

# Supply and Demand-Driven inflation: Decomposition and policy implications

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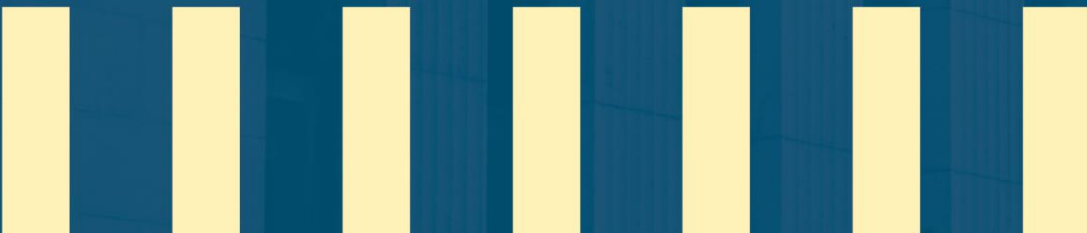
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## Abstract

This note decomposes Canadian inflation into supply- and demand-driven components using detailed personal consumption expenditure data. We find that both supply and demand forces contributed to the post-pandemic rise in inflation, with supply-side pressures accounting for the larger share. Demand-driven inflation is more cyclical and declines during economic downturns. We then use the decomposition in two policy applications. First, contractionary monetary policy shocks lower demand-driven inflation but have little effect on supply-driven inflation. Second, estimates of a targeted Taylor rule indicate that the Bank of Canada responds more strongly to demand-driven inflation than to supply-driven inflation. The results highlight the importance of distinguishing between the sources of inflation when evaluating inflationary pressures and monetary policy.

*Topics: Inflation and prices, Monetary policy*

*JEL codes: E31, E52, E58*

# Introduction

In the aftermath of the COVID-19 pandemic, both total and core inflation rose sharply in Canada. Inflation increased alongside a range of supply- and demand-side pressures, including labour shortages, disruptions to global supply chains, transportation bottlenecks, and strong consumer demand following the easing of pandemic restrictions (Bank of Canada, 2021a, 2021b).

This combination of shocks raised important questions about the source of inflation and its implications for monetary policy. Monetary policy is generally well suited to address inflation driven by excess demand. In contrast, supply shocks can create a more difficult policy trade-off because they tend to raise prices while weakening economic activity. In such environments, the policy interest rate cannot stabilize inflation and economic activity at the same time (Macklem, 2025). Distinguishing between supply- and demand-driven inflation is therefore important for understanding inflation dynamics and the role of monetary policy.

Following Shapiro (2022), this note decomposes aggregate inflation into supply- and demand-driven components using detailed Canadian personal consumption expenditure (PCE) data. Chen and Tombe (2023) apply a similar framework to Canadian data and conclude that post-pandemic inflation was largely driven by supply-side pressures. We extend their analysis through 2025Q3 and use the decomposition to study how monetary policy interacts with the two sources of inflation.

The decomposition aligns closely with widely discussed narratives about recent inflation episodes. Consistent with Chen and Tombe (2023), we find that supply-side pressures accounted for most of the rise in inflation following the pandemic. At the same time, demand-driven inflation increased noticeably in contact-intensive services during the recovery, consistent with pent-up demand for in-person activities after restrictions were lifted. More broadly, demand-driven inflation tends to fall during recessions, reflecting weaker aggregate demand during economic downturns.

We then examine whether the source of inflation matters for monetary policy. We begin by studying how monetary policy affects the two inflation components. To do so, we estimate a Bayesian vector autoregression that includes supply- and demand-driven inflation, high-frequency monetary policy shocks, and standard macroeconomic variables such as gross domestic product and commodity prices. The results show that contractionary monetary policy shocks lead to large and persistent declines in demand-driven inflation, while the response of supply-driven inflation is small and statistically

insignificant. These findings suggest that monetary policy affects inflation primarily through demand channels, consistent with standard models of monetary policy transmission.

Next, we examine whether monetary policy responds differently to inflation depending on its source. Following Hoffmann et al. (2024), we estimate a targeted Taylor rule that allows the policy response to vary across supply- and demand-driven inflation. The estimates indicate that the policy rate responds strongly and significantly to demand-driven inflation, but shows little systematic response to inflation driven by supply shocks. Taken together, the results highlight the importance of distinguishing between the sources of inflation when assessing the conduct and transmission of monetary policy.

## Data and methodology

We follow Shapiro (2022) in estimating demand- and supply-driven inflation, as summarized below. We begin by running 10-year rolling regressions of prices and quantities for each HCE category  $i$ :

$$q_{i,t} = \sum_{j=1}^p \gamma_j^{qq} q_{i,t-j} + \sum_{j=1}^p \gamma_j^{qp} p_{i,t-j} + v_{i,t}^q$$

$$p_{i,t} = \sum_{j=1}^p \gamma_j^{pp} p_{i,t-j} + \sum_{j=1}^p \gamma_j^{pq} q_{i,t-j} + v_{i,t}^p$$

where  $q_{i,t}$  and  $p_{i,t}$  are the log quantity and price indices for category  $i$  at time  $t$ , respectively. Each variable is regressed on  $p = 4$  lags of itself and the other variable.

Using the reduced-form residuals,  $v_{i,t}^q$  and  $v_{i,t}^p$ , we classify each category  $i$  at time  $t$  as having experienced a supply or demand shock using basic tenets of supply and demand, where demand shocks move price and quantities in the same direction, while supply shocks move price and quantities in opposite directions. Hence, for each category  $i$  in time  $t$ , we construct binary variables for positive and negative supply and demand shocks:

$$\mathbb{1}_{i \in \text{sup}(+),t} = \begin{cases} 1 & \text{if } v_{i,t}^p < 0, v_{i,t}^q > 0 \\ 0 & \text{otherwise} \end{cases}$$

$$\mathbb{1}_{i \in \text{sup}(-),t} = \begin{cases} 1 & \text{if } v_{i,t}^p > 0, v_{i,t}^q < 0 \\ 0 & \text{otherwise} \end{cases}$$

$$\mathbb{1}_{i \in dem(+),t} = \begin{cases} 1 & \text{if } v_{i,t}^p > 0, v_{i,t}^q > 0 \\ 0 & \text{otherwise} \end{cases}$$

$$\mathbb{1}_{i \in dem(-),t} = \begin{cases} 1 & \text{if } v_{i,t}^p < 0, v_{i,t}^q < 0 \\ 0 & \text{otherwise} \end{cases}$$

Let  $\omega_{i,t}$  denote the expenditure weight of category  $i$  in the PCE basket at time  $t$ . Combining these weights with the indicator variables allows us to decompose aggregate inflation into its demand- and supply-driven components:

$$\pi_{t,t-1} = \sum_i^N \mathbb{1}_{i \in dem,t} \omega_{i,t} \pi_{i,t,t-1} + \sum_i^N \mathbb{1}_{i \in sup,t} \omega_{i,t} \pi_{i,t,t-1}$$

Where  $\pi_{i,t,t-1}$  is the percentage change in the price index for category  $i$  between time  $t$  and time  $t - 1$ . The majority of this note focuses on annual PCE inflation, which is obtained by summing the previous four quarters of quarter-on-quarter PCE inflation.

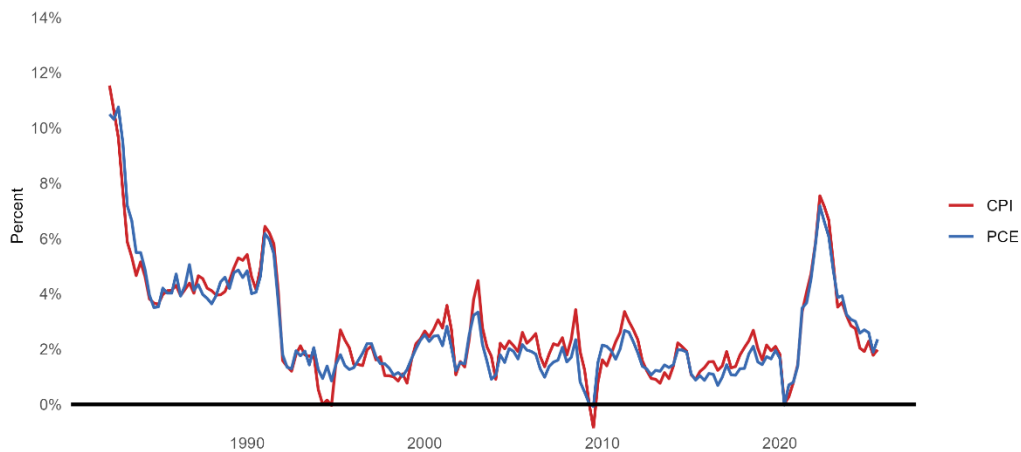
A limitation of this approach is that it identifies whether a category's price-quantity comovement is more consistent with a supply or a demand shock, but it cannot rule out the possibility that both shocks occur simultaneously. When a category is hit by both supply and demand disturbances at once, its classification depends on the relative elasticities of the underlying curves rather than on the pure shock structure. In addition, the method does not recover the magnitude of the shocks, only their inferred direction.

We implement this procedure using Canadian total and core HCE inflation, which is broadly comparable to U.S. PCE inflation. Total inflation is constructed from Statistics Canada's detailed quarterly household final consumption expenditure dataset, which reports real and nominal spending for 96 goods and services categories from 1990Q4 to 2025Q2, allowing us to form corresponding price and quantity indexes. Core inflation follows the Bank of Canada's trimmed-mean measure, which excludes 20 percent of weighted monthly price changes at each tail of the distribution, thereby removing 40 percent of the CPI basket in every period.

## Results

Figure 1 plots year-over-year CPI and PCE inflation from 1982Q2 to 2025Q3. Although CPI is Canada's headline inflation measure, PCE is better suited for our decomposition because it incorporates changes in expenditure patterns across categories. The two measures move closely together over the sample. However, CPI tends to exceed PCE slightly because its expenditure weights are updated less frequently and therefore capture consumer substitution across goods and services less effectively.

**Figure 1: Year-on-year CPI and PCE Inflation**

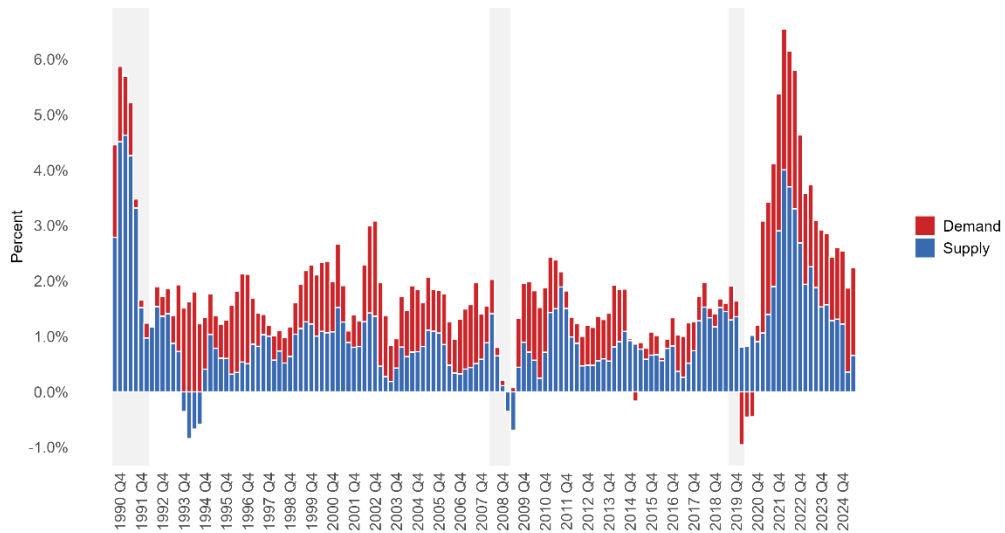


*Note: This figure shows year-on-year CPI and PCE inflation from 1982Q2 to 2025Q3.*

Figure 2 presents the decomposition of total PCE inflation into supply- and demand-driven components. The decomposition identifies several well-known inflation episodes. Demand-driven inflation typically falls during recessions, reflecting weak aggregate demand, while supply-driven inflation displays greater variation over time. Elevated supply-driven inflation in the early 1990s coincides with the introduction of the Goods and Services Tax (GST) and higher oil prices, while the decline in the mid-1990s overlaps with falling energy prices and the removal of tobacco excise taxes. During the Global Financial Crisis (GFC), both supply- and demand-driven inflation declined amid collapsing commodity prices and weaker economic activity.

The decomposition also sheds light on inflation developments during and after the COVID-19 pandemic. Demand-driven inflation turned negative during the pandemic as public health restrictions curtailed spending in many sectors. In contrast, supply-driven inflation remained close to its historical average. As the economy reopened, inflation rose sharply, peaking near 6 percent in 2022. Both supply- and demand-side forces contributed to the increase, although supply-driven inflation accounted for the larger share. Supply pressures subsequently eased, bringing inflation back toward the 2 percent target by early 2025. The decomposition of core inflation yields similar conclusions (Figure A1).

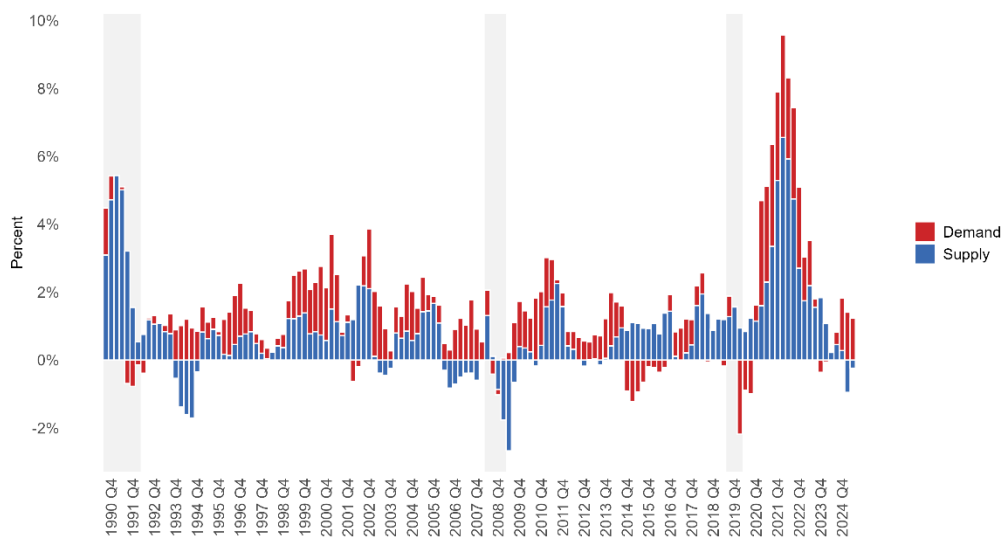
**Figure 2: Supply and Demand-Driven Total Inflation**



*Note: This figure shows the supply and demand decomposition of total annual PCE Inflation from 1990Q4 to 2025Q3. The recession shading is based on CD Howe's Business Cycle Council's recession dating.*

Figures 3 and 4 decompose goods and services inflation separately. For goods, the post-pandemic inflation surge reflects both a recovery in demand and substantial supply disruptions, including shipping bottlenecks, shortages of key inputs, and higher energy prices. Both components moderated as supply chains normalized and energy prices declined. By 2025, goods inflation had largely returned to target-consistent levels, with supply-driven goods inflation briefly turning negative following the decline in energy prices.

**Figure 3: Supply and Demand-Driven Goods Inflation**

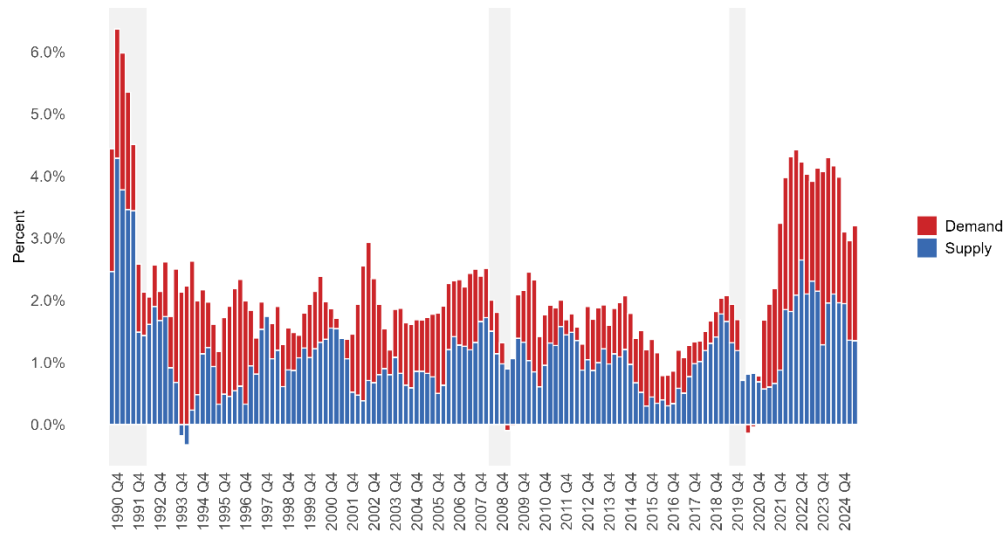


*Note: This figure shows annual supply and demand-driven goods inflation from 1990Q4 to 2025Q3. The recession shading is based on CD Howe's Business Cycle Council's recession dating.*

Services inflation exhibits a different pattern. Demand-driven services inflation increased strongly during the reopening phase, consistent with pent-up demand for in-person activities. Supply-driven services inflation also rose after the pandemic, reflecting capacity constraints and labour shortages in service industries. While labour market conditions gradually eased, services inflation remained elevated through 2024 and 2025, largely due to persistent shelter price pressures.<sup>1</sup>

<sup>1</sup> For an in-depth analysis of the time series behavior of goods and services inflation, see Eo, Uzeda and Wong (2023).

**Figure 4: Annual Supply and Demand-Driven Service Inflation**



Note: This figure shows the supply and demand decomposition of annual service inflation from 1990Q4 to 2025Q3. The recession shading is based on CD Howe's Business Cycle Council's recession dating.

We next examine whether the properties of inflation changed after the pandemic. Table 1 compares the mean, volatility, and persistence of supply-driven, demand-driven, and total inflation before and after COVID-19. All three measures became substantially higher and more volatile in the post-pandemic period. Inflation persistence also increased, indicating that inflation shocks became more long-lasting than in the decades preceding the pandemic.<sup>2</sup>

**Table 1: Mean, volatility and persistence of PCE inflation in pre- and post-pandemic periods**

		Mean	Std dev	Persistence
1995Q1-2019Q4	Supply	0.7979	0.4150	0.7287
	Demand	0.7296	0.4150	0.7808
	Total	1.5275	0.5851	0.7159
2020Q1-2025Q3	Supply	1.7350	0.9881	0.8923
	Demand	1.3386	0.9904	0.8353
	Total	3.0735	1.8006	0.8836

Note: The table shows the mean, volatility, and persistence of supply, demand, and total annual PCE inflation in pre- and post-pandemic periods. The measure of persistence is the autoregressive coefficient of an AR (1) regression.

<sup>2</sup> Excluding the pandemic years of 2020 and 2021 strengthens these findings.

Table 2 focuses on episodes of inflation above 3 percent, the upper bound of the Bank of Canada's inflation-control range. Before the pandemic, annual PCE inflation exceeded 3 percent only briefly. In contrast, inflation remained above 3 percent for eleven consecutive quarters after 2020. Notably, demand-driven inflation never exceeded 3 percent, while supply-driven inflation did so repeatedly during the post-pandemic period. This pattern highlights the central role of supply-side disruptions in explaining the unusually high and persistent inflation observed after COVID-19.

**Table 2:** Number of Instances and Average Duration of Annual PCE Inflation Above 3%

		Number of quarters of inflation above 3%	Average duration of above target inflation
1995Q1-2019Q4	Supply	0	
	Demand	0	
	Total	1	1
2020Q1-2025Q3	Supply	3	3
	Demand	0	
	Total	11	11

*Note: The table shows the number of instances and average duration of supply and demand-driven annual PCE inflation above 3% in the pre- and post-pandemic periods.*

Taken together, the decomposition suggests that both supply and demand forces contributed to recent inflation dynamics, but supply-side pressures played the dominant role during the post-pandemic inflation surge. In the next section, we use this decomposition to study how monetary policy affects supply- and demand-driven inflation and whether policymakers respond differently to inflation arising from these two sources.

## Monetary policy generates demand-driven disinflations

Standard macroeconomic models predict that monetary policy lowers inflation primarily by reducing aggregate demand. We use our inflation decomposition to assess whether this prediction is consistent with the Canadian data.

Following Shapiro (2022), we estimate a vector autoregression that incorporates supply- and demand-driven components of inflation and use this framework to assess whether contractionary monetary policy shocks in Canada indeed reduce inflation mainly through the demand channel, as implied by standard theory. To model the relationship between monetary policy and supply- and demand-driven inflation, we estimate a VAR similar to

Champagne and Sekkel (2018), augmented to include separate supply- and demand-driven inflation components.

$$y_t = \alpha + \sum_{i=1}^3 A_i y_{t-i} + \epsilon_t \quad (1)$$

where

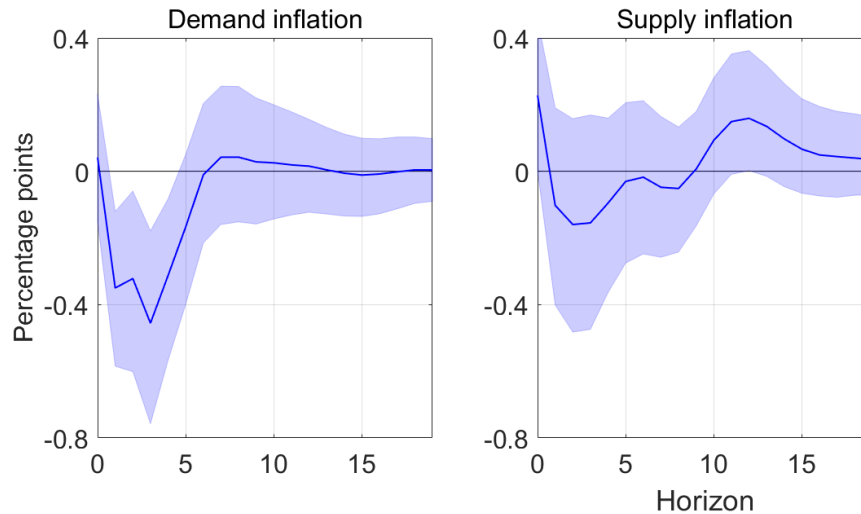
$$y_t = \begin{bmatrix} MPS_t \\ y_t \\ bcpi_t \\ \pi_t^{dem} \\ \pi_t^{sup} \\ r_t \end{bmatrix}$$

$MPS_t$  are high frequency monetary policy shocks measured as the sum of changes in the price of Three-Month Canadian Banker's Acceptance (BAX) futures contracts surrounding rate decisions in a quarter, as described in Sekkel, Stern and Zhang (2025).  $y_t$  is the gross domestic product,  $bcpi_t$  is the Bank of Canada commodity price index,  $\pi_t^{dem}$  is the demand-driven component of year-on-year total inflation,  $\pi_t^{sup}$  is the supply-driven component of year-on-year total inflation, and, finally,  $r_t$  is the policy rate. We take a Bayesian approach to estimation and estimate the model with data from 1997Q2 to 2019Q4.

Figure 5 reports the responses of supply- and demand-driven inflation to a 100-basis-point contractionary monetary policy shock. The results reveal a clear asymmetry across the two inflation components. Demand-driven inflation declines substantially and remains below baseline for several quarters following the shock. In contrast, the response of supply-driven inflation is small and statistically indistinguishable from zero throughout the horizon.

These findings are consistent with the standard transmission mechanism of monetary policy. Higher interest rates reduce aggregate demand, which in turn lowers demand-driven inflation.

**Figure 5:** Results of BVAR Estimation



*Note: This figure reports impulse responses from the BVAR model to a 100-basis-point contractionary monetary policy shock. The sample spans 1997Q2–2019Q4. Shaded areas denote 68% credible intervals*

## Does monetary policy react differently to supply- and demand-driven inflation?

The previous section showed that monetary policy affects inflation primarily through demand channels. We now ask whether policymakers also respond differently to inflation depending on its source.

Central banks often face a trade-off when inflation is driven by supply disruptions. Tightening monetary policy can help contain inflation, but it may also amplify the decline in economic activity caused by the supply shock itself. For this reason, central banks may choose to partially "look through" temporary supply-driven increases in inflation. Whether such an approach is appropriate depends on the size and persistence of the shock. Recent research summarized by Briganti et al. (2025) argues that responding too little to large or persistent supply shocks can be costly, suggesting that some degree of policy flexibility may be desirable.

To examine how the Bank of Canada has historically responded to different sources of inflation, we estimate a targeted Taylor rule following Hoffman et al. (2024). The framework allows the policy rate to respond separately to demand-driven inflation, supply-driven inflation, and the output gap. The model is estimated using quarterly data from 1995Q1 to 2025Q3, and we exclude data from 2009Q3 to 2010Q1 and 2020Q2 to

2021Q4 to avoid distortions from the zero lower bound constraint on monetary policy. The estimated rule is given by

$$i_t = \rho i_{t-1} + (1 - \rho) [i^* + \phi_\pi^d (\pi_t^d - \pi_d^*) + \phi_\pi^s (\pi_t^s - \pi_s^*) + \phi_y \hat{y}_t] + \varepsilon_t \quad (2)$$

where  $\rho$  is the interest rate smoothing parameter,  $\hat{y}_t$  is the official output gap reported by Bank of Canada,  $\pi_d^*$  is the target for demand-driven year-on-year core inflation, and  $\pi_s^*$  is the target for supply-driven year-on-year core inflation. The overall inflation target,  $\pi^*$ , is given by  $\pi_d^* + \pi_s^*$ . The term  $i^*$  denotes the nominal neutral interest rate, which can be recovered using the estimated constant term and the interest rate smoothing coefficients.

Table 3 reports the results. The estimates indicate that the Bank of Canada responds strongly to demand-driven inflation and economic activity, but not to supply-driven inflation. A one-percentage-point increase in demand-driven inflation is associated with an increase in the policy rate of roughly 4 percentage points, while a one-percentage-point increase in the output gap raises the policy rate by about 2.4 percentage points. Both coefficients are economically large and statistically significant. In contrast, the estimated response to supply-driven inflation is small and statistically indistinguishable from zero.

These findings suggest that the Bank of Canada's historical conduct of monetary policy is consistent with a flexible inflation-targeting framework. Policymakers respond aggressively when inflation reflects excess demand but tend to respond less aggressively to inflation arising from supply disturbances. This pattern is broadly consistent with the results in Hoffman et al. (2024) for the United States and other countries.

Taken together with the evidence from the previous section, the results paint a coherent picture of monetary policy transmission and conduct in Canada. Monetary policy reduces inflation primarily through demand channels, and policymakers respond most strongly when inflation itself is driven by excess demand.

**Table 3:** Results of Taylor Rule Estimation

Parameter	Point estimate	p-value
Interest rate smoothing parameter	0.926	0.000
Response to demand-driven inflation	3.992	0.055
Response to supply-driven inflation	-0.266	0.840
Response to output gap	2.433	0.001
Constant term	0.002	0.006

*Note: This table presents the results of the targeted Taylor rule estimation in equation (2). The sample ranges from 1995Q1 to 2025Q3, starting a few years after the introduction of inflation targeting. Following Hoffman (2024), we exclude data from when monetary policy was at the zero lower bound, namely from 2009Q3 to 2010Q1 and 2020Q2 to 2021Q4.*

## Conclusion and discussion

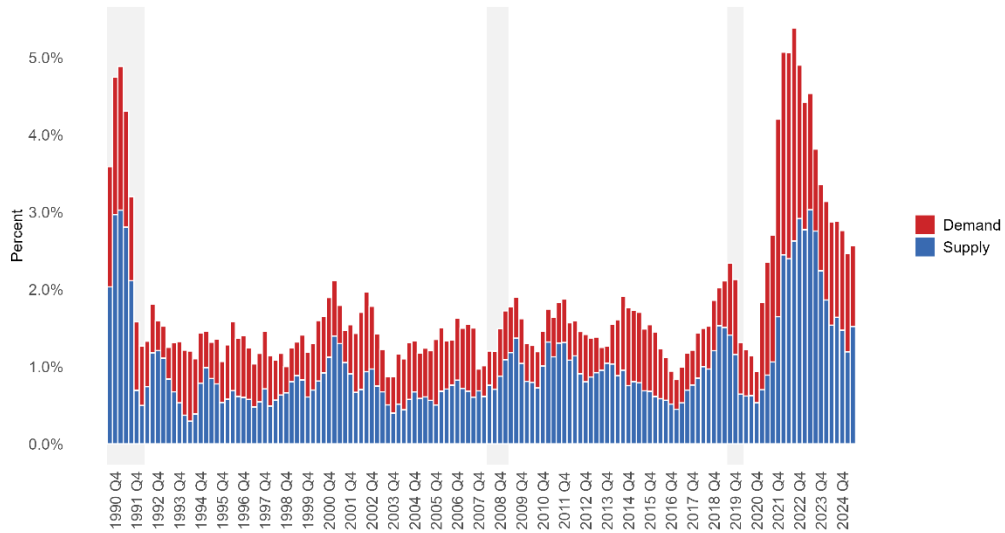
This note decomposes Canadian inflation into supply- and demand-driven components using detailed personal consumption expenditure data and the methodology proposed by Shapiro (2022). Using information from 96 expenditure categories, we find that both supply and demand forces contributed to inflation following the COVID-19 pandemic, although supply-side pressures accounted for the larger share of the increase. More broadly, demand-driven inflation exhibits a strong cyclical pattern, falling during economic downturns and rising during periods of strong economic activity.

The decomposition also provides useful insights into the conduct and transmission of monetary policy. First, we show that contractionary monetary policy primarily lowers demand-driven inflation, with little measurable effect on supply-driven inflation. This finding is consistent with standard models in which monetary policy affects inflation by influencing aggregate demand. Second, we find that the Bank of Canada has historically responded more strongly to demand-driven inflation than to supply-driven inflation.

Taken together, the results highlight the importance of distinguishing between the sources of inflation. While headline inflation may be similar across episodes, the underlying drivers can differ substantially and have different implications for monetary policy. Decomposing inflation into supply- and demand-driven components can therefore provide a useful complement to traditional inflation measures when assessing inflationary pressures and evaluating the appropriate stance of monetary policy.

# Appendix

**Figure A1: Inflation Decomposition for Core Inflation**



Note: This figure shows the supply and demand decomposition of annual core PCE inflation. The recession shading is based on CD Howe's Business Cycle Council's recession dating.

**Table A1: Historical averages of total annual PCE inflation**

	Supply	Demand	Overall
1991-2019	0.009	0.007	0.017
1991-2025	0.010	0.008	0.019

Note: The table shows historical averages for total annual PCE inflation and its supply and demand decomposition, rounded to 3 decimal points.

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