest q	(8) p archtest p	(9) archtest q	(10) jbtest p	(11) jbtest q	(12) eigen
Thailand	0.188	0.125	0.906	1	0.469	0.156	0.156	0.156	0.156	0.875	0.906	0.894
Philippines	0.083	0	0.833	0.833	0.25	0	0	0	0	0.917	0.667	0.831
Australia	0.346	0	0.923	0.962	0.423	0.115	0.077	0.115	0.077	0.846	0.962	0.982
NewZealand	0.2	0.1	0.9	1	0.3	0.1	0	0.1	0	1	1	0.814
Japan	0	0	0.538	1	0.154	0.077	0.077	0.077	0.077	0.846	0.769	0.862
SouthKorea	0.167	0.083	0.833	1	1	0.417	0.25	0.417	0.25	1	1	0.929
Taiwan	0	0.083	0.833	0.667	0.583	0.583	0.417	0.583	0.417	0.667	0.75	0.972
Indonesia	0	0	0.143	0.143	0.143	0.143	0	0.143	0	0.857	0.857	0.876
Canada	0.062	0.258	0.814	0.979	0.278	0.041	0.031	0.041	0.031	0.856	0.845	1.169
UnitedStates	0.03	0.101	0.758	0.949	0.242	0.03	0.071	0.03	0.071	0.838	0.909	0.962
UnitedKingdom	0.171	0.122	0.756	1	0.293	0.195	0.146	0.195	0.146	0.927	0.756	0.966
Germany	0	0.375	0.375	0.875	0.375	0	0	0	0	0.75	0.875	0.978
France	0.056	0.222	0.778	0.889	0.278	0	0.056	0	0.056	0.833	0.944	0.973
Italy	0.083	0.417	0.583	0.917	0.667	0.083	0	0.083	0	0.917	1	1.072
Sweden	0	0.222	0.667	1	0.111	0	0.333	0	0.333	0.667	0.778	0.936
Denmark	0	0.091	1	1	0.091	0.091	0	0.091	0	0.818	0.455	0.814
Netherlands	0	0.5	0.5	1	0.75	0	0	0	0	0.75	0.25	0.944
Finland	0.25	0	0.75	1	0.25	0	0	0	0	0.5	1	0.893
Mexico	1	0.125	0.875	1	0.75	0	0	0	0	1	1	0.886
SouthAfrica	0	0	0.75	1	1	0	0	0	0	1	1	0.925
Austria	0	0.25	0	1	0	0	0	0	0	0.75	1	0.993
Romania	1	0	0	1	1	0.5	0.5	0.5	0.5	0.75	0.25	0.887
Slovakia	0	0	0.5	1	0	0	0	0	0	1	0.75	0.879
Norway	0	0.25	1	1	0.25	0	0	0	0	0.25	0.75	0.939
Ireland	0	0	0.25	1	0	0	0	0	0	1	1	0.923
Czechia	0	0	0.25	1	0	0	0	0	0	1	1	0.93
Estonia	0.25	0	1	1	0	0.25	0	0.25	0	0.25	1	0.841
Latvia	0	0	0.5	1	0	0	0	0	0	1	1	0.963
Malta	0	0.75	0.75	1	0	0	0	0	0	0.5	1	0.973
Luxembourg	0	0	1	1	0.25	0	0	0	0	0.5	1	0.745
Cyprus	0	0	1	0.75	0	0.25	0	0.25	0	0.75	1	0.868
Hungary	0	0	0.5	0.75	0	0	0	0	0	0.5	0	0.927

Notes: Columns (1)-(11) show mean rejection rates of different specification tests across expenditure items in a given country. Columns (1)-(2) test the null of a unit root in the levels of prices and quantities against the alternative of stationarity about a linear trend with an augmented Dickey-Fuller test. Columns (3)-(4) conduct analogous tests for the first differences of prices and quantities. Column (5) reports results from testing for cointegration using Johansen maximum eigenvalue test. Columns (6)-(7) report mean rejection rates from a Ljung-Box test for autocorrelation in residuals. Columns (8)-(9) test for conditional heteroskedasticity in the residuals. Columns (10)-(11) test for normality of the residuals. Column (12) reports the maximum eigenvalue of the companion matrix of the VAR across all expenditure items.

Table A5: Demand-driven Inflation — Correlations between baseline and alternative specifications

Country	*i)* Diff8Lags	*ii)* DiffAIC	*iii)* DiffNoCovid	*iv)* RollingWindow	*v)* OneStepAhead	*vi)* ThresholdNormal	*vii)* ThresholdEmpiricalCDF	*viii)* Level	*ix)* DetrendHamilton	*x)* DetrendHP
Thailand	0.967	0.927	0.956	0.98	0.976	0.977	0.963	0.928	0.843	0.88
Philippines	0.9	0.842	0.981	0.949	0.994	0.972	0.928	0.898	0.808	0.705
Australia	0.935	0.88	0.951	0.939	0.958	0.991	0.956	0.924	0.869	0.877
NewZealand	0.943	0.855	0.939	0.935	0.945	0.967	0.953	0.931	0.782	0.842
Japan	0.959	0.947	0.969	0.957	0.954	0.977	0.987	0.938	0.923	0.903
SouthKorea	0.97	0.939	0.996	0.841	0.884	0.994	0.993	0.916	0.844	0.891
Taiwan	0.935	0.921	0.987	0.761	0.799	0.98	0.976	0.882	0.795	0.781
Indonesia	0.923	0.892	0.734	NaN	NaN	0.94	0.911	0.675	0.426	0.637
Canada	0.856	0.864	0.873	0.978	0.976	0.95	0.942	0.917	0.886	0.857
UnitedStates	0.935	0.944	0.923	0.96	0.982	0.994	0.956	0.942	0.859	0.821
UnitedKingdom	0.918	0.883	0.977	0.974	0.983	0.987	0.99	0.874	0.854	0.874
Germany	0.814	0.833	0.831	0.829	0.791	0.972	0.968	0.865	0.878	0.845
France	0.923	0.882	0.954	0.932	0.939	0.988	0.954	0.848	0.805	0.809
Italy	0.97	0.945	0.954	0.995	0.995	0.995	0.987	0.926	0.883	0.914
Sweden	0.939	0.931	0.948	0.983	0.984	0.977	0.987	0.905	0.871	0.903
Denmark	0.898	0.85	0.912	0.961	0.94	0.97	0.965	0.929	0.817	0.857
Netherlands	0.974	0.96	0.974	0.995	0.996	0.996	0.997	0.961	0.946	0.949
Finland	0.84	0.804	0.855	0.873	0.966	0.974	0.967	0.899	0.755	0.774
Mexico	0.823	0.823	0.757	0.879	0.87	0.932	0.932	0.875	0.656	0.757
SouthAfrica	0.748	0.639	0.857	0.576	0.656	0.954	0.901	0.678	0.474	0.423
Austria	0.895	0.852	0.926	0.943	0.945	0.966	0.979	0.899	0.911	0.885
Romania	0.752	0.79	0.973	0.975	0.983	0.973	0.944	0.936	0.714	0.903
Slovakia	0.886	0.916	0.894	0.995	0.998	0.968	0.957	0.891	0.837	0.721
Norway	0.72	0.542	0.659	0.936	0.947	0.958	0.957	0.659	0.67	0.704
Ireland	0.976	0.94	0.875	0.946	0.959	0.973	0.976	0.851	0.8	0.774
Czechia	0.846	0.777	0.829	0.848	0.925	0.952	0.947	0.907	0.747	0.687
Estonia	0.9	0.799	0.921	0.916	0.948	0.944	0.932	0.863	0.772	0.838
Latvia	0.957	0.956	0.927	0.974	0.989	0.99	0.983	0.9	0.884	0.781
Malta	0.339	0.482	0.153	0.952	0.98	0.892	0.872	0.593	0.589	0.507
Luxembourg	0.8	0.841	0.921	0.977	0.973	0.989	0.991	0.931	0.795	0.778
Cyprus	0.969	0.97	0.974	0.978	0.976	0.973	0.996	0.94	0.916	0.914
Hungary	0.907	0.791	0.836	0.972	0.924	0.991	0.959	0.909	0.805	0.884
Mean	0.87866	0.85053	0.88175	0.9261	0.93984	0.9705	0.95956	0.87469	0.79419	0.80234

Notes: Table shows correlations between year-on-year demand-driven inflation rates from baseline specification (section 3.1) and robustness checks (section 3.3)

Table A6: Supply-driven Inflation — Correlations between baseline and alternative specifications

Country	*i)* Diff8Lags	*ii)* DiffAIC	*iii)* DiffNoCovid	*iv)* RollingWindow	*v)* OneStepAhead	*vi)* ThresholdNormal	*vii)* ThresholdEmpiricalCDF	*viii)* Level	*ix)* DetrendHamilton	*x)* DetrendHP
Thailand	0.969	0.929	0.957	0.956	0.942	0.992	0.975	0.922	0.853	0.865
Philippines	0.955	0.935	0.993	0.942	0.996	0.97	0.984	0.947	0.923	0.851
Australia	0.952	0.912	0.968	0.945	0.964	0.993	0.959	0.955	0.924	0.928
NewZealand	0.953	0.876	0.957	0.952	0.939	0.973	0.97	0.939	0.807	0.86
Japan	0.972	0.965	0.984	0.96	0.954	0.994	0.993	0.965	0.949	0.94
SouthKorea	0.977	0.957	0.997	0.947	0.961	0.996	0.995	0.949	0.941	0.938
Taiwan	0.957	0.946	0.988	0.892	0.925	0.989	0.978	0.893	0.808	0.823
Indonesia	0.836	0.646	0.695	NaN	NaN	0.973	0.959	0.701	0.139	0.847
Canada	0.772	0.824	0.848	0.985	0.979	0.973	0.959	0.9	0.849	0.804
UnitedStates	0.956	0.954	0.957	0.961	0.984	0.993	0.961	0.97	0.91	0.894
UnitedKingdom	0.962	0.924	0.988	0.982	0.99	0.993	0.993	0.922	0.893	0.925
Germany	0.96	0.94	0.965	0.987	0.976	0.986	0.983	0.899	0.966	0.951
France	0.966	0.945	0.983	0.987	0.989	0.982	0.96	0.928	0.938	0.908
Italy	0.911	0.831	0.886	0.97	0.967	0.966	0.947	0.791	0.664	0.795
Sweden	0.936	0.96	0.938	0.983	0.983	0.987	0.988	0.94	0.891	0.923
Denmark	0.958	0.941	0.957	0.989	0.982	0.996	0.993	0.971	0.924	0.941
Netherlands	0.939	0.909	0.939	0.99	0.992	0.984	0.976	0.913	0.882	0.897
Finland	0.896	0.906	0.945	0.949	0.987	0.991	0.967	0.946	0.832	0.881
Mexico	0.912	0.907	0.953	0.556	0.84	0.993	0.993	0.973	0.401	0.94
SouthAfrica	0.941	0.926	0.969	0.86	0.894	0.98	0.974	0.919	0.861	0.857
Austria	0.712	0.772	0.854	0.95	0.937	0.943	0.951	0.823	0.788	0.549
Romania	0.939	0.972	0.977	0.958	0.983	0.993	0.991	0.954	0.94	0.912
Slovakia	0.946	0.954	0.957	0.997	0.999	0.992	0.988	0.916	0.913	0.852
Norway	0.834	0.735	0.771	0.955	0.962	0.98	0.971	0.81	0.831	0.824
Ireland	0.969	0.928	0.879	0.808	0.853	0.981	0.975	0.837	0.802	0.767
Czechia	0.953	0.944	0.953	0.971	0.982	0.993	0.989	0.969	0.926	0.929
Estonia	0.955	0.894	0.979	0.972	0.987	0.993	0.987	0.928	0.886	0.909
Latvia	0.969	0.963	0.966	0.989	0.993	0.988	0.985	0.929	0.9	0.861
Malta	0.657	0.779	0.647	0.971	0.976	0.846	0.813	0.783	0.611	0.506
Luxembourg	0.797	0.769	0.928	0.886	0.947	0.986	0.985	0.921	0.807	0.738
Cyprus	0.8	0.815	0.87	0.665	0.66	0.965	0.961	0.548	0.56	0.629
Hungary	0.956	0.924	0.965	0.99	0.989	0.997	0.981	0.962	0.838	0.96
Mean	0.91147	0.89319	0.92541	0.93242	0.952	0.98003	0.97137	0.89759	0.81741	0.85013

Notes: Table shows correlations between year-on-year demand-driven inflation rates from baseline specification (section 3.1) and robustness checks (section 3.3)

Table A7: Phillips Curve Slope with Demand- vs. Supply-Driven Inflation (Hamilton Filter)

	(1)	(2)	(3)	(4)	(5)	(6)
	$\pi^{d}_{i,t}$	$\pi^{s}_{i,t}$	$\pi^{agg}_{i,t}$	$\pi^{d}_{i,t}$	$\pi^{s}_{i,t}$	$\pi^{agg}_{i,t}$
$\widehat{y}_{i,t}$	0.0309***	-0.00777	0.0290***	0.0320***	-0.00718	0.0311***
	(0.00461)	(0.00806)	(0.00622)	(0.00481)	(0.00831)	(0.00600)
$\pi^{E}_{i,t}$	0.121***	0.249***	0.423***	0.120***	0.250***	0.426***
	(0.00912)	(0.0723)	(0.0554)	(0.00916)	(0.0740)	(0.0547)
$\pi^{m}_{i,t}$	-0.0467	1.062**	0.855**	-0.00826	1.063**	0.881*
	(0.237)	(0.396)	(0.411)	(0.244)	(0.413)	(0.434)
$\pi^{d}_{i,t-1}$	0.851***			0.854***		
	(0.0497)			(0.0506)		
$\pi^{s}_{i,t-1}$		0.680***			0.681***	
		(0.0686)			(0.0697)	
$\pi^{agg}_{i,t-1}$			0.717***			0.715***
			(0.0500)			(0.0489)
$\Delta ppi^{w}_{i,t}$				0.00237	0.00549	0.00953
				(0.00503)	(0.00608)	(0.00728)
Country FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Number of Obs	2265	2265	2265	2149	2149	2149
Number of Country	28	28	28	27	27	27
R^2	0.863	0.870	0.933	0.862	0.871	0.933

$\Delta ppi^{w}_{i,t}$ denotes change in trade-weighted partners' producer price indexes. Standard errors are clustered in countries.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A8: Phillips Curve with Demand- vs. Supply-Driven Inflation: AE vs EM

	(1) $\pi^d_{i,t}$	(2) $\pi^s_{i,t}$	(3) $\pi^{agg}_{i,t}$
$\hat{y}^{EM}_{i,t}$	0.101***	-0.0594	0.0615***
	(0.0252)	(0.0350)	(0.0148)
$\hat{y}^{AE}_{i,t}$	0.0424***	-0.0270*	0.0304
	(0.0146)	(0.0148)	(0.0234)
$\pi^E_{i,t}$	0.113***	0.281***	0.433***
	(0.00753)	(0.0762)	(0.0654)
$\pi^m_{i,t}$	0.168	0.980**	1.013**
	(0.244)	(0.436)	(0.420)
$\Delta ppi^w_{i,t}$	0.00289	0.00590	0.0110
	(0.00460)	(0.00666)	(0.00796)
$\pi^d_{i,t-1}$	0.821***		
	(0.0700)		
$\pi^s_{i,t-1}$		0.615***	
		(0.0998)	
$\pi^{agg}_{i,t-1}$			0.648***
			(0.0920)
Country FE	Y	Y	Y
Time FE	Y	Y	Y
Number of Obs	2174	2174	2174
Number of Country	27	27	27
R^2	0.862	0.895	0.942

Standard errors are clustered in countries.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$