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Look Through or Lean Against? Monetary Policy Responses to Global Supply Shocks in ASEAN+3 Economies

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Monetary Policy Responses to Global Supply Shocks in ASEAN+3 Economies

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Abstract

Global supply shocks generate stagflationary pressures and pose difficult tradeoffs for monetary policy. This paper studies how central banks respond to such shocks using panel and country-level structural VARs for eight ASEAN+3 economies over 1970–2024. By employing a broad set of global supply shock measures, we document three main findings. First, monetary policy tightens on average following adverse global supply shocks despite their contractionary effects on output. Second, policy responses have shifted over time, from more accommodative responses before 1999 to more systematic tightening in the post-1999 inflation-targeting era. Third, policy responses vary significantly across different measures of global supply shocks. Central banks react most strongly to oil-price shocks, supply-chain disruptions, and energy- and food-shortage shocks, which generate broad-based and persistent inflationary pressures, while responses are substantially weaker—or even accommodative—for shocks associated with geopolitical risk, shipping costs, and industrial-shortage and labor-shortage measures. Conditional impulse response analysis based on a New Keynesian framework further suggests that heterogeneity in policy reactions is mainly explained by policy preferences, inflation expectations, shock persistence, and shock composition. Central banks respond more aggressively when shocks are associated with persistent inflationary transmission and rising inflation expectations, while responses are weaker when shocks contain a larger demand-compression component.

JEL classification: E31, E52, E58, F44
Keywords: Global supply shocks; Monetary policy; Inflation expectations; Panel VAR; Stagflation; ASEAN+3

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I. Introduction

Global supply shocks have re-emerged as a major challenge for monetary policy in recent years. Pandemic-related supply disruptions, geopolitical tensions, commodity price shocks, and trade fragmentation have simultaneously raised inflation and weakened economic activity across many economies (Ambrosino, Chan, and Tenreyro 2026; Kalemli-Ozcan, Soylu, and Yildirim 2025; Bianchi and Coulibaly 2025; Guerrieri, Lorenzoni, and Werning 2025). These shocks generate stagflationary pressures that complicate monetary policy decisions by creating tradeoffs between price stability and output stabilization.

These challenges are particularly important for Asian economies, which are highly integrated into global trade and production networks and remain vulnerable to external price and supply disturbances (Ha, Islamaj, and Mattoo 2024; AMRO 2025; Wang and Ng 2026). Global supply shocks affect the region through multiple channels, including commodity prices, imported intermediate inputs, global shipping costs, and exchange-rate pressures. Episodes such as the COVID-19 pandemic, the Russia–Ukraine war, and disruptions to global shipping routes have underscored the vulnerability of open economies to external supply disturbances and imported inflation.

From a theoretical perspective, there is no unique monetary policy prescription for responding to supply shocks. In standard New Keynesian frameworks, adverse supply disturbances raise inflation while lowering output, creating a fundamental tradeoff for policymakers. Tightening monetary policy may help contain persistent inflation and prevent the de-anchoring of inflation expectations. However, when shocks are temporary or primarily operate through demand-compression channels, aggressive tightening may generate unnecessary output losses.[3]

Despite the policy importance of these issues, empirical evidence on how central banks respond to global supply shocks remains limited and mixed. Existing studies typically focus on specific shocks—such as oil price and supply-chain disruptions—or examine individual economies and historical episodes. One strand of the literature studies oil and commodity shocks and shows that monetary policy tends to tighten when inflationary effects are persistent (Kilian and Lewis 2011; Peersman and Van Robays 2012; Baumeister and Hamilton 2019). Another strand emphasizes global production disruptions and supply-chain bottlenecks, particularly after the COVID-19 pandemic (Auer et al. 2017; Benigno et al. 2022; Shapiro 2022). Related work highlights the role of uncertainty-driven shocks, including geopolitical risk and trade policy uncertainty (Bloom, 2009; Caldara and Iacoviello, 2022). More recent studies emphasize the role of credibility and inflation expectations in shaping monetary policy responses to supply disturbances (Bianchi and Melosi 2019; Clarida 2025; Nakamura et al. 2025).

This paper studies monetary policy responses to global supply shocks using panel and country-level structural VARs for eight ASEAN+3 economies—Indonesia, Malaysia, Singapore, the Philippines, and Thailand, together with China, Japan, and Korea—over 1970–2024—with a focus on 1999-2024. We employ a broad set of global supply shock measures, including oil price shocks, supply-chain disruptions, geopolitical risk indicators, shipping-cost measures, shortage-based indicators (that are decomposed into energy-, food-, labor-, and

[3] For theoretical discussion of supply shocks and monetary policy based on New Keynesian framework, see Clarida, Galí, and Gertler (1999), Woodford (2003); Basu and Bundick (2017); Reis (2021); among many others.

industry-related shortages), and trade-related indicators (such as world trade volume, terms of trade, and trade policy uncertainty). We then construct a composite global supply shock measure to capture common global supply disturbances across alternative indicators.

We document three main empirical regularities regarding monetary policy responses of these economies. First, monetary policy tightens on average following adverse global supply shocks despite their contractionary effects on output. Second, policy responses have changed markedly over time: accommodation or muted responses were more common before 1999, whereas tightening has become more prevalent in the inflation-targeting era. Third, monetary policy responses vary systematically across supply shock types. Central banks respond more aggressively to shocks associated with persistent inflation and rising inflation expectations, while responses are weaker or more accommodative when shocks primarily operate through uncertainty and demand-compression channels.

To explain the key drivers of these policy responses (and the heterogeneous responses over time and across shock measures), we then use conditional impulse response analysis based on a New Keynesian framework. The results indicate that inflation dynamics, inflation expectations, and shock persistence are the primary determinants of monetary policy responses in the post-1999 period, whereas output and exchange-rate conditions play a more limited role. By contrast, the pre-1999 evidence suggests that monetary policy responses reflected a broader set of objectives, with inflation, output, and exchange rates all contributing to policy decisions. This shift is consistent with the transition toward inflation-targeting and credibility-oriented monetary policy frameworks, under which inflation expectations and inflation persistence became increasingly important policy concerns. Overall, the findings suggest that heterogeneous monetary policy responses largely reflect differences in shock composition, inflation persistence, and monetary policy regimes rather than inconsistent policy behavior.

Related Literature. A growing empirical literature examines the macroeconomic effects of supply disturbances and the corresponding monetary policy responses, but its conclusions remain mixed across shock types, countries, and identification strategies. One strand focuses on commodity and cost-push shocks, particularly oil-price fluctuations. Studies such as Kilian (2009), Kilian and Lewis (2011), Peersman and Van Robays (2012), and Baumeister and Hamilton (2019) show that monetary policy tends to respond more aggressively when oil and commodity shocks generate persistent inflationary pressures. These findings emphasize the importance of distinguishing between demand-driven and supply-driven commodity-price movements and suggest that central banks react differently depending on the underlying nature of the shock.

A second strand examines global production disruptions and supply-chain bottlenecks. Recent work highlights the macroeconomic consequences of shipping costs, production bottlenecks, and supply-chain stress, particularly following the COVID-19 pandemic. Studies such as Auer, Borio, and Filardo (2017), Alessandria et al. (2023), Benigno et al. (2022), and Shapiro (2022) document significant inflationary spillovers from global production networks and supply-chain disruptions, thereby increasing the likelihood of monetary-policy tightening. Related research considers uncertainty-driven and news-based disturbances, including geopolitical risk, trade policy uncertainty, and shortage-related shocks. Unlike traditional cost-push shocks, these disturbances often affect economic activity through uncertainty, weaker investment, tighter financial conditions, and lower aggregate demand. Evidence from Bloom (2009), Caldara and Iacoviello (2022), and Caldara et al. (2020, 2025) suggests that such shocks are associated with weaker or more delayed inflationary effects and may therefore elicit more cautious policy responses.

A related literature emphasizes the role of inflation expectations and policy credibility in shaping monetary-policy responses to supply disturbances. Clarida, Galí, and Gertler (1999), Woodford (2003), and Reis (2021) argue that the optimal response to supply shocks depends critically on whether inflation expectations remain anchored. When expectations remain well anchored, central banks may choose to "look through" temporary supply-driven inflation in order to avoid unnecessary output losses. By contrast, when shocks threaten to de-anchor expectations and generate second-round effects, stronger policy tightening may be required to preserve credibility and stabilize inflation. Recent empirical evidence by Nakamura, Riblier, and Steinsson (2025) similarly highlights the importance of credibility and expectations formation in determining the appropriate monetary-policy response to supply disturbances.

Another strand of research focuses on the evolution of monetary policy frameworks over time. Studies based on Taylor-rule estimates and regime comparisons—including Clarida, Galí, and Gertler (1999), Mumtaz and Surico (2012), and Bianchi and Melosi (2019)—show that monetary policy responses vary systematically with credibility, policy frameworks, and inflation-targeting regimes. Recent work examining the post-pandemic inflation surge further underscores the importance of these considerations. Clarida (2025) argues that the inflation surge of 2021–2022 reflected a combination of pandemic-related supply disruptions, shifts in demand toward goods relative to services, and highly accommodative macroeconomic policies. The episode highlights both the global nature of supply disturbances and the importance of policy credibility in determining the appropriate monetary-policy response.

More recently, attention has turned to trade fragmentation and tariffs as a source of global supply disruptions. Ambrosino, Chan, and Tenreyro (2026) study trade fragmentation in an open-economy New Keynesian framework and show that it can generate inflationary pressures through higher import costs while simultaneously compressing aggregate demand through lower real incomes. Related research emphasizes the role of global production networks in transmitting trade shocks. Kalemli-Ozcan, Soylu, and Yildirim (2025) develop a multi-sector global model with input-output linkages and show that tariffs propagate through global value chains, affecting inflation dynamics, exchange rates, and sectoral production across countries. Another strand examines the optimal monetary-policy response to trade-policy shocks. Bianchi and Coulibaly (2025) show that tariffs can inefficiently reduce imports when tariff revenues are rebated to households, implying that the Ramsey-optimal monetary-policy response may be expansionary to offset the contraction in aggregate demand. Recent theoretical work also highlights the international coordination dimension. Guerrieri, Lorenzoni, and Werning (2025) show that when shocks affect internationally traded inputs, such as energy or intermediate goods, decentralized monetary policies may be inefficient because national policymakers do not internalize their effects on global prices.

In summary, the literature documents substantial heterogeneity in monetary-policy responses across shock types, time periods, and countries. However, most existing studies focus on a single class of supply shocks—such as oil shocks, supply-chain disruptions, geopolitical risks, or trade-policy shocks—in isolation. As a result, relatively little is known about how monetary-policy responses compare across alternative global supply shocks or which characteristics of shocks account for the observed heterogeneity in policy reactions. A unified framework that systematically compares multiple types of global supply shocks, examines how policy responses evolve over time, and identifies the mechanisms underlying heterogeneity remains largely absent. This gap is particularly evident for Asian economies, where evidence on monetary-policy responses to global supply shocks remains relatively limited. This paper seeks to fill that gap by combining a broad set of global supply shock measures with a unified empirical framework and by examining how policy preferences, inflation expectations, shock persistence, and shock composition shape monetary-policy responses across ASEAN+3 economies.

More specifically, this paper contributes to the literature in three ways. First, to our knowledge, it is the first study to provide a comprehensive analysis of monetary policy responses to global supply shocks in a panel of ASEAN+3 economies. By combining a broad set of global supply shock measures with panel and country-level structural VARs, the paper provides systematic evidence on how central banks in the region respond to global supply disturbances. Second, it shows that monetary policy responses vary systematically with the underlying characteristics of supply shocks, particularly their effects on inflation expectations, inflation persistence, and the balance between cost-push and demand-compression channels. Third, it documents how monetary policy has evolved over time, from more accommodative responses before 1999 toward a stronger emphasis on inflation stabilization and expectations anchoring in the post-1999 era.

The remainder of the paper is organized as follows. Section II presents the conceptual framework. Section III describes the empirical strategy and data. Section IV documents monetary policy responses to global supply shocks. Sections V–VII examine the sources of monetary policy responses and their heterogeneity. Section V focuses on central bank preferences and transmission mechanisms, Section VI examines how these drivers have evolved over time, and Section VII analyzes the role of shock composition and persistence. Section VIII concludes. Additional robustness exercises, historical evidence for the 1970–1998 period, alternative shock measures, cross-IRF correlation analysis, and regression-based validation exercises are reported in the appendices.

II. Conceptual Framework: Monetary Policy and Global Supply Shocks

This section develops a simple conceptual framework to guide the empirical analysis. The objective is not to derive a full structural model, but to clarify the key channels through which global supply shocks affect inflation, output, and optimal monetary policy, and to motivate the sources of heterogeneous policy responses observed in the data.

II.1 Global Supply Shocks in a New Keynesian Environment

To discipline empirical analysis, we interpret global supply shocks through a standard New Keynesian framework consisting of a Phillips curve, an IS equation, a monetary policy reaction function, and a central bank loss function. The framework highlights the channels through which adverse global supply shocks affect inflation, output, and optimal monetary policy. [4]

Phillips Curve. Inflation dynamics are described by a forward-looking Phillips curve:

$$\pi_t = \beta \mathbb{E}_t \pi_{t+1} + \kappa x_t + u_t$$

where π_t denotes inflation, x_t is the output gap, $\beta \in (0,1)$ is the discount factor, and $\kappa > 0$ is the slope of the Phillips curve. The term u_t captures cost-push disturbances. Global supply shocks enter the economy primarily through the cost-push term:

$$u_t = \gamma s_t,$$

where s_t denotes an adverse global supply shock and $\gamma > 0$ measures the pass-through of global supply disturbances into domestic marginal costs. This formulation is standard in analyses of commodity price shocks, oil supply disruptions, and supply-chain disturbances. A positive realization of s_t raises inflation directly, independent of domestic demand conditions.[5]

IS Equation. Aggregate demand is governed by an intertemporal IS equation:

$$x_t = \mathbb{E}_t x_{t+1} - \sigma(i_t - \mathbb{E}_t \pi_{t+1} - r_t^n)$$

where i_t is the nominal policy interest rate, $\sigma > 0$ measures the interest-rate sensitivity of the output gap, and r_t^n is the natural rate of interest. Global supply shocks can affect aggregate demand indirectly by influencing the natural rate:

$$r_t^n = \bar{r} - \phi s_t - \psi \omega_t$$

where ω_t captures uncertainty or financial stress associated with global supply disturbances. This channel reflects that global supply shocks may raise risk premia, tighten financial conditions, or depress investment and consumption, thereby lowering the natural rate of interest (Barsky and Sims 2012; Bloom 2009; Basu and Bundick 2017). When this channel

[4] The theoretical framework in this section builds on models developed by Clarida, Galí, and Gertler (1999), Woodford (2003), Galí (2015), and Reis (2021).
[5] Global supply shocks may also affect inflation through exchange-rate pass-through. Adverse supply disturbances can weaken economic activity, increase uncertainty, and worsen external balances, resulting in exchange-rate depreciation. In turn, higher import prices may amplify domestic inflationary pressures. In the ASEAN+3 economies, where imports account for a significant share of consumption and production inputs, this channel may reinforce the inflationary consequences of global supply shocks.

dominates, global supply shocks generate demand compression in addition to cost-push inflation.

Monetary Policy Objective. The central bank minimizes a standard quadratic loss function:

$$\mathcal{L} = \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left(\pi_t^2 + \lambda x_t^2\right)$$

where $\lambda > 0$ reflects the relative weight placed on output gap stabilization.[6]

Adverse global supply shocks create a fundamental tradeoff: inflation rises due to higher marginal costs, while output declines because higher inflation and tighter financial conditions depress demand. This "stagflationary tradeoff" has been emphasized in both theoretical and empirical work on supply shocks and monetary policy.

Optimal Policy Tradeoff. Combining the Phillips curve and IS equations yields:

$$\pi_t = \beta \mathbb{E}_t \pi_{t+1} + \kappa x_t + \gamma s_t,$$

$$x_t = \mathbb{E}_t x_{t+1} - \sigma(i_t - \mathbb{E}_t \pi_{t+1} - r_t^n)$$

Under discretionary policy, the optimal interest rate response to a supply shock is expressed as:[7]

$$i_t = r_t^n + \mathbb{E}_t \pi_{t+1} + \frac{\kappa}{\sigma\lambda} \pi_t$$

This expression suggests that monetary tightening is likely to be stronger when (i) the Phillips curve is steeper (κ), (ii) output is less sensitive to interest rates (σ), or (iii) the central bank places greater weight on inflation stabilization ($1/\lambda$). This framework also implies that monetary policy may tighten when supply shocks generate persistent inflation (π_t) or risk de-anchoring expectations ($\mathbb{E}_t \pi_{t+1}$), may accommodate when shocks primarily lower the natural rate (r_t^n) and compress demand, or look through transitory shocks when expectations remain anchored.

II.2 Sources of Heterogeneity in Monetary Policy Responses

The framework in the previous section highlights several reasons why monetary policy responses to global supply shocks may differ across countries, periods, and shock types. Unlike demand shocks, which move inflation and output in the same direction, supply shocks create stagflationary pressures by simultaneously increasing inflation and reducing output. When supply shocks are temporary and inflation expectations remain well anchored, central banks may choose to "look through" short-run inflationary pressures in order to avoid unnecessary output losses. By contrast, when shocks are persistent or risk de-anchoring inflation expectations, tighter monetary policy may be required to prevent second-round

[6] For expositional simplicity, the framework here focuses on the conventional inflation–output stabilization tradeoff. For modern central banking, however, exchange-rate stabilization may also enter policymakers' objective functions, particularly in open economies. Section V extends the framework to incorporate exchange-rate considerations and examines their role in shaping monetary policy responses to global supply shocks.
[7] Appendix C provides a proof of this relationship.

inflation dynamics and preserve credibility. In addition, some disturbances commonly classified as supply shocks may operate partly through uncertainty, financial conditions, or weaker aggregate demand. In such cases, monetary accommodation may be more likely despite higher inflation on impact.

The framework thus suggests four reasons why monetary-policy responses may differ across countries, periods, and global supply shocks. First, policy preferences matter. Central banks differ in the relative weight they place on inflation stabilization, output stabilization, and, in open economies, exchange-rate stabilization. Second, inflation expectations and persistence matter. Supply shocks that generate persistent inflation or rising inflation expectations are more likely to trigger monetary tightening because of concerns about second-round effects and policy credibility. Third, shock composition matters. Some global supply shocks operate primarily through cost-pushing channels, while others contain substantial uncertainty or demand-compression components. The resulting policy responses may therefore differ even when both are classified as supply shocks. Fourth, structural transmission mechanisms matter. Differences in the sensitivity of inflation and output to monetary policy may affect the optimal degree of policy adjustment.

These considerations motivate the empirical analysis in Sections V-VII, which examine how policy preferences, inflation expectations, persistence, shock composition and persistence, and structural transmission mechanisms contribute to heterogeneity in monetary-policy responses to global supply shocks.

III. Empirical Strategy

This section describes the empirical framework used to study how central banks respond to global supply shocks. Our strategy is two-fold. First, we identify global supply shocks using an external global framework that isolates disturbances common to the global economy. Second, we study the domestic transmission of global shocks using panel and country-specific SVARs.

III.1 Identifying Global Supply Shocks

The first step of our empirical strategy is to identify global supply shocks that originate at the global level and are exogenous to individual economies. Identifying global supply shocks is inherently challenging, as no single observable variable captures the full range of disturbances affecting global supply conditions. The existing literature employs a wide variety of proxies and identification strategies, often yielding divergent results. Rather than imposing a restrictive definition, we adopt a deliberately broad approach that incorporates multiple alternative measures of global supply shocks and allows for systematic comparison across them. We consider <u>seven</u> broad categories of global supply shock measures. Details of these alternative measures are explained in **Table A1** and Appendix B.

First, we use *model-based* estimates of global supply shocks obtained from a FAVAR model developed in Forbes, Ha, and Kose (2026a). These shocks are identified using sign restrictions consistent with adverse supply disturbances—i.e., an increase in global inflation and a decline in global output. We follow the logic of structural VAR analyses that distinguish supply from demand shocks based on their joint effects on prices and quantities (Uhlig 2005; Baumeister and Hamilton 2019). By extracting common global factors for output and inflation, the FAVAR framework isolates shocks that are global in nature rather than country-specific.

Second, we include *price- and quantity-based* indicators that capture disruptions in global production and transportation networks. These measures include the Global Supply Chain Pressure Index (GSCPI) developed by the Federal Reserve Bank of New York, which aggregates information from shipping costs, delivery times, and backlogs across countries (Benigno et al. 2022). We also use the Baltic Dry Index (BDI), a widely used indicator of global shipping costs in commodity markets, which has been employed as a proxy for supply bottlenecks and transport constraints in international trade (Kilian 2009).[8]

Third, we incorporate *news-based* measures that capture disruptions arising from geopolitical tensions and economic shortages. These include the Geopolitical Risk (GPR) index of Caldara and Iacoviello (2022), which measures the intensity of geopolitical events and threats, and the global shortage index constructed by Caldara et al. (2025), which tracks news about shortages in energy, food, labor, and industrial inputs. These measures are particularly relevant for capturing supply disturbances that operate through uncertainty, expectations, and precautionary behavior rather than purely through contemporaneous cost increases.[9]

Fourth, we consider *trade-related* shocks that affect global supply through disruptions to international trade flows and trade policy. These include shocks to global trade volumes, trade policy uncertainty, tariff rates, and terms-of-trade measures. Trade disruptions can act as global supply shocks by raising production costs, reducing input availability, and fragmenting global value chains (Caldara et al. 2020; Auer, Borio, and Filardo 2017). Consistent with the treatment of other indicator-based measures, these variables are orthogonalized in the global block and are conditioned on global demand shocks.

Fifth, we also consider supply shocks specific to *oil markets*. In addition to the model-based oil supply shocks identified by Forbes, Ha, and Kose (2026a), three oil-market-specific shocks identified by Kilian (2009) and Baumeister and Hamilton (2019) are employed. These distinguish supply-driven oil price movements from demand-driven fluctuations and precautionary demand.

While all these measures are commonly labeled as “global supply shocks,” they differ substantially in their underlying economic mechanisms. Some primarily capture cost-push inflationary pressures, while others embed significant demand, uncertainty, sentiment or financial components. This heterogeneity is central to our interpretation of monetary policy responses. At the same time, each individual measure is subject to measurement error.

Finally, to reduce such measurement error and capture common variation across a wide range of indicators, we construct *composite global supply shocks*. The baseline measure is the first principal component of seven global supply shock measures, including model-based aggregate supply shocks and oil price shocks from a global FAVAR, supply-chain pressure indices, shipping cost shocks, geopolitical risk, news-based shortage measures, and trade-related supply shocks. This composite shock captures broad global supply disturbances

[8] Because these indicators are endogenous to global output, inflation, and commodity prices, we identify the corresponding global supply shocks in the indicators (e.g., GSCPI or BDI) by orthogonalizing with respect to global output, inflation, and commodity prices as well as global demand shocks as in Forbes, Ha, and Kose (2026), ensuring that the resulting shocks capture exogenous supply-side disturbances.

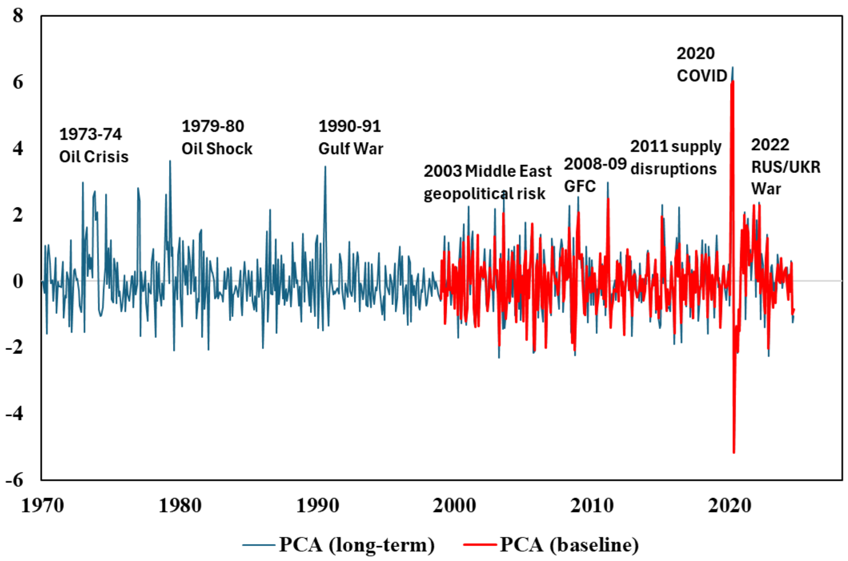
[9] As with the price- and quantity-based indicators, these measures are endogenous to global macroeconomic conditions. We therefore orthogonalize them to the global conditions.

shared across measures. Considering the data availability, the length of this series is from 1999 to 2024.[10]

Validity checks. Before employing these identified global shocks in the SVAR models, we need to verify that these identified shocks truly reflect the global supply shocks. As a first validation exercise, we observe the common measures of global supply shocks (**Figure 1**). The resulting composite shock captures broad global supply disturbances that are common across otherwise heterogeneous indicators. As shown in the figure, the common factor aligns closely with well-known historical supply-side episodes, including the 1973–74 oil crisis, the 1979–80 oil shock, the 1990–91 Gulf War, the 2008–09 global financial crisis, the post-2011 supply-chain disruptions, the 2020 COVID-19 pandemic, and the 2022 Russia–Ukraine war.[11]

Figure 1 Common measures of global supply shocks

(First principal component of alternative measures of global supply shocks, long-term average = 0)



Note: The figure shows the common global supply shock constructed using principal component analysis. The baseline series (red) corresponds to the first principal component of multiple global supply shock indicators, including model-based shocks, supply-chain pressure indices, shipping costs, geopolitical risk, and news-based shortage measures. The long-term series (blue) is based on the first principal component of a smaller subset of measures available over a longer historical sample. Both series are normalized to zero mean and unit variance. The close comovement over the overlapping period supports the robustness of the PCA-based measure.

This correspondence provides face validity for the PCA-based measure as a proxy for global supply disturbances. Importantly, while individual supply shock measures often differ in their economic content—some reflecting cost-push pressures and others embedding uncertainty or demand components—the composite shock isolates their common variation, which we interpret as broad global supply disturbances. This measure serves as our baseline global supply shock in the panel and country-specific SVAR analysis.

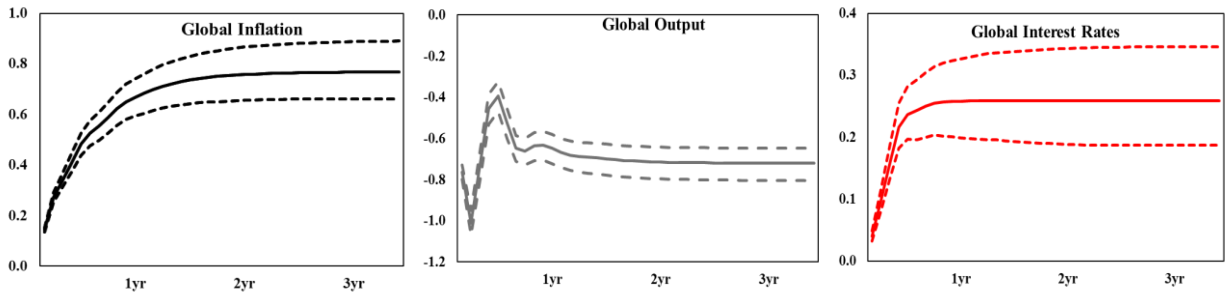
[10] To study longer historical periods from 1970s, we also construct an alternative composite shock based on a smaller subset of measures available over earlier decades. This allows us to analyze changes in monetary policy responses since the 1970s while maintaining consistency in shock identification.

[11] The post-2011 supply-chain disruptions reflect a combination of global production shocks and transportation bottlenecks, including the 2011 Tōhoku earthquake and tsunami in Japan, flooding in Thailand's manufacturing sector, and subsequent disruptions to semiconductor and electronics supply chains. These events highlighted the vulnerability of global value chains to localized production shocks (Auer et al., 2017; Benigno et al., 2022).

We then assess more formally the validity of the identified global supply shocks by examining their dynamic effects on global macroeconomic aggregates. **Figure 2** shows that the baseline PCA-based global supply shock measure generates the expected stagflationary pattern: global inflation rises persistently (as shown in the left panel), global output declines (middle), and global interest rates increase (right) in response to the shock. These responses are consistent with standard theoretical predictions and with the empirical literature on adverse supply disturbances, providing support for the interpretation of the identified shock as a genuine global supply disturbance. More broadly, across alternative measures, adverse global supply shocks are generally followed by higher inflation and lower output.[12]

Figure 2 Dynamic impulse responses of global variables to global supply shocks

(Percentage points; global FAVAR; across 13 advanced economies; common global supply shocks; 1999-2024)



Note: The figure reports cumulative impulse response functions of global inflation, global output, and global interest rates to a one-standard-deviation global supply shock identified using the PCA-based composite measure. The global aggregates are constructed from dynamic factor models estimated using monthly data for 13 advanced economies and capture the common global components of inflation, output, and interest rates, as explained in Forbes, Ha, and Kose (2026a). Solid lines denote median responses and dashed lines indicate 90 percent confidence intervals. The horizontal axis shows the response horizon in years.

III.2 Panel SVAR Model

In the second step of our empirical strategy, we study the domestic transmission of global supply shocks using panel and country-specific structural VAR models. The key feature of this step is that global supply shocks are identified externally, as described in Section III.1, and are treated as predetermined with respect to domestic economies.

For each country $i = 1, \dots, N$, we estimate a VAR of the form:

$$Y_{i,t} = A(L)Y_{i,t-1} + u_{i,t},$$

where $Y_{i,t}$ is the vector of global and domestic variables and $A(L)$ denotes a finite-order lag polynomial. The state vector is defined as:

$$Y_{i,t} = [\varepsilon_t^{GS}, oil_t^G, y_t^G, \pi_t^G, r_t^G, y_{i,t}, \pi_{i,t}, \pi_{i,t}^e, r_{i,t}, e_{i,t}]'$$

where ε_t^{GS} is the externally identified global supply shock. The remaining global variables include oil price oil_t^G, global output y_t^G, global inflation π_t^G, and the global interest rate r_t^G. Domestic variables include output $y_{i,t}$, inflation $\pi_{i,t}$, the policy interest rate $r_{i,t}$, inflation expectations $\pi_{i,t}^e$, and the exchange rate $e_{i,t}$. The ordering reflects the assumption that

[12] Importantly, however, several measures—particularly those based on geopolitical risk and shipping costs—generate disproportionately large output declines relative to their inflationary effects. These common and heterogeneous impulse response functions are examined in greater detail in Section IV.

individual economies are small relative to the global economy and do not contemporaneously affect global conditions. In particular, the global supply shock ε_t^{GS} is taken as exogenous to all domestic variables, while domestic monetary policy responses are fully endogenous with the contemporaneous relationships among domestic variables identified using a recursive ordering consistent with the monetary policy transmission literature.[13]

To identify the transmission of global supply shocks to domestic economies, we impose a recursive structure in the panel and country-level SVARs by ordering the identified global supply shock first in the system. This assumption implies that global supply disturbances are contemporaneously exogenous to domestic macroeconomic variables and monetary policy decisions. In other words, while global shocks can immediately affect domestic inflation, output, exchange rates, and interest rates, domestic variables do not contemporaneously feed back into the global supply shock within the same period.[14]

Importantly, the exogeneity assumption is intended to apply contemporaneously rather than implying full block exogeneity over time. In principle, larger economies such as China, Japan, and Korea may influence global supply conditions with a lag through their effects on global commodity demand, trade flows, and production networks. To minimize such feedback effects, the global supply shock measures are identified using external global models and global indicators that are orthogonalized with respect to global demand conditions and constructed independently of the domestic SVAR models.[15]

We estimate the model both as a panel SVAR—imposing common dynamic coefficients across countries—and as country-specific SVARs that allow for heterogeneity in transmission dynamics.

III.3 Stylized Facts: Average and Heterogeneous Responses

To summarize the average monetary policy reaction to global supply shocks, we compute impulse response functions of the interest rate for each country and then average across countries:

$$I\bar{R}F_r(h) = \frac{1}{N}\sum_{i=1}^{N} IR\,F_r^{(i)}(h)$$

[13] The recursive ordering of domestic variables primarily governs the contemporaneous transmission of global supply shocks within the domestic economy and is standard in the monetary policy transmission literature. Inflation, inflation expectations, output, and the policy interest rate are ordered before equity prices and exchange rates, reflecting the view that monetary policy can respond contemporaneously to macroeconomic conditions, while financial markets adjust rapidly to policy decisions. Since the paper focuses on the responses to externally identified global supply shocks rather than the identification of monetary policy shocks, the benchmark impulse responses are largely insensitive to alternative orderings of domestic variables. Moreover, robustness checks using alternative domestic specifications yield qualitatively similar results and do not affect the paper's main conclusions.

[14] This recursive ordering is motivated by the interpretation of global supply shocks as originating from disruptions to global production and commodity markets that are plausibly exogenous to individual open economies at high frequencies. The assumption allows us to treat global supply shocks as predetermined with respect to domestic conditions, thereby isolating the causal effect of global disturbances on monetary policy responses.

[15] Moreover, the robustness checks reported in Appendix E show that the main results remain qualitatively unchanged when the sample is restricted to the five ASEAN economies, suggesting that the findings are not driven by feedback effects from the larger economies in the sample.

where $IRF_r^{(i)}(h)$ denotes the impulse response of the policy rate in country i at horizon h following a one-standard-deviation global supply shock. An increase in the policy rate is interpreted as monetary tightening, while a decline is interpreted as accommodation. These average impulse responses form the basis for the stylized facts documented in Section IV.

We then focus on three types of heterogeneity. First, heterogeneity across shock measures. We compare policy responses across alternative global supply shock proxies to assess whether monetary policy tightening or accommodation depends systematically on the nature of the shock. Second, time variation. We estimate IRFs separately for the pre-1999 and post-1999 periods to capture changes in monetary policy regimes associated with the rise of inflation targeting and improved credibility. Finally, as a robustness check, we also consider country-specific IRFs. After estimating the average IRFs as shown above, we estimate IRFs separately by:

- Shock type $s \in \mathcal{S}$,
- Time period $\tau \in \{1970–98, 1999–2024\}$,
- Country $i \in \{\text{each of ASEAN+3 economies}\}$

This yields:

$$IRF_{i,s,\tau}^{MP}(h) = \frac{\partial i_{i,t+h}}{\partial u_{s,t}^{GS}}$$

III.4 Explaining Heterogeneity: Conditional IRFs

The final step of the empirical strategy investigates the mechanisms underlying heterogeneous monetary policy responses. We employ two complementary approaches. For this, we implement conditional impulse response function (IRF) analysis within a Bayesian VAR framework.

Conditional Impulse Responses. Conditional IRFs trace the response of the policy interest rate to a global supply shock conditional on the behavior of another variable, such as inflation, output, or inflation expectations, or on the model parameters, such as the persistence of the transmission. This approach allows us to characterize how monetary policy reactions vary with the economic environment generated by the shock, rather than relying on average responses alone. Conditional IRFs are constructed by decomposing posterior draws from the Bayesian SVAR according to the magnitude or direction of a conditioning variable and then computing impulse responses within each subset. Differences across conditional IRFs therefore reflect systematic state dependence in monetary policy behavior.

As a concrete example, consider conditioning the IRF of policy rates on the response of inflation expectations. We divide posterior draws into two groups depending on whether inflation expectations rise strongly or weakly following a global supply shock. We then compute the impulse response of the policy interest rate separately for each group. This approach follows recent work on state-dependent and conditional transmission mechanisms (Tenreyro and Thwaites, 2016; Barnichon and Brownlees, 2019). More detailed mathematical formulations are presented in Section IV.

The conditional impulse response of the policy rate in this case is formulated as:

$$IRF_r^{(i)}(h \mid \Delta\pi_i^e \in \mathcal{Z}) = \mathbb{E}\left[\frac{\partial r_{i,t+h}}{\partial \varepsilon_t^{GS}} \mid \Delta\pi_i^e \in \mathcal{Z}\right], \qquad \mathcal{Z} \in \{\mathcal{Z}^{high}, \mathcal{Z}^{low}\}$$

where, $IRF_r^{(i)}(h \mid \Delta\pi_i^e \in \mathcal{Z})$ denotes the response of the interest rate in country i at horizon h to a global supply shock, conditional on the response of the variables of interest (e.g., inflation expectations). The expectation is taken over posterior draws of the SVAR parameters that satisfy the conditioning event $\Delta\pi_i^e \in \mathcal{Z}$, where $\mathcal{Z}^{high}$ and $\mathcal{Z}^{low}$correspond to subsets of draws associated with large and small cumulative responses of the variables. Conditioning is implemented by partitioning posterior draws rather than by altering the underlying model, so differences across conditional impulse responses reflect systematic state dependence in monetary policy reactions. The framework can then be used to assess whether a global supply shock is accompanied by a large increase in the variables of interest. [16]

Related literature. As mentioned above, our approach is related to the state-dependent impulse responses (Tenreyro and Thwaites, 2016; Barnichon and Brownlees, 2019), which examines how transmission varies across exogenously defined states of the economy, such as recessions versus expansions or periods of high versus low uncertainty. Our framework differs in that the identified global supply shock is held fixed, and conditioning is performed on the resulting responses of key macroeconomic variables and transmission mechanisms—such as inflation, inflation expectations, and persistence. The objective is therefore not to estimate how shocks propagate across different economic regimes, but rather to identify which transmission channels are associated with heterogeneous monetary-policy responses to a common shock.

Our framework is also related to the literature estimating Taylor-type monetary policy reaction functions. Standard Taylor-rule specifications relate the policy rate to contemporaneous inflation, output, and other macroeconomic variables, and the estimated coefficients are often interpreted as revealing the relative importance of different policy objectives. Our approach differs in two respects. First, rather than estimating a static relationship between the policy rate and macroeconomic variables, we examine how the entire path of monetary-policy responses following an identified global supply shock varies with the corresponding responses of other variables. Second, because conditioning is performed on impulse responses generated by a common identified shock, the framework focuses on dynamic transmission mechanisms rather than contemporaneous correlations. In this sense, the conditional-IRF framework can be interpreted as a dynamic analogue of a Taylor rule, providing evidence on which transmission channels are most strongly associated with monetary-policy responses to global supply shocks.

From an econometric perspective, our conditional-IRF approach is closely related to the recent Bayesian literature that advocates conducting inference directly on the posterior distribution of impulse responses rather than solely on the parameters of the underlying VAR (Plagborg-

[16] The conditional-IRF approach is related to quantile-regression methods in that both examine how outcomes vary across different states of the economy. However, unlike quantile regressions, which characterize heterogeneity in the unconditional relationship between variables, conditional IRFs preserve the underlying shock identification and model structure. By conditioning on the responses of inflation, output, inflation expectations, or other variables while holding the identified global supply shock fixed, the analysis isolates state-dependent monetary policy responses rather than differences arising from shock composition or magnitude.

Møller 2019; Inoue and Kilian 2022).[17] In addition, Inoue and Kilian (2016, 2022) emphasize that structural impulse responses are analyzed *jointly* rather than one response function at a time because economically meaningful inference requires accounting for the dependence structure across variables and horizons. Our framework builds on this insight by using the joint set of impulse responses as the basis for economic conditioning.

Our framework also shares a common spirit with the narrative sign-restriction literature (Antolín-Díaz and Rubio-Ramírez, 2018), in that both approaches partition the set of admissible impulse responses using economically meaningful information. Whereas narrative restrictions employ historical information---e.g. narratives on oil shocks---to sharpen structural identification, our framework uses transmission characteristics to classify posterior draws and investigate the sources of heterogeneity in monetary-policy responses. The approach therefore operates as an economic decomposition of the posterior distribution rather than an identification device.

Finally, our approach is related to quantile-regression methods in that both examine heterogeneity across states. However, quantile regressions typically characterize how relationships vary across different quantiles of the dependent variable (here, the policy-rate response). By contrast, our conditional-IRF framework conditions on the responses of other transmission variables while holding the identified global supply shock fixed. The resulting differences therefore reflect associations between monetary-policy responses and alternative transmission mechanisms rather than variation arising from shock composition or magnitude.

All in all, compared to the existing methodologies, our approach offers two key advantages. First, because conditioning is performed on posterior draws while preserving the identified global supply shock and model structure, differences across conditional IRFs reflect variation in transmission mechanisms rather than differences in shock identification, model specification, or shock magnitude. Second, by conditioning on economically relevant regions of the posterior distribution, the framework provides a transparent way to connect heterogeneity in monetary policy responses to specific mechanisms emphasized by economic theory, including policy preferences, inflation expectations, inflation persistence, and structural transmission channels.

Robustness check: IRF regressions. As a robustness check to the conditional IRF analyses, we regress the response of policy rates (following global supply shocks) on the responses of other endogenous variables. As a baseline approach, we here employ the conditional IRFs while the regression-based results are used as robustness checks in the appendix. The regression-based exercise complements the conditional-IRF analysis by estimating a dynamic policy reaction function in impulse-response space. Rather than relating the policy rate to contemporaneous macroeconomic conditions as in standard Taylor-rule specifications, the regression relates to the policy-rate response to the corresponding inflation, output, exchange-rate, and expectation responses generated by a common identified global supply shock. This approach allows us to quantify which transmission channels are most strongly associated with monetary-policy responses while preserving the dynamic nature of the adjustment process.

[17] Plagborg-Møller (2019) emphasizes that impulse responses themselves are the primary objects of economic interest and develops a framework that places Bayesian inference directly on structural impulse responses. Likewise, Inoue and Kilian (2022) show that pointwise posterior summaries may be misleading because they need not correspond to any actual posterior draw and argue that inference should instead be based on the joint posterior distribution of impulse responses.

IV. How Do Central Banks React to Global Supply Shocks?

This section documents how monetary policy responds to global supply shocks across the eight ASEAN+3 economies in the sample. We first examine average responses to global supply shocks, then explore how these responses vary over time and across different types of shocks.

IV.1 Average Monetary Policy Response to Global Supply Shocks

Figure 3 summarizes the average dynamic responses of domestic macroeconomic variables to an adverse global supply shock identified using the composite (PCA) global supply shock measure. The figure shows a clear *stagflationary* pattern: Inflation rises persistently following the shock, increasing by up to around 0.15 percentage points, while output growth declines significantly, with the decline reaching approximately −1.2 percentage points at its trough. Inflation expectations (one-year-ahead) rise modestly, peaking at around 0.07 percentage points. These responses are consistent with the reactions of the global variables (as shown in **Figure 2**) and the standard theoretical predictions on the stagflationary effects of global supply disturbances.

Monetary policy responds by tightening on average over 1999–2024. As shown in **Figure 3**, the interest rate increases gradually, with the response peaking at roughly 0.05 percentage points several quarters after the shock.[18] The delayed but persistent tightening mirrors the inflation and inflation expectations response and suggests that central banks react not only to contemporaneous inflation but also to concerns about inflation persistence.

The exchange rate depreciates against the U.S. dollar following the shock, with the response reaching about 0.3 percentage points at its peak. Although monetary tightening would normally be expected to support the currency, the observed depreciation suggests that exchange-rate movements are dominated by the broader macroeconomic consequences of the adverse supply shock, including weaker output, deteriorating external conditions, and heightened uncertainty. In this sense, the exchange-rate response appears to reflect the overall economic deterioration associated with the shock rather than the direct effect of tighter monetary policy. Equity prices also respond negatively, declining by as much as 1.4 percentage points, reflecting weaker growth prospects and tighter financial conditions.

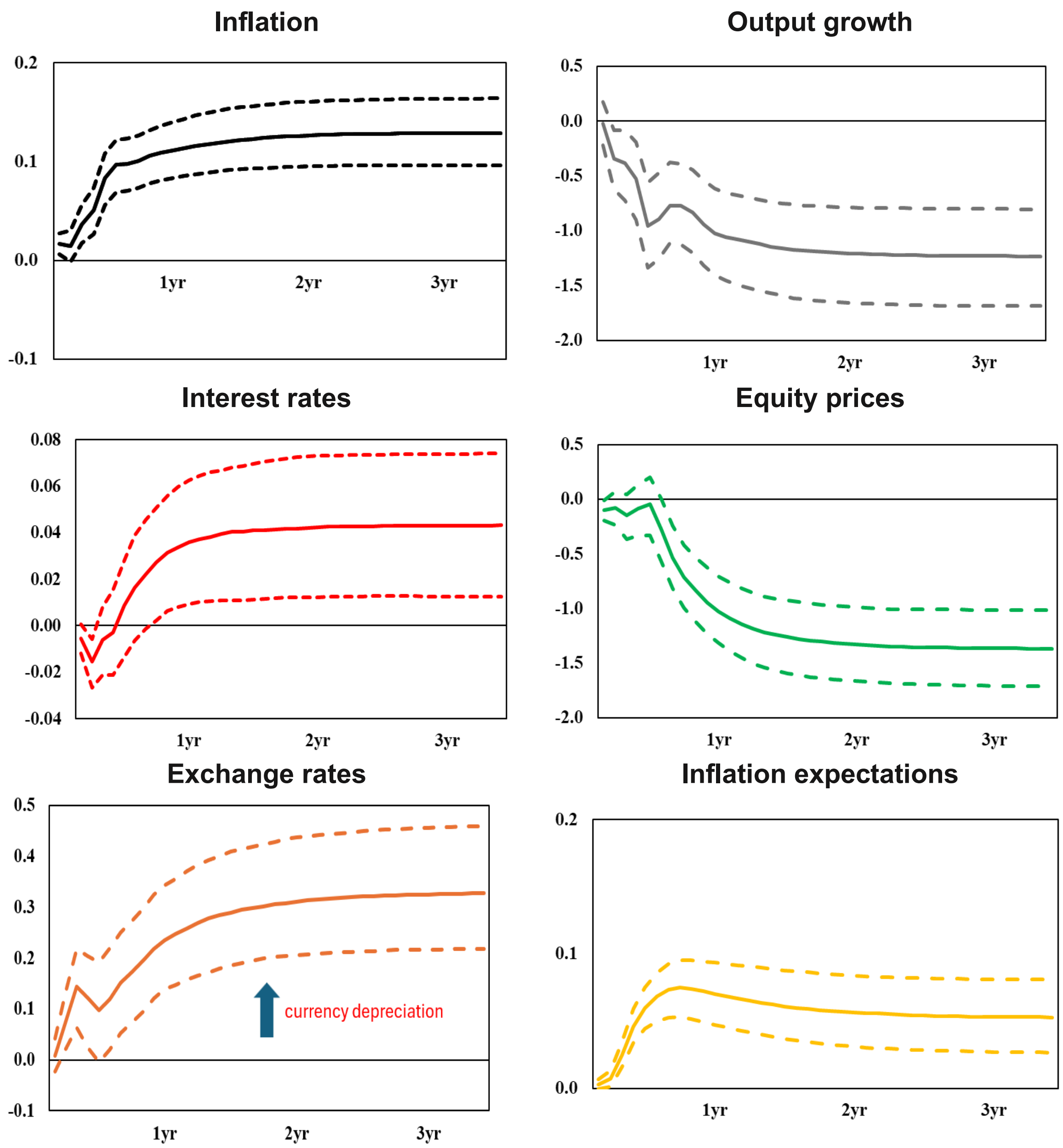
Overall, the figure shows that global supply shocks elicit average monetary policy tightening despite their contractionary effects on real activity. This finding aligns with recent empirical studies documenting policy tightening in response to cost-push inflation pressures in the inflation-targeting era. It also mirrors central bank communications during recent supply-driven inflation episodes, where policymakers emphasized the need to prevent persistent inflation despite adverse real-side effects.

That said, this average response masks important heterogeneity across shock types and economies. Central bank responses may also have changed over time as policy frameworks evolved. We explore these potential sources of heterogeneity in the following subsections.

[18] The effects become more sizeable if we drop a few economies where policy rates declined following the shock.

Figure 3 Dynamic impulse responses of domestic variables to global supply shock

(Percentage points; Panel SVAR; across eight ASEAN+3 economies; common global supply shocks; 1999-2024)



Note: The figure reports cumulative impulse response functions of domestic (ASEAN+3) variables to a one-standard-deviation global supply shock identified using the PCA-based composite measure. The average responses of the variables are estimated from a panel SVAR. Exchange rates are defined such that an increase denotes domestic currency depreciation against the U.S. dollar. The horizontal axis shows the response horizon in years.

IV.2 Monetary Policy Response to Global Supply Shocks: Over Time

Next, we explore how monetary policy responses to global supply shocks have evolved over time. To examine possible structural changes in policy behavior, we compare the responses across two subperiods, 1970–98 and 1999–2024. Due to the limited availability of monthly datasets, this exercise focuses on Japan and Korea, where all variables are consistently available from the 1970s onward.[19] [20]

Figure 4 (Panel A) shows that the average response of policy interest rates to the benchmark PCA-based global supply shock differs markedly across the two subsamples. In the earlier period (1970–98), global supply shocks are associated with a small and statistically insignificant decline in policy rates, suggesting a broadly accommodative monetary policy response. By contrast, in the post-1999 period, consistent with what is explained in the previous sub-section, the response becomes positive and statistically significant, with central banks raising policy rates following adverse global supply shocks. The difference across the two periods is economically large and statistically significant, indicating a clear shift in the average monetary policy response over time. This shift coincides with the widespread adoption of inflation-targeting frameworks, improvements in central bank credibility, and a stronger emphasis on anchoring inflation expectations (Gürkaynak, Levin, and Swanson 2010; Bianchi and Melosi 2019).

Panel B of **Figure 4** shows that this pattern is broadly robust across alternative measures of global supply shocks (those available from 1970), although the magnitude and statistical significance differ by shock type. Following oil price shocks, monetary policy responses shift from large accommodation in the earlier period to positive and statistically significant tightening after 1999. A similar pattern is observed for economic-shortage shocks, although the accommodative monetary policy is not statistically significant over 1970-98. Equally pronounced change occurs for model-based non-oil global supply (GS) shocks. While policy responses are relatively muted in the earlier period, central banks respond much more aggressively in the post-1999 era, with substantially larger increases in policy rates. Overall, these results suggest that modern central banks have become increasingly responsive to supply shocks perceived as generating broad-based and persistent inflationary pressures.

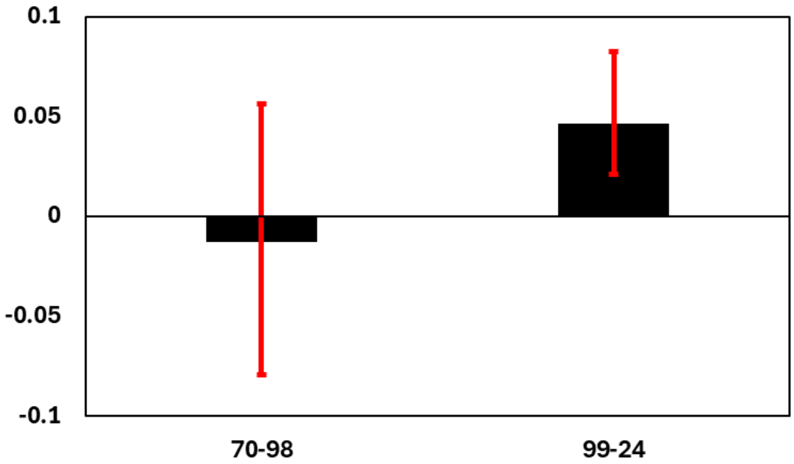
[19] The 1999 break should be interpreted as capturing broader changes in monetary policy regimes and macroeconomic environments rather than a uniform transition to inflation targeting. For Korea, the post-1999 period broadly coincides with the post-Asian-financial-crisis adoption of inflation targeting and improvements in central bank credibility. For Japan, however, the same period is also characterized by persistent deflation, the zero-interest-rate policy, and unconventional monetary policy measures. The comparison between 1970–98 and 1999–2024 should therefore be viewed more generally as reflecting changes in monetary policy frameworks and macroeconomic conditions over time.

[20] As a robustness check, we re-estimate the model using interest rates for all ASEAN+3 economies while allowing for missing observations in other variables. The resulting interest-rate responses remain qualitatively unchanged, confirming that the main findings are not driven by the restricted country coverage of the historical sample.

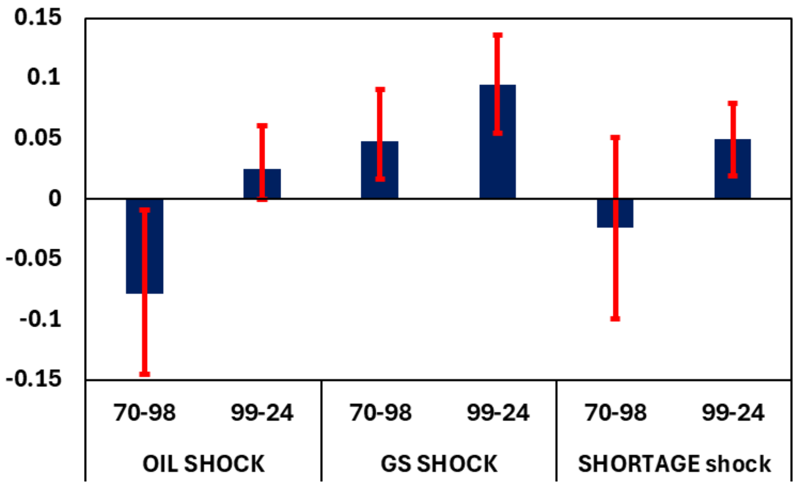
Figure 4 Impulse responses of interest rates to global supply shocks: Over time

(Percentage points; Panel SVAR; Data for Japan and Korea; different measures of global supply shocks)

A. Benchmark (PCA) global supply shock



B. Alternative global supply shocks



Note: The figure reports cumulative impulse responses of the domestic policy interest rate to a one-standard-deviation global supply shock estimated from a panel SVAR. Panel A shows responses to the benchmark PCA-based global supply shock for two subsamples: 1970–98 and 1999–2024. Panel B reports responses using alternative global supply shock measures, including oil supply shocks, model-based non-oil global supply shocks (GS shock), and shortage-based shocks. Bars represent the cumulative response (in percentage points), and red whiskers denote 90 percent confidence intervals.

IV.3 Heterogeneity Across Types of Global Supply Shocks

Next, this section explores whether monetary policy responses differ markedly across alternative measures of global supply shocks over 1999-2024. **Figure 5** compares cumulative interest-rate responses following a range of global supply disturbances.

A clear pattern emerges. Central banks appear to tighten monetary policy following the majority of global supply shocks that are likely to reflect primarily cost-push inflationary pressures. Interest rates rise significantly following benchmark PCA-based global supply shocks ("PCA"), FAVAR-model-based aggregate global supply shocks (GS) and oil price shocks (Oil), and global supply chain disruption shocks (GSCPI). These responses are sizable and statistically significant, suggesting that central banks react aggressively when shocks generate persistent inflationary pressures and risk de-anchoring inflation expectations.[21] By contrast, monetary policy responses are weaker or accommodative following geopolitical risk (GPR) and shipping-cost (BDI) shock.[22]

Figure 5 (middle columns) also reveals important heterogeneity across different types of economic shortage shocks. Monetary policy responds strongly and significantly to aggregate-, energy- and food-shortage shocks. By contrast, responses to industrial and labor shortages are small and slightly negative. This heterogeneity suggests that central banks differentiate across shortages. Energy and food shortages may be viewed as more likely to generate broad-based inflationary pressures, whereas labor and industrial shortages may be interpreted as more temporary or sector-specific disturbances. These findings are consistent with recent work emphasizing that shortages differ substantially in their macroeconomic transmission and inflation persistence (Auer, Borio, and Filardo 2017; Reis 2021).

The right columns in **Figure 5** further highlight heterogeneity across trade-related supply shock measures. Monetary policy responds positively to adverse world trade volume shocks and terms-of-trade shocks, although the magnitude of the response is generally smaller than for benchmark global supply shocks. These findings suggest that disruptions to global trade conditions can generate inflationary pressures sufficiently persistent to warrant monetary tightening, particularly when they affect import prices or the availability of traded goods. By contrast, trade policy uncertainty (TPU) shocks are associated with considerably weaker and statistically insignificant policy responses. This distinction suggests that trade-related disturbances may encompass both supply-driven and uncertainty-driven channels, as will be tested in Sections V and VI, with important implications for monetary policy transmission.

Overall, the results in this section demonstrate that monetary policy responses to global supply shocks are systematically related to the economic content of the shock rather than to its nominal classification. A plausible hypothesis is that shocks that generate persistent cost-push inflationary pressures tend to elicit statistically significant monetary tightening, while shocks

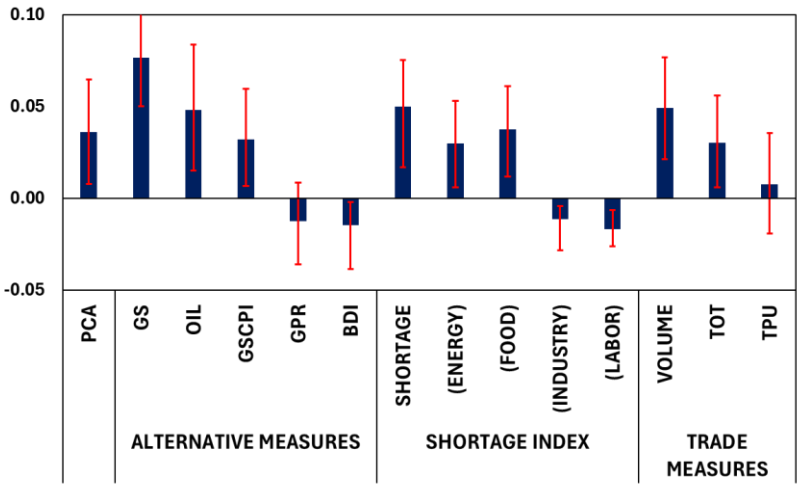
[21] As will be discussed in Section V, these shocks are indeed characterized by relatively large and persistent increases in inflation and inflation expectations, consistent with cost-push inflation dominating the policy tradeoff. This pattern is consistent with earlier evidence emphasizing the inflationary persistence of oil and supply-side disturbances and the associated incentives for monetary tightening (Bernanke et al., 1997; Kilian, 2009).

[22] As will be discussed in Sections V and VI, these shocks generate comparatively smaller inflationary pressures, suggesting that precautionary behavior, weaker investment, and tighter financial conditions might play a sizeable role in dampening the inflationary pressures due to cost-pushing factors. In such cases, central banks appear to place greater weight on output stabilization relative to inflation containment, consistent with theoretical and empirical evidence on uncertainty-driven shocks (Bloom, 2009; Caldara and Iacoviello, 2022; Salachas et al., 2025).

dominated by uncertainty or demand compression are more likely to produce muted or accommodative responses. This pattern will be examined more formally in Sections V-VII.

Figure 5 Impulse response of monetary policy rates to different measures of global supply shocks

(Percentage point; Panel SVAR; different measures of global supply shocks; ASEAN+3 economies, 1999-2024)



Note: The figure reports cumulative impulse response functions of domestic interest rates to one-standard-deviation global supply shocks identified using the PCA-based composite measure and alternative global supply shock measures. The bars report peak responses of policy interest rates across alternative measures, including geopolitical risk (GPR), oil supply shocks (OIL), shipping-cost indicators (BDI), shortage-based measures from Caldara et al. (2025), and trade-related supply shocks. See Section III.1 and Appendix B for details on each shock measure. Solid bars denote average responses, while vertical lines indicate 90 percent credible bands.

IV.4 Cross-country Differences within ASEAN+3

Despite the average responses as summarized above, based on country-specific SVAR results, some cross-country heterogeneity emerges in the monetary policy responses across ASEAN+3 economies.[23] In the majority of the economies—including Indonesia, Malaysia, Japan, Korea, the Philippines, and Thailand—interest rates tightened following the adverse global supply shocks, possibly reflecting stronger concerns about inflation persistence, exchange-rate pass-through, and capital-flow pressures. Indeed, the responses of inflation and inflation expectations significantly increased following global supply shocks in nearly all the individual economies. By contrast, responses in a few countries are more muted or even negative (i.e. accommodation), suggesting a greater emphasis on stabilizing domestic activity and financial conditions in the face of contractionary supply disturbances.

IV.5 Summary of Findings and Robustness Checks

This section documents three main empirical findings. First, monetary policy tightens on average following global supply shocks in the post-1999 period, despite the contractionary effects of these shocks on output. Second, monetary policy responses have changed markedly over time, shifting from broadly accommodative responses in the pre-1999 period toward more systematic tightening under modern inflation-targeting frameworks. Third, policy responses vary significantly across shock types: central banks tighten following the majority

[23] Country-specific results are not presented. They are available upon request.

of global supply shock measures that likely generate persistent cost-push inflation and rising inflation expectations, while responding more accommodatively to certain shocks, that are possibly dominated by uncertainty, financial tightening, or demand compression.

The main findings are robust to a wide range of alternative specifications and empirical approaches. Appendix E shows that the results remain qualitatively unchanged when using alternative measures of global supply shocks, including weighted-average indicators in place of dynamic factors, as well as alternative definitions of domestic variables, such as core CPI inflation, nominal effective exchange rates (NEERs), and policy rates instead of overnight market rates (for some economies). In addition, re-estimating the model for alternative country groups—including the five ASEAN economies excluding China, Japan, and Korea, and a subsample of inflation-targeting economies—yields similar patterns of monetary policy responses. These results are expected to alleviate concerns that the benchmark findings are driven by potential feedback effects from the larger regional economies, whose domestic developments may influence global supply conditions over time. The robustness of the ASEAN-only estimates suggests that the identified global supply shocks can be reasonably treated as externally determined from the perspective of the domestic monetary policy analysis.

Our findings suggest that heterogeneous monetary policy responses to global supply shocks are neither arbitrary nor inconsistent. Rather, they seem to reflect policy tradeoffs shaped by the inflationary persistence of shocks, the behavior of inflation expectations, and the evolution of monetary policy frameworks over time. These patterns are broadly consistent with the implications of a New Keynesian framework, in which central banks optimally balance inflation stabilization against output stabilization depending on the nature and transmission mechanism of the shock. In the next section, we examine these underlying mechanisms in greater detail.

V. Drivers of Heterogeneity in Monetary Policy: Shock Transmission

This section investigates the economic mechanisms underlying the average and heterogeneous monetary policy responses to global supply shocks documented in Section IV. Guided by the New Keynesian framework explained in Section II, based on conditional impulse response functions (defined in Section III.4), we examine which factors account for the monetary policy responses while holding the underlying shock decomposition fixed.[24]

V.1 Policy Priorities

First, differences in policy priorities over inflation, output, or exchange rate (FX) stabilization provide an important explanation for heterogeneous monetary policy responses to global supply shocks. In the New Keynesian framework, the relative weight placed on inflation stabilization versus output or FX stabilization is a key determinant of optimal policy.

Econometric exercise. We formalize these priorities by assuming that the central bank in country i minimizes the intertemporal loss function:

[24] Subsequent subsections relax this restriction by examining how monetary policy responses vary with the characteristics of global supply shocks, including their persistence and inflationary content.

$$\mathcal{L}_i = \mathbb{E}_t \sum_{h=0}^{\infty} \beta^h \left[\lambda_{\pi,i}\, \pi_{i,t+h}^2 + \lambda_{y,i}\, y_{i,t+h}^2 + \lambda_{FX,i}\, FX_{i,t+h}^2\right]$$

where $\pi_{i,t}$ denotes inflation, $y_{i,t}$ denotes output (or output gap), and $FX_{i,t}$ denotes the exchange rate against the U.S. dollar. The parameters $\lambda_{\pi,i}, \lambda_{y,i}\ , and\ \lambda_{FX,i}$ capture the relative weights placed on inflation, output, and FX stabilization, respectively.

The optimal response of the policy rate $r_{i,t}$ to a global supply shock ε_t^{GS} can be expressed as:[25]

$$\frac{\partial r_{i,t+h}}{\partial \varepsilon_t^{GS}} \propto \lambda_{\pi,i} \frac{\partial \pi_{i,t+h}}{\partial \varepsilon_t^{GS}} + \lambda_{y,i} \frac{\partial y_{i,t+h}}{\partial \varepsilon_t^{GS}} + \lambda_{FX,i} \frac{\partial FX_{i,t+h}}{\partial \varepsilon_t^{GS}}$$

The optimal policy rule implies that heterogeneity in policy-rate responses can arise either because macroeconomic responses to the shock differ or because policymakers place different weights on inflation, output, and exchange-rate stabilization. To help recover these preference-driven responses while holding the identified global supply shock fixed, we condition policy-rate IRFs on the inflation, output, and exchange-rate responses generated by each posterior draw.

Let $(IRF_{r,i}^{GS}(h), IRF_{\pi,i}^{GS}(h), IRF_{y,i}^{GS}(h), IRF_{FX,i}^{GS}(h))$ note the IRFs of the interest rate, inflation, output, and FX, respectively. We then recover these preference-driven responses using conditional IRFs. Specifically, we estimate:

$$IRF_r(h \mid \pi, y, FX) = \mathbb{E}\left[\frac{\partial r_{i,t+h}}{\partial \varepsilon_t^{GS}} \mid (\pi, y, FX) \in \mathcal{Z}_k\right]$$

where $\mathcal{Z}_k$ denotes a subset of posterior draws characterized by particular inflation, output, and FX responses to the global supply shock.

Conditioning is implemented by partitioning posterior draws of the Bayesian SVAR, rather than by altering the underlying model or the identification of the shock. As a result, differences across conditional IRFs reflect state-dependent monetary policy behavior, rather than differences in shock composition or estimation uncertainty. This approach provides *suggestive* evidence regarding the policy objectives that appear most salient following a global supply shock.

The conditional IRFs admit a direct interpretation in terms of central bank preferences:

- Inflation-focused policy rates: When the policy-rate response is stronger in states characterized by larger inflation responses, this pattern is indicative of a relatively large weight on inflation stabilization, $\lambda_{\pi,i}$.

[25] This expression is not intended as a structural derivation of the optimal policy rule. Rather, it provides a reduced-form representation linking policy-rate responses to the inflation, output, and exchange-rate consequences of a global supply shock.

- Output-stabilization-oriented policy rates: When monetary policy responds less aggressively or becomes accommodative in states with large output contractions, this behavior is consistent with a larger weight on output stabilization, $\lambda_{y,i}$.
- Exchange-rate-sensitive policy rates: When policy tightening is stronger in states associated with exchange-rate depreciation, consistent with a larger weight on FX stabilization, $\lambda_{FX,i}$, reflecting concerns about capital flows or financial stability.

These conditional responses allow us to infer which objective dominates monetary policy decisions following global supply shocks, without imposing parametric restrictions or estimating preference parameters directly. The conditional-IRF framework thus provides a transparent empirical counterpart to the theoretical loss-function representation and a coherent interpretation of heterogeneous monetary policy responses.

Empirical results. Figure 6 reports conditional IRFs illustrating how monetary policy responses vary with the strength of inflation, output, and exchange-rate responses following (PCA-based) global supply shocks. A clear pattern emerges: monetary policy responses are most sensitive to *inflation* outcomes. Conditioning on larger inflation responses (red line) leads to substantially stronger and more persistent increases in policy rates compared with the baseline response (grey) and states associated with smaller inflation responses (blue) (Panel A). The difference is large—up to 0.05 percentage point—and remains persistent over the medium term.

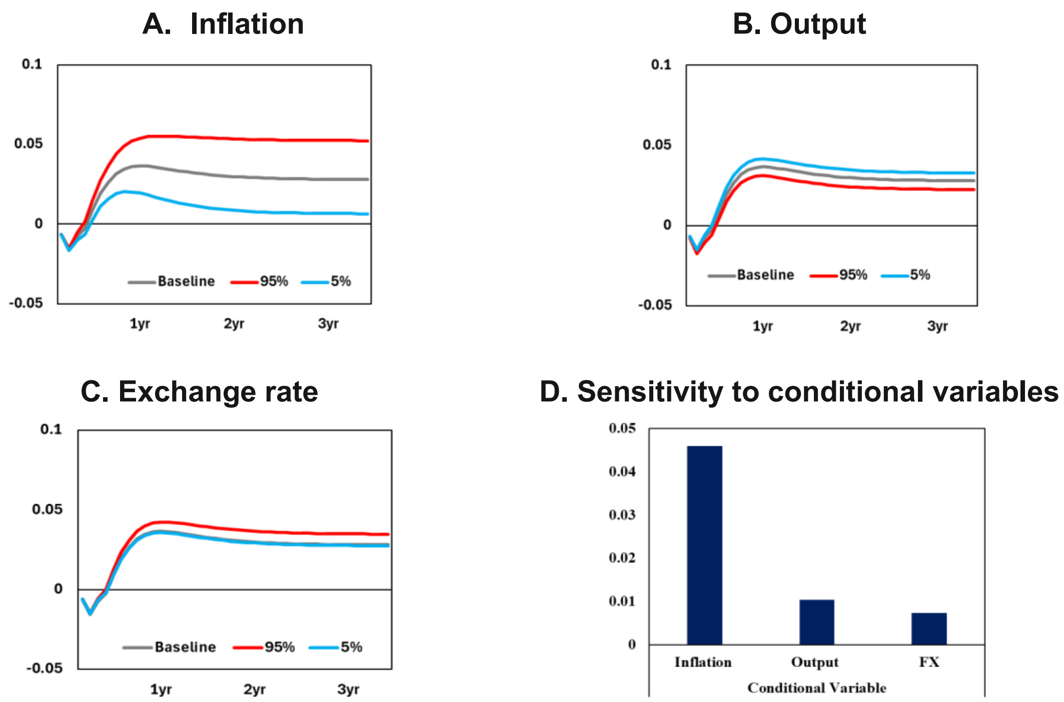
By contrast, conditioning on output responses generates much smaller differences in policy reactions (Panel B). In particular, episodes associated with larger output declines (red line) are followed by systematically weaker monetary tightening than episodes with smaller output declines (blue), consistent with the theoretical prediction that central banks partially accommodate adverse supply shocks when output losses become more severe. However, the quantitative magnitude of this difference remains relatively modest when compared with the much larger sensitivity of policy responses to inflation conditions. Similarly, conditioning on exchange-rate responses (Panel C) also affects monetary policy behavior: episodes associated with larger exchange-rate depreciations (red line) are followed by somewhat stronger monetary tightening, but the magnitude of this effect remains limited relative to the inflation channel.

These patterns are summarized in Panel D, which compares the sensitivity of cumulative policy-rate responses across conditioning variables. The sensitivity to inflation is substantially larger than the sensitivity to either output or exchange-rate responses. Output and exchange-rate conditions exert relatively modest influences on policy-rate responses—roughly one-quarter of the magnitude associated with inflation conditions. Overall, **Figure 6** provides empirical support for the view that the recent monetary policy frameworks in ASEAN+3 economies place primary emphasis on inflation stabilization following global supply shocks. These findings are broadly consistent with New Keynesian models in which central banks respond most aggressively to shocks that threaten persistent inflationary pressures and the credibility of the nominal anchor.[26]

[26] The dominance of inflation conditions in the post-1999 period contrasts sharply with the corresponding results for the earlier sample period (1970–98). As explained in more datils in Section VI, monetary policy responses during

Figure 6 Conditional response of interest rates

(Percentage points; Panel SVAR; PCA shock; eight ASEAN+3 economies; 1999-2024)



Notes: This figure reports conditional impulse response functions (IRFs) of domestic policy interest rates to a one-standard-deviation PCA-based global supply shock. Panels A–C show interest-rate responses conditional on the distribution of cumulative responses of inflation, output, and exchange rates, respectively. For each conditioning variable, the figure compares the IRF evaluated at the 95th percentile (red line) and the 5th percentile (blue) of the corresponding conditional distribution, relative to the baseline IRF (gray). Panel D summarizes the cumulative differences in maximum interest-rate responses across conditioning variables. The sample period is 1999–2024.

V.2 Role of Inflation Expectations

Inflation expectations play a central role in modern monetary policy frameworks. Both theory and empirical evidence emphasize that well-anchored expectations can mitigate the inflationary effects of supply shocks, whereas de-anchoring may give rise to persistent inflation dynamics and wage–price spirals. In practice, central banks respond not only to realized inflation but also to forward-looking inflation expectations, which serve as key indicators of the credibility of monetary policy and the risk of persistent inflationary pressures. In this subsection, we examine the role of inflation expectations in shaping monetary policy responses to global supply shocks.

Econometric exercise. Similar to the exercises in the previous sub-section, we assess whether monetary policy responses vary systematically with the response of inflation expectations in the baseline model. Specifically, we compute conditional impulse response functions of the policy rate by grouping observations according to the magnitude of $\hat{\pi}_i^e$:

$$IRF_r(h \mid \pi^e) = \mathbb{E}\left[\frac{\partial r_{i,t+h}}{\partial \varepsilon_t^{GS}} \mid \hat{\pi}_i^e \in \mathcal{Q}\right]$$

the pre-inflation-targeting era were influenced not only by inflation but also, and in many cases more strongly, by output and exchange-rate conditions.

where Q denotes regions of the distribution of inflation-expectation responses (e.g., high versus low). If inflation expectations matter for policy, policy-rate IRFs should be larger when $\hat{\pi}_i^e$ is high. A stronger policy response in the former group will provide evidence that inflation expectations exert an independent influence on monetary policy decisions.[27]

Empirical results. Figure 7 examines whether monetary policy responses to global supply shocks depend on the extent to which inflation expectations increase following the shock. Panel A shows that policy-rate responses vary substantially across inflation-expectation regimes. When inflation expectations rise strongly (red line), central banks tighten monetary policy more aggressively and persistently than when expectations respond only weakly (blue line). This pattern suggests that policymakers react not only to realized inflationary pressures but also to the risk that inflation expectations become de-anchored following a global supply shock.

Panel B demonstrates that this relationship remains robust after controlling for realized inflation responses. Conditional policy-rate responses continue to differ markedly across high- and low-expectation states even when inflation outcomes are held constant, indicating that inflation expectations contain information relevant for monetary policy beyond contemporaneous inflation developments. Central banks appear to respond aggressively when supply shocks threaten the credibility of the nominal anchor, even if realized inflation follows a similar path.

Panel C provides formal statistical inference for these results by reporting posterior credible intervals for the cumulative sensitivity measures. The difference between the 95th- and 5th-percentile conditional IRFs is statistically significant when conditioning on inflation expectations, but not when conditional on realized inflation alone. By contrast, the corresponding sensitivity to realized inflation alone is not statistically distinguishable from zero. Taken together, these findings suggest that inflation expectations play a more important role than realized inflation in shaping monetary policy responses to global supply shocks during the post-1999 period**.** [28]

V.3 Persistence of Inflationary Transmission

The persistence of supply shocks is a central determinant of optimal monetary policy in New Keynesian models. Persistent cost-push shocks raise the long-run inflationary costs of inaction and increase the likelihood of second-round effects, thereby strengthening the case for monetary tightening. In this paper, we distinguish between two conceptually different dimensions of persistence. First, the transmission of a given global supply shock may be more persistent, generating longer-lasting increases in inflation or inflation expectations even when the underlying shock is held constant. Second, the underlying supply shock itself may be more

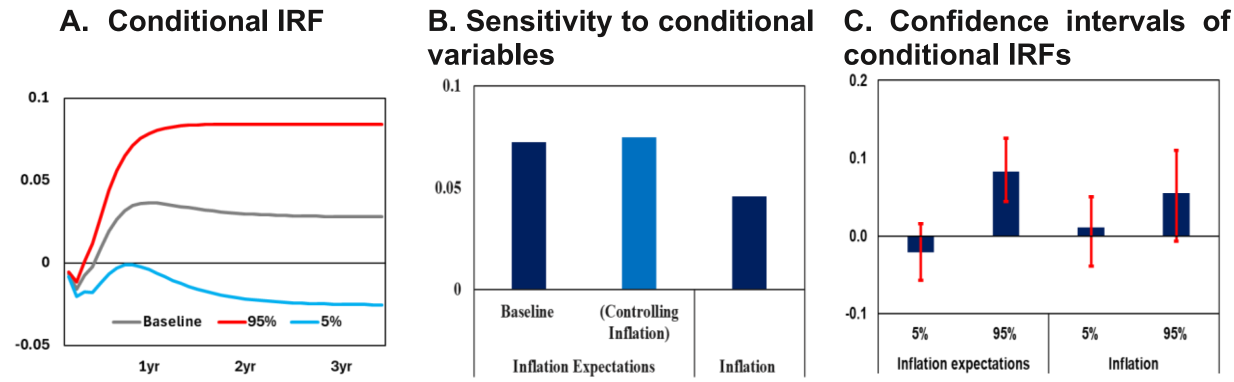
[27] In testing the role of inflation expectations, as a robustness check, we implement an alternative test to account for high correlation between realized inflation and inflation expectations. To isolate the role of expectations beyond realized inflation, we examine how policy rate responds to variation in expectations while holding inflation fixed. Let B denote a narrow bin of inflation responses—e.g., the middle 50 percent of the distribution, excluding the upper and lower 25 percent of draws. We then compare conditional policy responses: $IRF_r^{High\,\pi^e|\pi}(h)$ vs $IRF_r^{Low\,\pi^e|\pi}(h)$.

[28] Testing the role of inflation expectations in the 1970–98 period is not feasible because of limited cross-country data availability. Nevertheless, the importance of expectations may have been even greater during earlier decades, when inflation expectations were less firmly anchored and more susceptible to adverse supply shocks

persistent, producing prolonged stagflationary pressures at the global level. We examine these two dimensions separately. The present section focuses on the persistence of inflationary *transmission* while controlling for the identified shock, whereas the next section examines alternative global supply shocks that differ in their intrinsic persistence.

Figure 7 Impulse response of interest rates conditional on inflation expectations

(Percentage points; Panel SVAR model; 1999-2024, PCA-based global supply shocks; ASEAN+3 economies)



Note: This figure reports conditional impulse response functions (IRFs) of the domestic policy interest rate to a one-standard-deviation global supply shock, estimated from a panel SVAR for eight ASEAN+3 economies over 1999–2024. Global supply shocks are identified using the PCA-based composite measure. Panel A compares policy-rate responses across the conditional distribution of inflation expectations. The red and blue lines report the policy-rate IRFs evaluated at the 95th and 5th percentiles, respectively, of the inflation-expectations response, while the grey line shows the baseline IRF. Panel B examines the sensitivity of monetary policy responses to inflation expectations under alternative conditioning schemes. The first specification conditions on the inflation-expectations response alone. The second conditions on inflation expectations while controlling for realized inflation responses, isolating the independent role of expectations in shaping policy decisions. Bars denote the cumulative difference between the 95th- and 5th-percentile conditional IRFs. Panel C reports the 90 percent confidence intervals for the cumulative sensitive shown in Panels A and B. Error bars denote the lower and upper bounds of the posterior distribution.

Econometric exercise. To examine whether monetary policy responds to the persistence of inflationary transmission itself, we condition policy-rate responses on the duration of inflation and inflation-expectation responses following a global supply shock. For each posterior draw, persistence is measured as the number of months during which the non-cumulative impulse response remains positive. Equivalently, this corresponds to the period over which the cumulative response continues to increase. Formally, let

$$P_x(\theta) = \sum_{h=0}^{H} \mathbf{1}\,(IRF_x(h \mid \theta) > 0),$$

where $x \in \{\pi, \pi^e\}$ denotes inflation or inflation expectations.

We then compare monetary-policy responses evaluated at the 95th and 5th percentiles of the persistence distribution and assess whether:

$$IRF_r^{High\ P_x}(h) > IRF_r^{Low\ P_x}(h).$$

If central banks respond to persistent inflationary pressures rather than merely the initial inflation impulse, policy-rate responses should be stronger when inflation or inflation expectations remain elevated for longer.

Empirical results. Figure 8 reports conditional monetary-policy responses based on the persistence of inflation and inflation-expectation transmission from global supply shocks. The results indicate that policy-rate responses become systematically stronger when inflationary pressures remain elevated for a longer period (Panel A). Conditioning on more persistent inflation responses generates moderately stronger monetary tightening than conditioning on less persistent inflation responses. The effect is even more pronounced when conditioning on the persistence of inflation expectations (Panel B). Panel C summarizes these differences and shows that the sensitivity of policy-rate responses is larger for the persistence of inflation expectations than for the persistence of realized inflation. The results therefore suggest that central banks respond not only to the magnitude of inflationary pressures but also to their expected duration. Episodes in which inflation expectations continue to rise for longer are associated with more aggressive and persistent policy tightening.

The evidence indicates that both the persistence of the underlying supply disturbance and the persistence of its transmission to inflation and inflation expectations play an important role in shaping monetary-policy responses. While persistent shocks generate stronger tightening because they imply longer-lasting inflationary pressures, the persistence of inflation expectations appears to be particularly important because it directly captures the risk of inflation becoming embedded in future price-setting behavior.

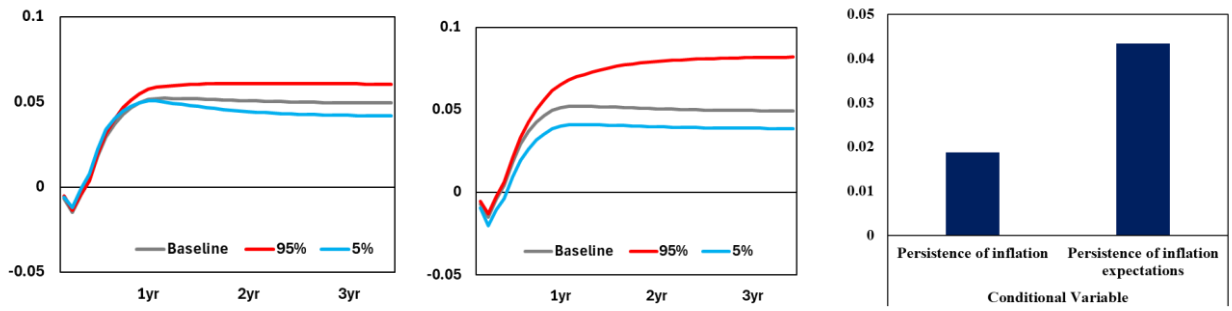
Figure 8 Impulse response of interest rates conditional on persistence of transmission

(Percentage points; Panel SVAR model; 1999-2024, PCA-based global supply shocks; ASEAN+3 economies)

A. Persistence of Inflation response

B. Persistence of Inflation expectations response

C. Sensitivity to conditional variables



Note: This figure reports conditional impulse response functions (IRFs) of domestic policy interest rates to a one-standard-deviation PCA-based global supply shock, estimated from a panel SVAR for 8 ASEAN+3 economies over 1999–2024. Panels A and B examine whether monetary policy responses differ depending on the persistence of inflation and inflation-expectation responses, respectively. Persistence is measured as the number of months during which the corresponding non-cumulative IRF remains positive following the shock, indicating that the cumulative response continues to increase. For each conditioning variable, the figure compares interest-rate responses evaluated at the 95th percentile (red line) and the 5th percentile (blue line) of the persistence distribution, relative to the baseline IRF (gray line). Panel A conditions on the persistence of inflation responses, while Panel B conditions on the persistence of inflation-expectation responses. Panel C summarizes the cumulative differences in maximum interest-rate responses across conditioning variables.

V.4 Other Factors

In the Appendix D, we further explore the structural mechanisms underlying monetary policy responses by conditioning the interest-rate impulse responses on key model parameters, including the slopes of the Phillips curve (κ) and IS curve (σ) as explained in Section II. The results suggest that, in the post-1999 period, the Phillips-curve and IS-curve parameters play only a limited role in shaping monetary tightening.

V.5 Summary: What Matters Most for Monetary Policy Choices?

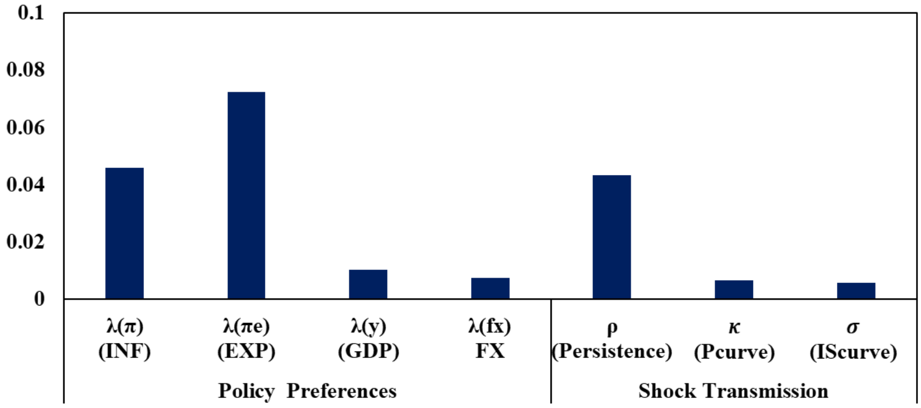
Figure 9 summarizes how central banks systematically adjust their policy reactions depending on the macroeconomic conditions and transmission mechanisms prevailing at the time of the shock. A clear hierarchy emerges from the results. Variables related to inflation dynamics—particularly inflation expectations—generate by far the largest variation in interest-rate responses. Conditioning on inflation expectations produces the strongest sensitivity of monetary policy responses across all specifications, exceeding the sensitivity associated with realized inflation itself. Measures of inflation persistence also play a prominent role. Monetary-policy responses are substantially stronger when inflationary pressures and inflation expectations remain elevated for longer periods following a global supply shock, indicating that central banks respond not only to the magnitude of inflationary pressures but also to their expected duration. Together, these findings suggest that policymakers are primarily concerned with the risk that supply shocks may generate prolonged deviations of inflation from target and trigger second-round effects through expectations formation.

Output conditions also matter for monetary policy responses, although their quantitative importance is considerably smaller than that of inflation-related variables. Episodes associated with larger output declines tend to generate somewhat weaker monetary tightening, consistent with the view that central banks partially accommodate adverse supply shocks when real economic costs become more severe. Exchange-rate conditions similarly affect monetary policy responses; episodes associated with larger exchange-rate depreciations tend to generate somewhat stronger monetary tightening, consistent with concerns about imported inflation, capital-flow pressures, and financial stability in open economies. Structural transmission parameters associated with the real economy, including the Phillips-curve slope and interest-rate sensitivity of output, contribute relatively little to the differences in monetary policy responses. Although these mechanisms influence the transmission of shocks in theory, they appear to play only a limited role in explaining how central banks react to global supply disturbances in practice.

These findings are also supported by a complementary reduced-form regression exercise reported in Appendix D4. The regression results yield a very similar ranking of explanatory factors, with inflation expectations emerging as the strongest predictor of monetary-policy responses, followed by inflation persistence and realized inflation.

Figure 9 Sensitivity of impulse response of interest rates: conditional on different parameters

(Percentage points; Panel SVAR; PCA global supply shock;1999-2024, 8 ASEAN+3 economies)



Note: This figure reports the sensitivity of conditional impulse response functions (IRFs) of the policy interest rate to a one-standard-deviation PCA-based global supply shock, estimated from a panel SVAR for eight ASEAN+3 economies over 1999–2024. Interest-rate responses are conditioned on alternative structural or policy-relevant variables, including inflation, output, inflation expectations, shock persistence, the Phillips-curve slope, and the IS-curve slope. Conditional IRFs are computed by partitioning posterior draws according to high and low values of the conditioning variable, while holding the underlying model and shock identification fixed. Bars report cumulative differences between high- and low-state policy-rate responses.

VI. What Explains the Changes in Monetary Policy Over Time?

The results presented thus far suggest that inflation expectations and inflation persistence are the primary determinants of monetary policy responses to global supply shocks in the post-1999 inflation-targeting era. Monetary policy responses become substantially stronger when supply shocks generate persistent inflationary pressures or threaten to de-anchor inflation expectations, whereas output and exchange-rate conditions play a more limited role.

To assess whether this pattern also characterized earlier monetary policy regimes, **Figure 10** (Panel A) reports the sensitivity of monetary policy responses during 1970–98. The figure summarizes how cumulative policy-rate responses vary when conditioning on inflation, output, and exchange-rate responses across alternative global supply shock measures.[29] Again, sensitivity is measured as the difference between cumulative policy-rate responses evaluated at the 95th and 5th percentiles of the conditional distribution of each conditioning variable.

The results differ markedly from those observed in the post-1999 period. Whereas modern monetary policy responses are driven predominantly by inflation expectations and inflation persistence, the pre-1999 period exhibits a broader set of policy considerations. Across both the benchmark PCA-based shocks and oil price shocks, monetary policy responses vary systematically with inflation, output, and exchange-rate conditions, suggesting that policymakers assigned meaningful weight to multiple macroeconomic objectives when responding to global supply disturbances.

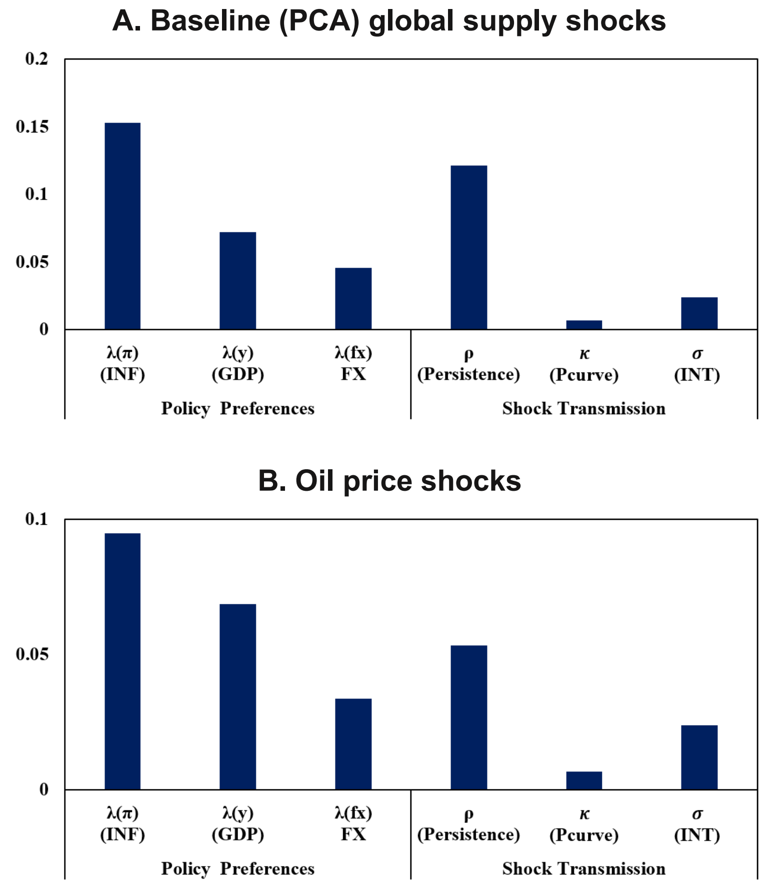
Inflation remains the single most important determinant of monetary policy behavior during this earlier period. However, output and exchange-rate considerations play a substantially

[29] Inflation expectations are not available for this period.

larger role than in the post-1999 era, particularly in the case of oil price shocks, where the sensitivity of policy responses to output approaches that associated with inflation. At the same time, inflation persistence remains economically relevant—especially for the benchmark PCA shocks—but is no longer the dominant mechanism shaping monetary policy decisions. This contrasts sharply with the modern period, where inflation expectations and persistence account for most of the heterogeneity in policy responses.

Figure 10 Sensitivity of interest rate IRFs conditional on other variables

(Percentage points; Panel SVAR; alternative shock; 8 ASEAN+3 economies)



Notes: This figure summarizes the sensitivity of monetary policy responses to global supply shocks during 1970–98. Sensitivity is measured as the cumulative difference between policy-rate impulse responses evaluated at the 95th and 5th percentiles of the conditional distribution of a given conditioning variable. Panel A reports sensitivities associated with policy-preference variables—namely inflation, output, and exchange-rate responses—for three representative global supply shock measures: the benchmark PCA-based composite measure, FAVAR-based oil supply shocks (OIL), and economic-shortage shocks. Panel B presents average sensitivities across the conditional-IRF exercises, grouped into policy-preference factors (inflation, output, and exchange rates) and shock-transmission mechanisms (inflation persistence, the Phillips-curve slope, and the IS-curve parameter). Larger values indicate that monetary policy responses vary more substantially across conditional states, implying a stronger role for the corresponding factor in shaping policy decisions. Similar qualitative patterns are obtained for other model-based global supply shocks and shortage-related measures.

These findings suggest that central banks before 1999 pursued a broader set of policy objectives when confronted with adverse supply shocks. In addition to inflation stabilization, policymakers placed greater emphasis on supporting economic activity and managing external-sector conditions. Larger output losses and exchange-rate pressures were associated with more accommodative policy responses, reflecting concerns about the real costs of disinflation, balance-of-payments pressures, and external competitiveness. One possible explanation is that, in an environment characterized by weaker policy credibility and less firmly anchored inflation expectations, central banks had relatively limited ability to influence expectations directly. As a result, policy accommodation was shaped primarily by preferences over inflation, output, and exchange-rate stabilization rather than by transmission-related mechanisms.

More broadly, both panels indicate that policy-preference variables dominate the sensitivity ranking during 1970–98. Structural transmission mechanisms—including inflation persistence, the Phillips-curve slope, and the IS-curve parameter—play a comparatively smaller role in explaining heterogeneity in monetary policy responses. Although persistence remains important under the benchmark specification, the Phillips-curve and IS-curve channels account for only a small fraction of the observed variation. Overall, the evidence suggests that differences in policy preferences, rather than structural characteristics of the transmission process, were the principal drivers of monetary policy accommodation during the pre-inflation-targeting era.

Taken together, these results suggest that the determinants of monetary policy responses to global supply shocks have evolved substantially over time. During 1970–98, central banks appear to have balanced inflation, output, and exchange-rate objectives more evenly, implying that differences in policy preferences were the primary source of heterogeneity in monetary policy behavior. By contrast, the post-1999 period is characterized by a stronger emphasis on inflation stabilization, inflation expectations, and the persistence of inflationary pressures. This does not imply that inflation expectations or persistence were unimportant in the earlier period; if anything, inflation processes were generally more persistent and expectations less firmly anchored. Rather, these characteristics appear to have been pervasive across economies and episodes, explaining relatively little of the cross-country variation in policy responses. The transition toward inflation-targeting frameworks and stronger policy credibility after the late 1990s therefore reduced the importance of differences in policy priorities while increasing the role of inflation expectations and inflation persistence in shaping monetary policy responses to global supply shocks.

VII. Drivers of Heterogeneity in Monetary Policy: Nature of Shocks

While the previous section emphasizes the role of inflation dynamics, inflation expectations, and policy preferences in shaping monetary policy responses to global supply shocks, additional dimensions of heterogeneity remain important. In particular, central banks may also respond differently depending on the nature of the shock---including the shock persistence and the relative importance of cost-push versus demand-compression channels embedded within global supply disturbances. These considerations are central in New Keynesian frameworks because they directly affect inflation persistence, output tradeoffs, and the risk of de-anchoring inflation expectations.

To further explore these mechanisms, this section examines two additional sources of heterogeneity. Section VII.1 investigates whether more persistent global supply shocks elicit systematically stronger monetary tightening than transitory shocks. Section VII.2 then distinguishes between shocks dominated by cost-push inflationary pressures and those operating primarily through uncertainty or demand-compression channels. Together, these exercises provide additional evidence that monetary policy responses to global supply shocks depend critically on the underlying transmission mechanism and expected persistence of the disturbance.

VII.1 Shock Persistence

The persistence of supply shocks is a central determinant of optimal monetary policy in New Keynesian models. Persistent cost-push shocks raise the long-run inflationary costs of inaction and increase the likelihood of second-round effects, thereby strengthening the case for monetary tightening.

Econometric exercise. To assess whether monetary policy responses depend on the persistence of global supply shocks, we contrast policy reactions under alternative identification schemes that differ in the implied duration of the shock. Let the key global variables used for sign restrictions be:

$$g_t = (y_t^G, \pi_t^G)',$$

where y_t^G and π_t^G denote global output and global inflation, respectively. Let $IRF_x(\, h \mid \varepsilon^{GS}\,)$ denote the impulse response of variable x at horizon h to a global supply shock. Under the baseline identification, we impose sign restrictions only on impact ($h = 0$):

$$\mathcal{R}_1\colon IRF_{\pi^G}(\,0 \mid \varepsilon^{GS}\,) \geq 0, \qquad IRF_{y^G}(0 \mid \varepsilon^{GS}) \leq 0.$$

This identification admits both transitory and persistent supply disturbances, provided they generate a stagflationary response on impact, following Forbes, Ha, and Kose (2026a).

Next, to isolate more persistent supply shocks, we impose the same sign restrictions over multiple horizons. Specifically, we require:

$$\mathcal{R}_4\colon IRF_{\pi^G}(\,h \mid \varepsilon^{GS}\,) \geq 0, \qquad IRF_{y^G}(\,h \mid \varepsilon^{GS}\,) \leq 0, \qquad \forall h \in \{0,1,2,3\}.$$

This alternative identification restricts attention to shocks that generate a sustained stagflationary pattern in global variables and therefore correspond to more persistent supply disturbances. Intuitively, $\mathcal{R}_4$ admits only shocks with longer-lasting effects on global inflation and output. Let the identified global supply shocks under the two schemes be denoted by $\varepsilon_t^{GS,1}$ and $\varepsilon_t^{GS,4}$, corresponding to $\mathcal{R}_1$ and $\mathcal{R}_4$, respectively. In a Bayesian sign-restriction FAVAR framework, this procedure yields two sets of admissible posterior draws:

$$\Theta_1 = \{\theta\colon \theta \text{ satisfies } \mathcal{R}_1\},\ \Theta_4 = \{\theta\colon \theta \text{ satisfies } \mathcal{R}_4\}.$$

For each country i, we feed the identified global supply shocks into a SVAR, with the global shock entering as the first variable:

$$Y_{i,t} = C_i(L)Y_{i,t-1} + D_i(L)\varepsilon_t^{GS,k} + \nu_{i,t}, k \in \{1,4\},$$

where $Y_{i,t}$ includes domestic variables such as output, inflation, inflation expectations, the policy interest rate, and exchange rate, as well as relevant global controls. The domestic monetary policy impulse response is defined as:

$$IRF_{r,i}^{(k)}(h) \equiv \frac{\partial r_{i,t+h}}{\partial \varepsilon_t^{GS,k}}, k \in \{1,4\}.$$

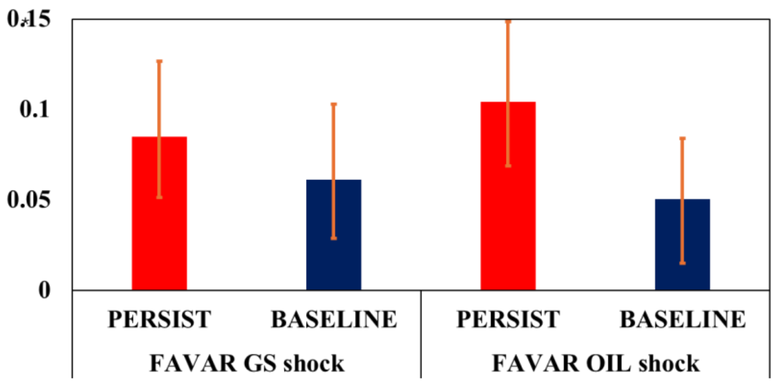
Our hypothesis is that persistent global supply shocks elicit stronger monetary tightening than transitory shocks: $I\bar{R}F_r^{(4)}(h) > I\bar{R}F_r^{(1)}(h), h \in \mathcal{H}$, and test whether $I\bar{R}F_r^{(4)}(h) > I\bar{R}F_r^{(1)}(h)$ on a cumulative basis.

Empirical results. Figure 11 shows that more persistent global supply shocks trigger significantly stronger monetary policy tightening than baseline shocks. For both FAVAR-based global supply (GS) shocks and FAVAR-based oil supply shocks (OIL), the cumulative increase in domestic policy rates is substantially larger under persistent-shock specifications. The differences are economically meaningful. For the GS shock, the cumulative policy-rate response rises from around 6 basis points in the baseline specification to roughly 8½ basis points under the persistent-shock specification. The effect is even more pronounced for oil shocks: the cumulative response increases from about 5 basis points to more than 10 basis points, implying that monetary tightening following persistent oil shocks is approximately twice as large as that following baseline oil shocks. Among the cases considered, persistent oil shocks therefore elicit the strongest policy response.

These findings suggest that central banks respond not only to the immediate inflationary effects of global supply disturbances, but also to their expected persistence and implications for future inflation dynamics. More persistent shocks increase the likelihood of sustained inflationary pressures, the de-anchoring of inflation expectations, and the emergence of second-round effects, thereby strengthening the case for monetary tightening. By contrast, when shocks are perceived to be more transitory, central banks appear more willing to "look through" temporary inflationary pressures in order to avoid exacerbating output losses.

Figure 11 Impulse response of domestic interest rates and shock persistence

(Panel SVAR; Model-based Global shocks; 8 ASEAN+3 economies; 1999-2024)



Note: The figure reports cumulative impulse response functions of domestic policy interest rates to one-standard-deviation model-based global supply shocks over the period 1999–2024. "Baseline" denotes the average response across all episodes, while "Persist" refers to episodes associated with more persistent inflationary pressures. The left panel reports responses to FAVAR-model-based global supply (GS) shocks, and the right panel reports responses to FAVAR-model-based oil supply shocks. Solid bars denote median responses, and vertical lines indicate 90 percent confidence intervals. See Forbes, Ha, and Kose (2026a) for sign restrictions used for the shock identification.

Overall, the two exercises—in Section IV.3 and the results presented here—provide complementary evidence that persistence is a key determinant of monetary-policy responses to global supply shocks. The first exercise shows that central banks react more aggressively when the underlying supply disturbance itself is more persistent. The second demonstrates that policy responses are stronger when inflation and inflation expectations remain elevated for longer following a shock, even after controlling for the shock itself.

Together, these findings suggest that policymakers respond not simply to the initial inflationary impact of supply shocks, but to the risk that inflationary pressures become prolonged and self-reinforcing. This interpretation is closely aligned with the New Keynesian framework developed in Section II, in which optimal policy responses depend critically on inflation persistence, expected future inflation, and the possibility of de-anchoring inflation expectations. More broadly, the results help explain why monetary policy responses differ across episodes and shock types: heterogeneity in policy reactions reflects differences not only in the magnitude of shocks, but also in their expected persistence and inflationary transmission.

VII.2 Shock Composition: Cost-Push versus Demand Components

Next, to help explain the heterogeneous effects of different types of global supply shocks on monetary policy as explained in Section V.3, we also explore whether the various shock measures capture different underlying types of supply disturbances.

Econometric exercise. We begin by examining whether differences in the economic composition of global supply shocks help explain the heterogeneity in monetary policy responses documented in Section IV. Although all shocks considered are commonly classified as supply disturbances, existing work emphasizes that they can differ substantially in the channels through which they affect inflation and real activity.[30]

To formalize these distinctions, we compare alternative measures of global supply shocks in terms of their joint effects on inflation, output, and inflation expectations. Let $s \in S$ index different global supply shock measures, and let $\varepsilon_t^{GS,s}$ denote the identified shock---one standard deviation increase. For each measure s and country i, we compute impulse responses of inflation, output, and inflation expectations:

$$IRF_{\pi,i}^{(s)}(h) \equiv \frac{\partial \pi_{i,t+h}}{\partial \varepsilon_t^{GS,s}}, \qquad IRF_{y,i}^{(s)}(h) \equiv \frac{\partial y_{i,t+h}}{\partial \varepsilon_t^{GS,s}}, \qquad IRF_{\pi^e,i}^{(s)}(h) \equiv \frac{\partial \pi_{i,t+h}^{e}}{\partial \varepsilon_t^{GS,s}}$$

We classify shocks as *cost-pushing* when inflation and inflation expectations increase while output declines—i.e., $IRF_{\pi,i}^{(s)} > 0$, $IRF_{\pi^e,i}^{(s)} > 0$, and $IRF_{y,i}^{(s)} < 0$ —with these responses statistically significant. Such shocks are consistent with stagflationary dynamics arising from higher marginal costs and reflect environments in which inflationary pressures are both realized and expected to persist. In contrast, shocks for which the inflation response is muted

[30] For instance, classic analyses of oil price shocks show that disturbances identified as supply shocks may embed important demand and precautionary components that alter their macroeconomic effects (Kilian, 2009; Baumeister and Hamilton, 2019). More recent studies highlight that global shocks related to geopolitics, supply-chain stress, and shortages often operate through uncertainty, financial conditions, and expectations rather than solely through contemporaneous marginal costs (Bloom, 2009; Basu and Bundick, 2017; Caldara and Iacoviello, 2022).

or not accompanied by a corresponding increase in inflation expectations, and for which output declines significantly, are interpreted as embedding a substantial *demand-compression* component. These shocks typically reflect heightened uncertainty, tighter financial conditions, or precautionary behavior, and do not generate sustained inflationary pressures.

Empirical results. Figure 12 summarizes the average international transmission of global supply shocks using the panel SVAR framework. Across a broad range of global supply shock measures, the dominant pattern is clearly stagflationary: domestic inflation rises (Panel A), real activity declines (Panel B), inflation expectations increase (Panel C), and monetary policy tightens on average (Panel D). This broad comovement confirms that the shocks identified in the analysis primarily reflect supply-side disturbances rather than conventional demand shocks.

At the same time, the figure reveals substantial heterogeneity across shock types. For most measures—such as the benchmark PCA-based shock, FAVAR-model-based GS and oil price shocks, and GSCPI shocks—the increase in inflation and inflation expectations is accompanied by a contraction in output. These stagflationary dynamics are generally associated with positive and statistically significant increases in policy interest rates, consistent with central banks responding aggressively to persistent inflationary pressures and risks of de-anchoring inflation expectations.

By contrast, a few indicators display a markedly different transmission pattern. Geopolitical risk (GPR) shocks and shipping-cost (BDI) shocks generate comparatively weak inflationary effects and, declining inflation expectations (in the case of BDI shocks). These shocks are also associated with relatively larger output contractions, and larger equity price declines (in the case of GPR shocks) suggesting that uncertainty, weaker investment, and aggregate-demand compression play a more important role than direct cost-push pressures.[31]

Heterogeneity is especially evident within the shortage-related indicators. Energy and food shortages generate relatively strong increases in inflation, inflation expectations, and policy rates, consistent with their broad pass-through into production costs and consumer prices. By contrast, industrial and labor shortages produce much smaller inflationary responses and are associated with muted or accommodative monetary policy reactions.[32] These differences suggest that central banks distinguish between shortages likely to generate persistent

[31] One interpretation is that these shocks are not purely supply-side disturbances. GPR shocks, for example, often operate through heightened uncertainty, precautionary behavior, delayed investment, financial-market stress, and weaker global demand. The Baltic Dry Index (BDI) is a measure of global shipping costs for bulk commodities and is commonly used as an indicator of global trade and transportation conditions. Although an increase in the BDI may initially reflect higher shipping demand or transportation bottlenecks, it can also contribute to global---particularly China---demand compression by raising trade and input costs, weakening investment and production, and reducing global trade activity. As a result, these shocks can generate substantial contractions in economic activity without producing sustained inflationary pressures or de-anchoring inflation expectations.

[32] Unlike energy or food shortages—which affect broad production costs and consumer prices—labor and industrial shortages may be more sector-specific, temporary, or demand-driven in nature. Although labor shortages are often associated with wage-price spirals and cost-push inflation, the results suggest that labor-shortage shocks in the ASEAN+3 sample operate through a broader set of channels. In particular, labor shortages may reflect demographic constraints, declining labor-force participation, skills mismatches, or cyclical slowdowns that simultaneously weaken production, investment, and aggregate demand. Consistent with this interpretation, labor-shortage shocks generate relatively modest inflationary pressures but sizeable output losses, implying a larger demand-compression component than is observed for energy- and food-shortage shocks. As a result, monetary policy responses to labor shortages appear considerably weaker than those associated with other shortage-related supply disturbances.

economy-wide inflationary pressures and those viewed as more temporary or sector-specific disturbances.

Trade-related measures also reveal important differences in the transmission. Negative trade volume shocks generate inflationary pressures alongside sizable declines in output, consistent with disruptions to global trade flows that constrain supply while weakening external demand. Terms-of-trade shocks produce broadly similar stagflationary effects, reflecting the impact of adverse movements in import prices on domestic costs and inflation. Trade policy uncertainty (TPU) shocks, by contrast, are associated with more muted inflationary responses and weaker increases in inflation expectations, while still exerting a noticeable drag on economic activity.

Overall, **Figure 12** shows that heterogeneous monetary policy responses reflect systematic differences in the joint behavior of inflation, output, and—most importantly—inflation expectations. The key determinant of policy responses is therefore not whether a shock is broadly classified as a "global supply shock," but rather the underlying transmission mechanism and its implications for inflation persistence and expectations formation. When shocks generate persistent cost-push inflation and rising inflation expectations, central banks respond by tightening policy. By contrast, when shocks primarily operate through uncertainty or demand-compression channels without materially raising inflation expectations, policy responses are considerably more accommodative. These findings provide a unified explanation for why central banks respond differently to seemingly similar global supply disturbances.

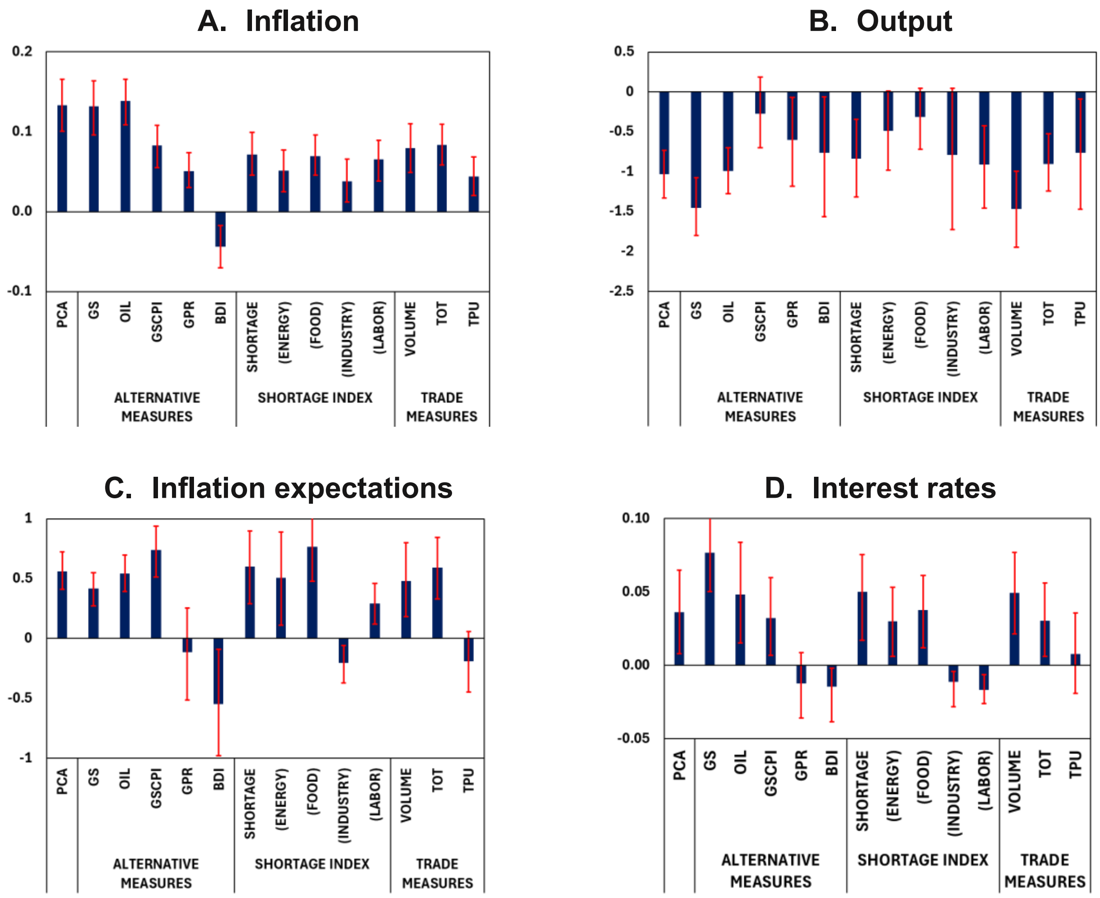
Cross-correlations of IRFs. To further support this interpretation, Appendix D1 and **Figure D1** examine the cross-shock correlation between monetary policy responses and the responses of key macroeconomic and financial variables across alternative global supply shock measures. The results suggests that inflation expectations and exchange-rate responses continue to exhibit a sizable positive association with monetary-policy tightening, with relatively strong explanatory power across alternative shock measures. By contrast, the correlations with output and equity-price responses weaken substantially (R-square being smaller than 0.1), suggesting that much of their raw correlation with policy-rate responses reflects variation in the overall size of the shocks rather than an independent role in shaping monetary-policy decisions.

These results are broadly consistent with the conditional-IRF evidence presented in the previous sections. They provide additional support for the view that heterogeneity in monetary policy responses across global supply shocks is driven primarily by differences in inflation dynamics, inflation expectations, and, to a lesser extent, exchange-rate pressures, rather than by differences in real activity or financial-market outcomes. While the number of alternative shock measures is limited and the results should therefore be interpreted as suggestive, they reinforce the conclusion that central banks respond primarily to the inflationary consequences of global supply shocks and the associated risks to inflation expectations.

Interestingly, the normalized relationships for output and equity prices also exhibit some evidence of nonlinearity. For relatively small shocks, stronger output and equity-price responses are associated with somewhat more accommodative monetary-policy behavior, consistent with efforts to mitigate economic downturns and financial stress. For larger shocks, however, the relationship becomes weaker or even negative, suggesting that inflation stabilization increasingly dominates policy decisions once supply shocks become sufficiently large. Given the limited number of observations, this evidence should be interpreted cautiously, but it is consistent with the broader finding that inflation considerations ultimately dominate monetary-policy responses to major global supply disturbances.

Figure 12 Impulse responses of domestic variables following global supply shocks

(Panel SVAR; Various global supply shocks; average across 8 ASEAN+3 economies; 1999-2024)



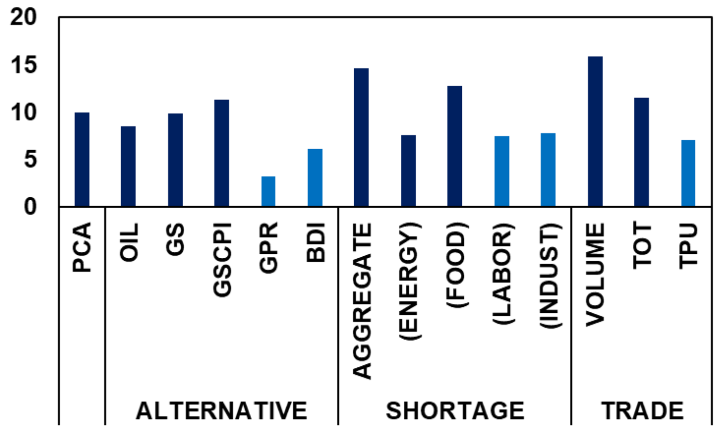
Note: The figure reports cumulative impulse response functions (IRFs) of domestic variables—inflation, output, inflation expectations, and the policy interest rate—following a global supply shock, estimated from a panel SVAR over the period 1999–2024. Global supply shocks are based on alternative measures, including model-based shocks, shortage-related indicators, trade-related shocks, oil-related shocks, and geopolitical risk (GPR), and trade-related shocks. The response of inflation is reported to be a one-standard-deviation shock, while the responses of output, inflation expectations, and the policy interest rate are scaled to correspond to a 1 percentage point increase in inflation. Each marker represents the cumulative response at a given horizon, and vertical lines denote 90 percent confidence intervals. Responses are averaged across countries. All variables are expressed in percentage points.

Persistence across alternative shocks. Figure 13 provides additional evidence on the mechanism underlying the heterogeneous monetary policy responses documented throughout this paper. Across alternative measures of global supply shocks, cost-push shocks—including oil shocks, supply-chain disruptions, energy and food shortages, and the benchmark PCA-based global supply shock—tend to generate substantially more persistent increases in inflation expectations than shocks associated with geopolitical risk, shipping costs, labor shortages, industrial shortages, or trade-policy uncertainty. In many cases, the transmission of cost-push shocks to inflation expectations remains positive for roughly 10–15 months, whereas the corresponding effects of demand-compression shocks dissipate much more quickly.

These findings are closely consistent with the results reported in Sections V and VI. Throughout the paper, we show that monetary policy responses are strongest when shocks generate persistent inflationary pressures and raise concerns about the anchoring of inflation expectations. The evidence in **Figure 13** suggests that the distinction between cost-push and demand-compressing supply shocks operates largely through this channel. Cost-push shocks appear more likely to generate prolonged increases in inflation expectations, raising the risk of second-round effects and requiring a stronger monetary policy response. By contrast, shocks that contain a larger demand-compression or uncertainty component tend to have less persistent effects on inflation expectations, allowing central banks to respond more cautiously or, in some cases, accommodate part of the shock. More broadly, these results reinforce the central conclusion of the paper: differences in monetary policy responses across global supply shocks reflect systematic differences in their inflationary transmission and persistence rather than inconsistent policy behavior.

Figure 13 Persistence of transmission to inflation expectations

(Panel SVAR; Various global supply shocks; average across 8 ASEAN+3 economies; 1999-2024)



Note: This figure reports the persistence of the transmission of alternative global supply shocks to inflation expectations in ASEAN+3 economies over 1999–2024. Persistence is measured as the number of months during which the non-cumulative impulse response of one-year-ahead inflation expectations remains positive following a one-standard-deviation shock. Equivalently, it represents the period over which the cumulative response continues to increase. Results are averaged across the eight ASEAN+3 economies. Dark bars denote shocks that are primarily interpreted as cost-push (inflationary) supply shocks, including the benchmark PCA-based measure, oil shocks, supply-chain disruptions, energy and food shortages, and trade-related shocks. Light bars denote shocks that contain a larger demand-compression or uncertainty component, including geopolitical-risk (GPR), shipping-cost (BDI), labor-shortage, industrial-shortage, and trade-policy-uncertainty (TPU) shocks. Higher values indicate more persistent transmission to inflation expectations and greater potential for second-round inflationary effects.

VIII. Conclusions

Global supply shocks pose a fundamental challenge for monetary policy by simultaneously raising inflation and depressing real activity. In such environments, there is no unique policy prescription: central banks may tighten to contain inflation, accommodate stabilize output, or look through transitory price pressures. This paper provides a comprehensive empirical assessment of how central banks have responded to global supply shocks and why those responses differ across periods and shock types.

Using a unified framework that incorporates a broad set of global supply shock measures and panel structural VARs covering 11 major advanced economies and 8 ASEAN+3 economies, we document three central findings. First, adverse global supply shocks generate a clear stagflationary pattern both globally and in the ASEAN+3 economies, characterized by persistent increases in inflation and declines in output. On average over the post-1999 sample, inflation rises by around 0.15 percentage points while output falls by roughly 1.2 percentage points following a one-standard-deviation global supply shock. Despite these contractionary real effects, monetary policy responds by tightening: policy interest rates increase gradually, inflation expectations rise modestly, and financial conditions deteriorate through declining equity prices and currency movements. These results suggest that central banks place substantial weight on preventing inflation persistence and preserving the anchoring of inflation expectations.

Second, monetary policy responses have changed markedly over time. Comparing the periods 1970–1998 and 1999–2024, we find that accommodation or muted responses were more common in the earlier period, whereas policy tightening became more systematic following the widespread adoption of inflation-targeting frameworks during the late 1990s and early 2000s. Evidence from Japan and Korea—where long monthly datasets are available from the 1970s onward—shows that post-1999 monetary policy reacts more aggressively to inflationary supply disturbances, particularly when inflation expectations increase persistently. This shift is consistent with the growing emphasis placed on central bank credibility and expectations anchoring under modern monetary policy frameworks.

Third, our results indicate that inflation expectations and inflation persistence play a central role in shaping monetary policy responses. Conditional impulse response analysis shows that policy reactions are more sensitive to inflation expectations than to realized inflation itself, highlighting the forward-looking nature of modern monetary policy frameworks. In addition, central banks respond more aggressively to persistent supply shocks and to shocks whose inflationary effects remain elevated for longer periods. For example, monetary tightening following persistent oil shocks is approximately twice as large as that following baseline oil shocks. These findings suggest that policymakers respond not only to the magnitude of inflationary pressures, but also to their expected duration and the risk that inflation expectations become de-anchored. Consistent with this interpretation, shocks associated with geopolitical risk (GPR), shipping costs (BDI), and some shortage measures generate weaker responses of inflation expectations and more muted monetary-policy reactions. By contrast, shocks that generate broader and more persistent inflationary pressures are significantly more likely to trigger policy tightening.

To interpret these findings, we draw on a New Keynesian framework in which inflation expectations, inflation persistence, and shock characteristics emerge as the dominant drivers of monetary policy decisions in the post-1999 period. By contrast, output stabilization concerns, exchange-rate considerations, and structural transmission parameters such as the Phillips-curve and IS-curve slopes play comparatively smaller roles. The composition and persistence of global supply shocks are therefore central in determining whether monetary policy tightens or accommodates such disturbances.

These findings carry important implications for both research and policy. Empirically, they help reconcile seemingly conflicting results in the literature by showing that differences in estimated monetary policy responses often reflect differences in the nature and persistence of the underlying supply shocks rather than inconsistencies in policy behavior. For policymakers, the results underscore the importance of distinguishing between temporary cost-push disturbances and more persistent inflationary shocks, as well as the critical role of monitoring inflation expectations when calibrating policy responses. The findings suggest that monetary policy should respond not only to the immediate inflationary effects of supply shocks but also to their expected persistence and potential to generate second-round effects. In particular, shocks that produce persistent increases in inflation expectations—such as oil-price shocks, supply-chain disruptions, and energy- and food-shortage shocks—may warrant a stronger policy response than shocks whose inflationary effects are short-lived or accompanied by substantial demand compression. More broadly, the results highlight the value of maintaining credible monetary-policy frameworks and clear communication strategies that help anchor inflation expectations and reduce the need for aggressive policy tightening following adverse supply disturbances. Given the broader effects of global supply shocks on exchange rates, capital flows, and financial conditions, monetary policy may also need to be complemented by macroprudential, foreign-exchange, and structural policies aimed at strengthening economic resilience.

Several avenues for future research remain. Incorporating global supply shocks into fully estimated DSGE models could help quantify welfare tradeoffs under alternative policy rules. Second, richer micro-level data on expectations and supply constraints may improve the measurement and identification of global supply disturbances and their transmission to domestic economies. Finally, the results should be interpreted as characterizing the average historical response of monetary policy to identified global supply shocks rather than explaining every individual policy episode. Particular historical episodes, including the post-pandemic period in some ASEAN+3 economies, may reflect additional considerations beyond the average relationships estimated in this paper, such as country-specific institutional frameworks, financial stability concerns, or the simultaneous occurrence of multiple shocks. A more detailed analysis of these episodes is left for future research.

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Look Through or Lean Against?
Monetary Policy Responses to Global Supply Shocks in ASEAN+3 Economies

August 2026

Supplemental Appendix

This appendix contains:

Appendix A. Data Appendix

Table A1. Data Description and Sources

Variable	Definition	Source
Global Supply Shock (PCA)	First principal component of multiple global supply shock indicators including model-based supply shocks, supply-chain pressure indices, shipping costs, geopolitical risk, and shortage news indices.	Authors' calculation based on multiple sources
Model-based Global Supply Shock	Structural supply shock identified from the global FAVAR model of Forbes, Ha, and Kose (2026a), using sign restrictions consistent with supply disturbances (higher inflation, lower output).	Forbes, Ha, and Kose (2026a)
Global Supply Chain Pressure Index (GSCPI)	Composite index capturing global supply-chain disruptions based on shipping costs, delivery times, and order backlogs.	Federal Reserve Bank of New York (Benigno et al., 2022)
Baltic Dry Index (BDI)	Index of global shipping costs for bulk commodities, used as an indicator of global transport constraints and supply bottlenecks.	Baltic Exchange / Refinitiv
Geopolitical Risk Index (GPR)	News-based index measuring geopolitical tensions, including wars, conflicts, and geopolitical threats.	Caldara and Iacoviello (2022)
Global Shortage Index	News-based indicator tracking shortages in energy, food, labor, and industrial inputs across countries.	Caldara et al. (2025)
Oil Supply and Demand Shock	Structural oil supply shocks identified using the methodology of Kilian (2009) and Baumeister and Hamilton (2019).	Baumeister and Hamilton (2019)
Global Output	Global industrial production index used as a proxy for global economic activity.	Authors' calculation based on cross-country data, Forbes, Ha, Kose (2026a)
Global Inflation	Global consumer price inflation constructed as a weighted average across major economies.	
Global Interest Rate	Global short-term interest rate constructed as a GDP-weighted average of policy rates in major advanced economies.	
Domestic Output	Industrial production index for each country, used as a proxy for real economic activity.	OECD, Havers Analytics
Domestic Inflation	Consumer price index (CPI) inflation for each country.	OECD, Havers Analytics
Domestic Interest Rate	Shadow interest rates, overnight interest rates, or policy interest rate.	Krippner (2013), BIS, Haver Analytics
Inflation Expectations	One-year-ahead inflation expectations from surveys of professional forecasters or consensus forecasts.	Authors' calculations based on Consensus Economics
Core Inflation	CPI excluding food and energy components, used as a proxy for underlying inflation dynamics.	OECD, Havers Analytics
Exchange rate	Exchange rate per US dollar for each country.	Havers Analytics

Appendix B. Measures of Global Supply Shocks

This appendix describes the alternative measures of global supply shocks (as summarized in Section III.1 and **Table A1**) used in the empirical analysis and compares them with the benchmark principal-component-based indicator used in the baseline specification. Because global supply disruptions can arise from multiple sources—including commodity markets, supply-chain constraints, geopolitical events, and shortages of key inputs—we consider several complementary indicators that capture different aspects of global supply disturbances.

B.1 Benchmark Measure: PCA-Based Global Supply Shock

Our benchmark measure of global supply shocks is constructed using principal component analysis (PCA) applied to a set of global indicators capturing supply-side disturbances. The indicators include measures of global supply-chain disruptions, shipping costs, geopolitical risk, commodity supply shocks, and shortage-related indicators. Each series is standardized prior to the PCA estimation.

The first principal component extracted from this set of indicators is interpreted as the common global supply shock factor. This approach allows us to summarize information contained in multiple supply-related variables while minimizing idiosyncratic noise in individual series. The resulting index captures broad global disruptions that simultaneously affect production costs, supply chains, and commodity markets. The first principal component is normalized to have unit variance so that the resulting impulse responses can be interpreted as the effects of a one-standard-deviation global supply shock. The sign of the factor is chosen such that positive realizations correspond to adverse global supply disturbances associated with stronger inflationary pressures and supply constraints. This normalization facilitates comparisons across alternative global supply shock measures considered in the paper and provides a consistent benchmark for the impulse-response analysis.

The first principal component explains on average 30 percent---ranging from 5 percent to 70 percent---of the total variation across the seven standardized supply-shock indicators. All factor loadings are positive, indicating that the various indicators capture a common component of adverse global supply disturbances. The estimated loadings further suggest that the common factor is driven primarily by model-based global supply shocks, oil supply shocks, supply-chain disruptions, and trade- and shortage-related shocks, while geopolitical risk and shipping-cost indicators contribute relatively little. These results indicate that the PCA-based measure captures the broad inflationary and cost-push component that is common across different types of global supply disturbances rather than reflecting any single underlying indicator.

The PCA-based measure has several advantages. First, it incorporates information from multiple sources of supply disturbances rather than relying on a single indicator. Second, it provides a parsimonious summary of global supply conditions that can be consistently constructed over long sample periods. Third, it mitigates measurement error associated with individual series by extracting the dominant common component across indicators. The correlations of the PCA measure with each individual measure below range from 0.05 to 0.76, consistent with factor loadings.

B.2 Oil Price Shocks

Oil-related shocks represent one of the most widely studied forms of global supply disturbances and have long been viewed as an important source of inflationary pressure and macroeconomic fluctuations (Hamilton, 1983; Kilian, 2009; Baumeister and Hamilton, 2019). To capture this dimension of global supply conditions, we employ the oil-shock measure developed in Forbes, Ha, and Kose (2026a). The measure is identified within a global FAVAR framework using sign restrictions on global macroeconomic variables, allowing the shock to isolate disturbances that generate the characteristic responses associated with adverse oil-market supply disruptions.

Oil-related supply shocks can arise from geopolitical conflicts, production cuts, sanctions, or other disruptions to global energy markets. Because oil remains a key input into transportation, manufacturing, and energy production, such shocks raise production costs across a broad range of sectors and are closely linked to cost-push inflation dynamics. Historically, oil shocks have played a central role in episodes of global inflation and monetary-policy tightening.

While oil-related shocks remain an important component of global supply disturbances, they capture only one dimension of the broader supply-side disruptions affecting modern economies. Consequently, our baseline PCA-based measure incorporates oil shocks together with a range of other indicators—including supply-chain disruptions, geopolitical risks, and shortage-related measures—to construct a broader measure of global supply conditions.

B.3 Supply-Chain Disruptions

Another important source of global supply shocks arises from disruptions in international production networks. Global supply chains have become increasingly complex and geographically fragmented, making them vulnerable to shocks affecting transportation, logistics, and intermediate-input production. To capture these disruptions, we employ the Global Supply Chain Pressure Index (GSCPI) compiled by the Federal Reserve Bank of New York (Benigno et al., 2022). The GSCPI combines information from transportation costs, delivery times, shipping conditions, and manufacturing-sector surveys to provide a comprehensive measure of pressures in global supply chains. Higher values of the index indicate greater disruptions to the flow of goods and intermediate inputs through international production networks.

Supply-chain disruptions became particularly prominent during the COVID-19 pandemic, when lockdowns, port congestion, transportation bottlenecks, and shortages of critical intermediate inputs severely constrained global production. These disruptions generated substantial increases in production costs and contributed to elevated inflation across many economies. More broadly, the GSCPI provides a useful measure of supply-side pressures that extend beyond commodity markets and capture disruptions affecting the broader global production system.

B.4 Geopolitical Risk

Geopolitical tensions represent an important source of global supply disturbances. Conflicts, wars, and geopolitical instability can disrupt trade routes, restrict access to key commodities, and generate uncertainty about future production conditions.

To measure such shocks, we use the geopolitical risk (GPR) index developed by Caldara and Iacoviello (2022), which is based on the frequency of geopolitical-risk-related terms in major international newspapers. Importantly, we decompose the GPR index into two components: a threat-based measure capturing rising geopolitical tensions and perceived risks of conflict, and a realized (actual) measure capturing the materialization of geopolitical events such as wars, military actions, or terrorist attacks.

This decomposition allows us to distinguish between shocks that primarily reflect heightened uncertainty and those that correspond to realized disruptions to economic activity. Threat-based GPR shocks are more closely associated with uncertainty and precautionary behavior, affecting investment and consumption decisions without necessarily generating immediate supply constraints. By contrast, realized geopolitical shocks are more likely to disrupt production, trade flows, and energy markets directly, thereby generating cost-push pressures. Examples of realized geopolitical shocks include the Gulf War, conflicts in the Middle East, and the Russia–Ukraine war, which have been associated with significant disruptions in global energy markets and trade. In contrast, periods of elevated geopolitical threat without immediate conflict—such as rising tensions in strategic regions—are primarily reflected in the threat-based component of the GPR index.

In our empirical analysis, this distinction proves important for understanding monetary policy responses. While both components capture aspects of geopolitical risk, they differ in their transmission channels and macroeconomic implications, allowing us to disentangle the roles of uncertainty-driven versus supply-driven disturbances within the broader class of geopolitical shocks.

B.5 Shortage-Based Indicators

Recent studies emphasize the role of shortages in critical inputs—such as energy, food, industrial materials, semiconductors, and labor—in generating supply disruptions and inflationary pressures. These shortages may arise from production constraints, logistical bottlenecks, trade restrictions, or shifts in global demand patterns.

To capture these developments, we employ the news-based shortage indicators developed by Caldara et al. (2025). These measures are constructed using textual analysis of major international news sources and track the prevalence of reports related to shortages across a range of sectors, including energy, food, industrial inputs, and labor markets. Higher values indicate a greater incidence of reported shortages and therefore more severe supply constraints.

Shortage indicators are particularly useful because they capture dimensions of supply disruptions that may not be fully reflected in commodity prices, oil markets, or transportation costs. By focusing on sector-specific shortages reported in real time, they provide a broader measure of supply constraints affecting production capacity, input availability, and pricing pressures throughout the economy. As a result, they complement traditional measures of global supply shocks and help identify episodes in which shortages in specific sectors become an important source of inflationary pressure.

B.6 Trade-Related Supply Shocks

Trade policies and trade frictions can generate supply disruptions by affecting access to imported inputs, altering relative prices, and disrupting international production networks. Changes in trade conditions may raise production costs, reduce the availability of intermediate goods, and increase uncertainty regarding future trade relationships. To capture these effects, we consider several trade-related indicators, including the world trade volume index, the global terms-of-trade measure, and the global trade policy uncertainty index. The world trade volume index captures fluctuations in global trade activity, while the terms-of-trade measure reflects changes in relative import and export prices that can affect production costs and external competitiveness. The trade policy uncertainty index captures uncertainty arising from tariffs, trade disputes, and other policy actions affecting international commerce.

These indicators provide complementary measures of trade-related disruptions that may influence both supply conditions and aggregate demand. Unlike traditional commodity-price or supply-chain measures, trade-related indicators capture shocks operating through changes in global trade flows, relative prices, and policy uncertainty, thereby affecting production capacity, investment decisions, and inflationary pressures across countries.

B.7 Model-Based Aggregate Supply Shocks

In addition to the price-, quantity, or new-based indicators described above, we also consider model-based measures of global supply shocks derived from structural macroeconomic frameworks. These shocks are identified within estimated models that explicitly impose economic restrictions to disentangle supply-side disturbances from demand-driven fluctuations.

Specifically, model-based aggregate supply shocks are constructed using structural vector autoregressions (SVARs) or related frameworks that impose sign, zero, or narrative restrictions to isolate exogenous shifts in production costs or productive capacity. These shocks are typically identified as disturbances that raise inflation while reducing output, consistent with the standard definition of cost-push or adverse supply shocks in New Keynesian models. A key advantage of model-based measures is that they provide a theoretically grounded decomposition of macroeconomic fluctuations. By explicitly accounting for the joint behavior of inflation, output, and other macroeconomic variables, these approaches allow for a more direct mapping between empirical shocks and structural economic concepts. In particular, they distinguish supply shocks from demand shocks even when both affect similar observables, thereby addressing potential identification challenges present in reduced-form indicators.

In our empirical analysis, we include model-based supply shocks as identified in Forbes, Ha, and Kose (2026a) as part of the set of alternative measures used to construct the benchmark PCA factor. We also examine their individual effects to assess whether monetary policy responses differ when supply disturbances are identified through structural macroeconomic models rather than through observable indicators. The results indicate that model-based supply shocks generally exhibit similar stagflationary properties—raising inflation and reducing output—although their quantitative effects and associated policy responses may differ from those implied by broader indicator-based measures.

Appendix C. Derivation of the policy rule (discretion)

Consider the standard New Keynesian system:

$$\pi_t = \beta \mathbb{E}_t \pi_{t+1} + \kappa x_t + u_t,$$

$$x_t = \mathbb{E}_t x_{t+1} - \sigma(i_t - \mathbb{E}_t \pi_{t+1} - r_t^n),$$

and the per-period loss function under discretion:

$$\min_{\{x_t\}} \pi_t^2 + \lambda x_t^2,$$

taking $\mathbb{E}_t \pi_{t+1}$, $\mathbb{E}_t x_{t+1}$, u_t, and r_t^n as given at time t.

Using the Phillips curve constraint, inflation can be written as a function of x_t:

$$\pi_t(x_t) = \beta \mathbb{E}_t \pi_{t+1} + \kappa x_t + u_t.$$

Substituting into the loss function yields:

$$\min_{x_t} (\beta \mathbb{E}_t \pi_{t+1} + \kappa x_t + u_t)^2 + \lambda x_t^2.$$

First-order condition. Differentiating with respect to x_t gives:

$$2(\beta \mathbb{E}_t \pi_{t+1} + \kappa x_t + u_t)\kappa + 2\lambda x_t = 0,$$

or equivalently, $\kappa \pi_t + \lambda x_t = 0$.

This delivers the standard targeting rule:

$$x_t = -\frac{\kappa}{\lambda}\pi_t.$$

To obtain the implied interest rate rule, rearrange the IS equation:

$$i_t = r_t^n + \mathbb{E}_t \pi_{t+1} + \frac{1}{\sigma}(\mathbb{E}_t x_{t+1} - x_t).$$

Substituting the targeting rule into $-x_t/\sigma$ yields:

$$i_t = r_t^n + \mathbb{E}_t \pi_{t+1} + \frac{1}{\sigma}\mathbb{E}_t x_{t+1} + \frac{\kappa}{\sigma\lambda}\pi_t.$$

Finally, under discretion (or in a baseline presentation), it is common to use the approximation $\mathbb{E}_t x_{t+1} \approx 0$ (e.g., when focusing on the contemporaneous policy response around steady state), which yields:

$$i_t = r_t^n + \mathbb{E}_t \pi_{t+1} + \frac{\kappa}{\sigma\lambda}\pi_t.$$

Appendix D. Further Analyses on Determinants of Monetary Policy Response

D1. Cross-Correlations between Monetary Policy and Macro-Financial Responses

This appendix provides a complementary perspective on the determinants of monetary policy responses by examining the cross-shock correlation between interest-rate responses and the responses of other macroeconomic and financial variables. Each observation corresponds to the cumulative IRFs (CIRFs) associated with a particular global supply shock measure. The objective is to assess which dimensions of the macroeconomic response are most closely associated with monetary policy tightening across different types of global supply disturbances.

Figure D1 (Panel A) reports correlations based on the raw CIRFs. A clear pattern emerges: interest-rate responses are most strongly correlated with inflation responses. The estimated relationship is positive and economically large, with inflation explaining more than 60 percent of the variation in policy-rate responses across shocks. This result is consistent with the central finding of the paper that inflation stabilization remains the primary objective guiding monetary policy responses to global supply shocks. Inflation expectations also exhibit a sizable positive correlation with policy responses, with an R-squared of around 0.4. Output, exchange rates, and equity prices display correlations of a similar magnitude, suggesting that monetary policy reacts systematically to broader macroeconomic and financial conditions as well. However, the correlations in Panel A may mainly reflect differences in the overall magnitude of the underlying shocks. Larger global supply shocks naturally generate larger responses across all variables, potentially inflating the measured correlations. To address this issue, Panel B normalizes all responses by the corresponding inflation response, thereby controlling for differences in shock size and focusing on variation in transmission mechanisms across shocks.

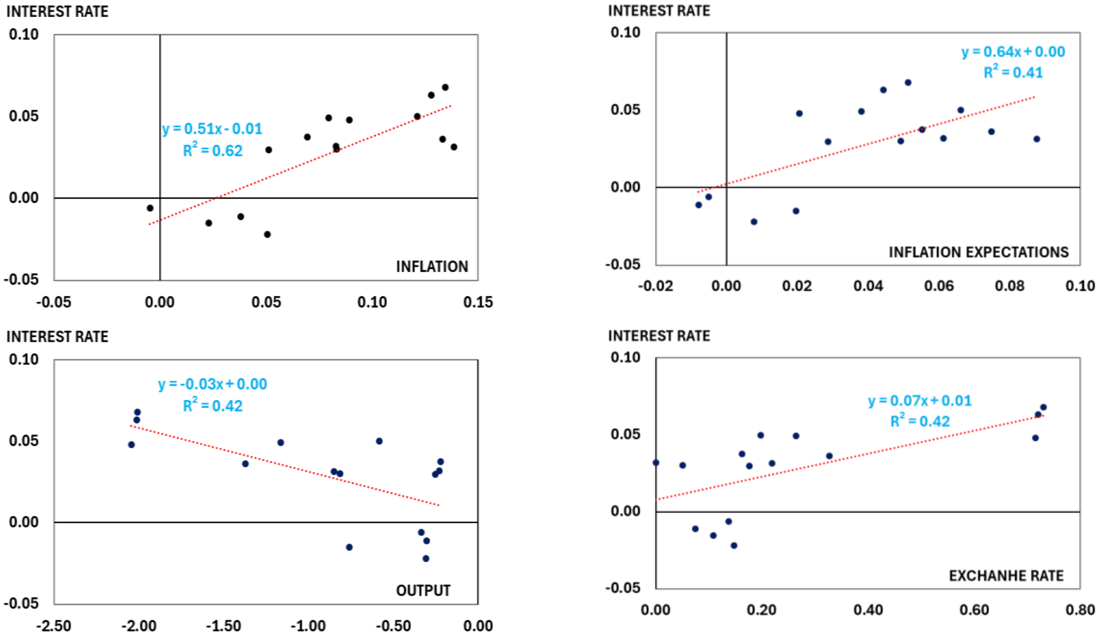
Panel B reveals a more nuanced picture. Inflation expectations continue to display a positive and economically meaningful relationship with monetary policy responses, with R-squared values remaining in the range of 0.2–0.4. Exchange-rate responses also retain a sizable positive correlation with policy tightening. By contrast, the explanatory power of output and equity-price responses declines substantially after normalization. The corresponding R-squared values fall markedly, indicating that much of the correlation observed in Panel A reflects common variation in shock size rather than an independent role for real activity or financial-market conditions. At the same time, Panel B suggests the possibility of non-linear relationships between monetary policy responses and both output and equity-price outcomes. As illustrated by the separate trend lines, relatively small shocks appear to be associated with a positive relationship between policy rates and real or financial conditions, consistent with central banks partially accommodating supply shocks to mitigate economic downturns or financial instability. For larger shocks, however, the relationship becomes negative, suggesting that central banks place greater weight on inflation stabilization and inflation expectations when supply disturbances become sufficiently severe.

These results should be interpreted with caution because they are based on a relatively small number of global supply shock measures. Consequently, the analysis is best viewed as suggestive rather than conclusive.

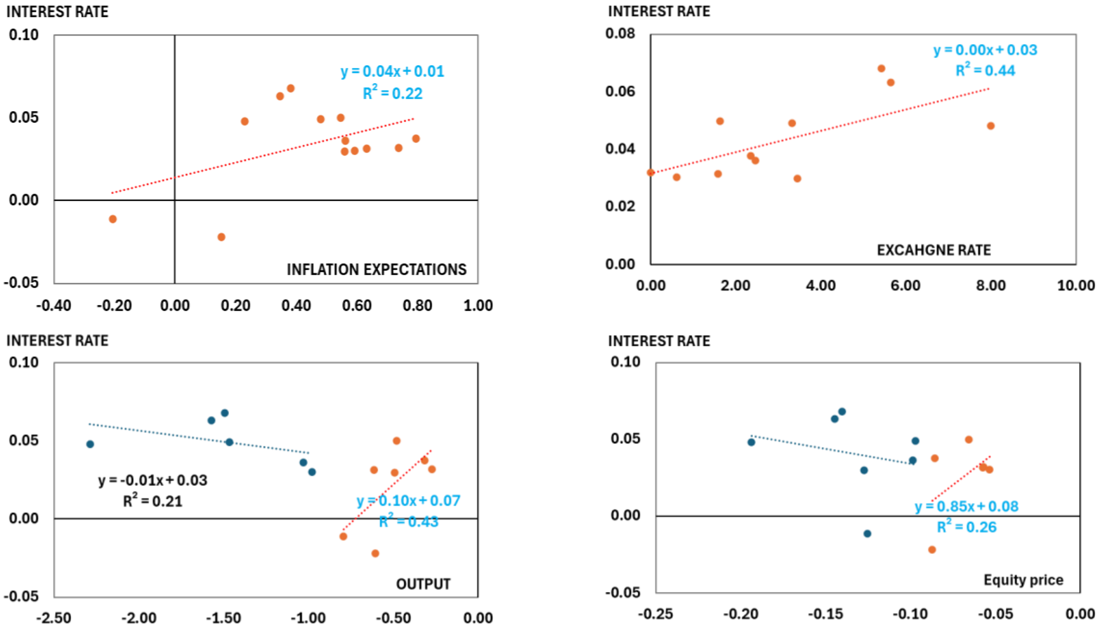
Figure D1. Cross-Shock Correlations between IRFs of Interest-Rate and Other Variables

(Panel SVAR; Various global supply shocks; average across 8 ASEAN+3 economies; 1999-2024)

A. Scatter plot: raw IRFs



B. Scatter plot: controlling shock size



Note: This figure examines the relationship between monetary policy responses and the responses of key macroeconomic and financial variables across alternative global supply shock measures. Each observation corresponds to the cumulative impulse response function (IRF) of a particular global supply shock measure estimated from the panel SVAR for 8 ASEAN+3 economies over 1999–2024. The vertical axis reports the cumulative response of the domestic policy interest rate, while the horizontal axis reports the corresponding cumulative response of inflation, inflation expectations, output, exchange rates, or equity prices. Panel A uses the raw cumulative IRFs. Because the magnitude of identified shocks differs across measures, Panel B controls for shock size by normalizing all variable responses by the corresponding inflation response to each shock. The fitted lines report simple OLS relationships, and the reported R^2 values summarize the strength of the cross-shock correlation. Positive slopes indicate that stronger responses of a given variable are associated with stronger monetary policy tightening following global supply shocks.

D2. Drivers of Monetary Policy Heterogeneity: The Phillips Curve Slope

The slope of the Phillips curve governs the inflation–output tradeoff faced by monetary policymakers and is therefore a key determinant of optimal policy responses to supply shocks. In New Keynesian models, a steeper Phillips curve implies that inflation responds more strongly to changes in economic activity, making inflation stabilization relatively less costly in terms of output. Conversely, when the Phillips curve is flat, inflation becomes more "stubborn," and aggressive monetary tightening entails larger output losses.

Econometric exercise. Let ε_t^{GD} denote a global demand shock identified following Forbes, Ha, and Kose (2026a). For each country i, we compute IRFs of inflation and output to this shock:[33]

$$IRF_{\pi,i}^{GD}(h) \equiv \frac{\partial \pi_{i,t+h}}{\partial \varepsilon_t^{GD}}, IRF_{y,i}^{GD}(h) \equiv \frac{\partial y_{i,t+h}}{\partial \varepsilon_t^{GD}}$$

We construct a proxy for the Phillips curve slope using the ratio of inflation and output responses:

$$\hat{\kappa}_i \equiv \frac{\max_{h \le H} IRF_{\pi,i}^{GD}(h)}{\max_{h \le H} IRF_{y,i}^{GD}(h)}$$

For a demand expansion, a higher value of $\hat{\kappa}_i$ indicates that inflation responds more strongly for a given output movement, corresponding to a steeper Phillips curve. To assess whether monetary policy responses depend on the Phillips curve slope, we condition policy-rate responses to global supply shocks on $\hat{\kappa}_i$. We split the sample into "steep" and "flat" Phillips curve groups based on the distribution of $\hat{\kappa}_i$:

$$\mathcal{G}^{Steep} = \{i: \hat{\kappa}_i \ge q_{0.95}(\hat{\kappa})\}, \mathcal{G}^{Flat} = \{i: \hat{\kappa}_i \le q_{0.05}(\hat{\kappa})\}$$

We then compute group-average monetary policy responses:

$$IRF_r^{Steep}(h) = \frac{1}{|\mathcal{G}^{Steep}|} \sum_{i \in \mathcal{G}^{Steep}} IRF_{r,i}^{GS}(h), \qquad IRF_r^{Flat}(h) = \frac{1}{|\mathcal{G}^{Flat}|} \sum_{i \in \mathcal{G}^{Flat}} IRF_{r,i}^{GS}(h)$$

The theoretical prediction is that, when the Phillips curve is steep, inflation reacts strongly to real activity, making inflation stabilization easier and leading to more aggressive monetary tightening in response to supply-driven inflationary pressures:

$$IRF_r^{Steep}(h) - IRF_r^{Flat}(h) > 0, \text{for relevant } h$$

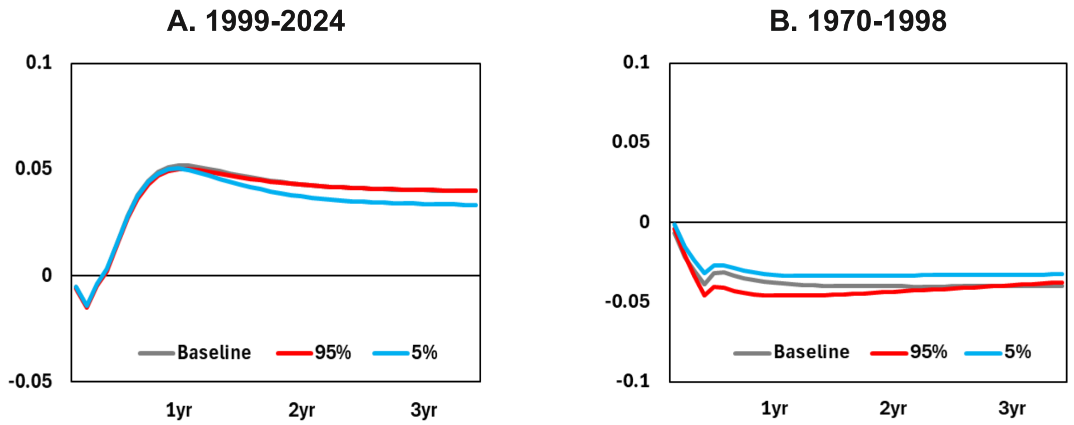
[33] The results are qualitatively unchanged when domestic demand (DD) shocks are used instead of global demand shocks to construct the conditional Phillips-curve measure. We focus on global demand shocks in the baseline specification because they generate larger and more persistent responses of domestic inflation and output across the sample economies (Forbes, Ha, and Kose 2026), thereby providing a clearer measure of the inflation–output tradeoff underlying the Phillips curve. The corresponding results based on domestic demand shocks are very similar and are available upon request.

Empirical results. Figure D2 examines whether monetary policy responses to global supply shocks depend on the relative strength of inflation and output responses, which serves as a proxy for the inflation–output tradeoff associated with the Phillips curve. For the post-1999 period, conditional interest-rate responses exhibit only modest differences across inflation–output states. Monetary policy tightening is slightly stronger when inflation rises more relative to output losses, but the differences are economically small and not statistically significant. This suggests that variation in the effective Phillips-curve slope plays at most a limited role in explaining heterogeneity in monetary policy responses during the inflation-targeting era.

The results for 1970–1998 (panel B) are qualitatively similar. Although policy responses were generally more accommodative during this earlier period, the conditional IRFs show little systematic variation across inflation–output states and the differences are likewise statistically insignificant. Taken together, the evidence provides only weak support for the view that cross-country or cross-episode differences in the inflation–output tradeoff are an important determinant of monetary policy responses to global supply shocks. Relative to inflation expectations, inflation persistence, and other transmission mechanisms examined in previous sections, the Phillips-curve channel appears to play a comparatively minor role.

Figure D2. IRF of interest rates conditional on inflation/output responses

(Percentage points; Panel SVAR; PCA GS shock; 8 ASEAN+3 economies)



Note: This figure reports conditional impulse response functions (IRFs) of the policy interest rate to a global supply shock, estimated from panel SVARs for ASEAN+3 economies. Global supply shocks are identified using the PCA-based composite measure. Interest-rate responses are conditioned on the relative inflation-output response to the externally identified global demand shock (source: Forbes et al. 2026), measured as the ratio of cumulative inflation responses to cumulative output responses across posterior draws. For each period, the policy-rate IRF is evaluated at the 95th percentile (red line) and the 5th percentile (blue line) of the conditioning distribution, relative to the baseline IRF (gray line). Higher values of the conditioning variable correspond to episodes in which inflation rises more relative to output losses following a global supply shock. Differences between the conditional IRFs therefore provide evidence on whether monetary policy responds more aggressively when inflationary pressures dominate real-side effects. Panel A reports results for 1999–2024, while Panel B reports results for 1970–1998.

D3. Drivers of Monetary Policy Heterogeneity: Interest-Rate Sensitivity of Output

The sensitivity of output to interest rates is another key structural determinant of optimal monetary policy responses to supply shocks. In standard New Keynesian models, a steeper IS curve—corresponding to a stronger response of output to changes in real interest rates—reduces the amount of policy tightening required to stabilize inflation following an adverse supply disturbance. Conversely, when output is relatively insensitive to interest rates, larger policy rate adjustments are needed to achieve a given degree of disinflation. In this section, we examine whether monetary policy responses to global supply shocks depend on the slope of the IS curve.

Econometric exercise. Let ε_t^{MP} denote an exogenous domestic monetary policy shock, identified following Forbes, Ha, and Kose (2026a). For each country i, we compute impulse responses of output and the policy rate to this shock:

$$IRF_{y,i}^{MP}(h) \equiv \frac{\partial y_{i,t+h}}{\partial \varepsilon_t^{MP}}, IRF_{r,i}^{MP}(h) \equiv \frac{\partial r_{i,t+h}}{\partial \varepsilon_t^{MP}}$$

We summarize interest-rate sensitivity using the ratio

$$\hat{\sigma}_i \equiv -\frac{\min_{h \le H} IRF_{y,i}^{MP}(h)}{\max_{h \le H} IRF_{r,i}^{MP}(h)}$$

A higher value of $\hat{\sigma}_i$ indicates that a given increase in the policy rate induces a larger contraction in output, corresponding to a steeper IS curve. To assess whether interest-rate sensitivity affects policy responses to global supply shocks, we condition monetary policy responses on $\hat{\sigma}_i$. We split countries into "high-σ" and "low-σ" groups based on the distribution of $\hat{\sigma}_i$:

$$\mathcal{G}^{High\sigma} = \{i: \hat{\sigma}_i \ge q_{0.95}(\hat{\sigma})\}, \mathcal{G}^{Low\sigma} = \{i: \hat{\sigma}_i \le q_{0.05}(\hat{\sigma})\}$$

We then compute group-average monetary policy responses:

$$IRF_r^{High\sigma}(h) = \frac{1}{|\ \mathcal{G}^{High\sigma}\ |} \sum_{i \in \mathcal{G}^{High\sigma}} IR\,F_{r,i}^{GS}(h),$$

$$IRF_r^{Low\sigma}(h) = \frac{1}{|\ \mathcal{G}^{Low\sigma}\ |} \sum_{i \in \mathcal{G}^{Low\sigma}} IR\,F_{r,i}^{GS}(h)$$

The theoretical prediction is that, when output is more sensitive to interest rates, central banks require less aggressive tightening to counter inflationary pressures:

$$IRF_r^{High\sigma}(h) < IRF_r^{Low\sigma}(h), \text{ for relevant } h$$

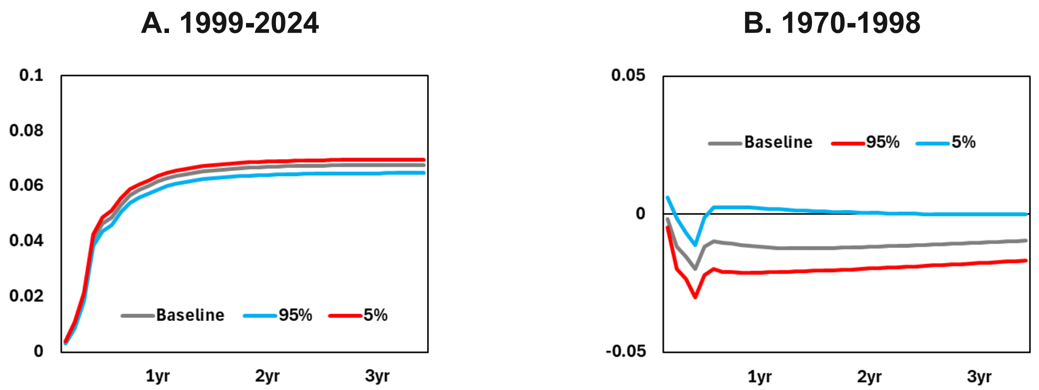
Empirical results. Figure D3 examines whether monetary policy responses to global supply shocks depend on the sensitivity of output to interest rates, as captured by the slope of the IS curve. For the post-1999 period, conditional interest-rate responses show very little variation across high- and low-sensitivity states. Monetary policy tightening following global supply shocks is broadly similar regardless of whether output responds strongly or weakly to interest-rate movements, and the differences across conditional IRFs are economically small and statistically insignificant. This finding is consistent with the results in Section V.1, which indicate that output stabilization plays only a limited role in explaining monetary policy responses during the inflation-targeting era. When central banks place greater weight on inflation stabilization and inflation expectations, differences in the strength of the output transmission channel are unlikely to have a major influence on policy decisions.

The results for 1970–1998 are more suggestive. Although the conditional differences remain modest, they are noticeably larger than those observed in the post-1999 sample. In particular, monetary policy responses tend to be more accommodative when output is highly sensitive to interest-rate changes, consistent with the idea that central banks were more concerned about the output costs of tightening during this earlier period. This pattern accords with the broader evidence presented in Section IV that output considerations played a more important role in monetary policy decisions before the widespread adoption of inflation-targeting frameworks.

Taken together, the results suggest that the slope of the IS curve is not a major determinant of monetary policy responses in the post-1999 period, but it may have played a more meaningful role when output stabilization objectives were more prominent. Relative to inflation expectations and inflation persistence, however, the quantitative importance of the IS-curve channel remains limited throughout the sample.

Figure D3. Impulse response of interest rates conditional on IS curve

(Percentage points; Panel SVAR; PCA GS shock; 11 advanced economies and 8 ASEAN+3 economies)



Note: This figure reports conditional impulse response functions (IRFs) of the domestic policy interest rate to a global supply shock, estimated from panel SVARs. Global supply shocks are identified using the PCA-based composite measure. Interest-rate responses are conditioned on the sensitivity of output to monetary policy shocks, which serves as a proxy for the slope of the IS curve. Conditional IRFs are constructed by partitioning posterior draws according to whether output responses to monetary policy shocks (identified based on Forbes et al. 2026) are relatively more or less sensitive to interest-rate movements. The policy-rate IRF is evaluated at the 95th percentile and 5th percentile of the conditioning distribution, corresponding to high- and low-interest-rate sensitivity states, respectively, and compared with the baseline IRF (gray line).

D4. Determinants of Monetary Policy Responses: Regression analysis

As a complement to the conditional impulse response analysis, this appendix examines the relationship between monetary-policy responses and key macroeconomic variables using simple bivariate regressions. While the conditional-IRF framework is preferred because it preserves the identified shock structure and allows for state-dependent responses, the regression approach provides a useful reduced-form summary of the associations between policy-rate responses and other variables across posterior draws. The results are summarized in **Table D1**.

Table D1. Bivariate Regressions of Monetary Policy Responses

Variable	Coefficient	t-statistic	R²
INF	0.3245***	17.93	0.097
GDP	-0.0035**	-2.32	0.002
EXP	0.9356***	70.56	0.624
FX	0.0166***	3.17	0.003
Persistence	0.0541***	9.86	0.089
P-curve	0.0638***	3.99	0.005
IS-curve	0.0206	1.76	0.001

Note: This table reports simple bivariate regressions of cumulative monetary-policy responses on cumulative responses of selected variables following global supply shocks. The underlying observations are posterior draws from the panel SVAR estimated over the post-1999 sample. INF, GDP, EXP, FX, Persistence, P-curve, and IS-curve denote the responses of inflation, output, inflation expectations, exchange rates, inflation expectations-transmission persistence, the Phillips-curve slope proxy, and the interest-rate sensitivity of output (IS-curve proxy), respectively. Coefficients measure the association between policy-rate responses and each conditioning variable. R^2denotes the explanatory power of each regression. Statistical significance is indicated by *** $p < 0.01$ and ** $p < 0.05$.

The results are highly consistent with the conditional-IRF analysis in the main text. Inflation expectations emerge as by far the strongest predictor of monetary-policy responses. The coefficient on inflation expectations is positive and highly significant, with an R² of 0.62, substantially larger than for any other variable. Inflation itself also exhibits a positive and statistically significant relationship with policy-rate responses, although its explanatory power is considerably smaller. Similarly, the persistence measure is positively and significantly related to monetary-policy tightening.

Exchange-rate responses and the Phillips-curve proxy enter with positive and statistically significant coefficients, although their explanatory power is limited. By contrast, output responses display a small but statistically significant negative coefficient. The negative sign is economically intuitive: episodes associated with larger output declines tend to be accompanied by somewhat less monetary tightening, consistent with the notion that central banks partially accommodate adverse supply shocks when the real economic costs become more severe. In other words, policymakers appear willing to moderate the pace of tightening when supply disturbances generate substantial output losses. However, the explanatory power of output responses is small, indicating that variation in output outcomes accounts for little of the heterogeneity in monetary-policy reactions. This finding suggests that, while output stabilization considerations remain relevant at the margin, they are quantitatively far less important than inflation dynamics, inflation expectations, and inflation persistence in shaping policy responses to global supply shocks. Likewise, the demand-sensitivity measure, which captures the slope of the IS curve, is statistically insignificant and contributes almost no explanatory power.

Overall, the regression results closely mirror the ranking obtained from the conditional-IRF analysis: inflation expectations emerge as the dominant determinant of monetary-policy responses, followed by inflation persistence and realized inflation. Exchange-rate considerations and Phillips-curve effects play secondary roles, while output stabilization concerns and interest-rate sensitivity contribute relatively little.

Appendix E. Robustness and Sensitivity Checks

This appendix presents a series of robustness exercises designed to assess the sensitivity of the main findings to alternative measures of global supply shocks, alternative measures of global and domestic variables, alternative country groups, country-specific estimation, and complementary empirical methodologies on the role of structural factors in explaining interest rate responses (**Figure E1**). Overall, the results confirm the central conclusions of the paper: monetary policy responses to global supply shocks are overall positive (i.e. tightening) and depend critically on the inflationary content and persistence of the underlying disturbance, with inflation expectations playing a particularly important role in shaping policy reactions.

Alternative Measures of Global Supply Shocks. The main analysis employs a benchmark PCA-based global supply shock measure that aggregates information from a broad set of indicators, including oil-market disturbances, supply-chain disruptions, shortages, and trade-related shocks. To ensure that the results are not driven by the construction of the composite index, as explained in Sections IV.3 and VII.2, we re-estimate empirical models using a wide range of alternative global supply shock measures.

These measures include model-based global supply shocks, oil supply shocks identified using sign restrictions, the Global Supply Chain Pressure Index (GSCPI), shipping-cost indicators, geopolitical risk measures, economic-shortage indices, and trade-related indicators such as world trade volumes, terms of trade, and trade policy uncertainty. Across these alternative specifications, the key qualitative findings remain unchanged. Adverse global supply shocks are generally associated with tighter monetary policy responses despite their contractionary effects on output, although the magnitude of policy tightening varies considerably across shock types.

Importantly, the heterogeneity in monetary policy responses aligns closely with differences in the persistence and composition of the underlying shocks. Measures associated with broad-based and persistent inflationary pressures—such as oil supply disruptions, supply-chain bottlenecks, and energy- and food-shortage shocks—elicit stronger policy tightening. By contrast, shocks containing larger demand-compression or uncertainty components—such as geopolitical risk shocks and Baltic Dry Index shocks—are associated with weaker or more accommodative policy responses.

Alternative Measures of Global and Domestic Variables. To assess the robustness of the baseline findings, we re-estimate the panel SVAR using alternative measures of both global and domestic variables. First, we replace the benchmark dynamic-factor measure of global supply shocks with a weighted-average index constructed directly from the underlying cross-country indicators. The resulting policy-rate responses remain qualitatively unchanged, indicating that the findings are not sensitive to the specific aggregation methodology used to construct the global supply shock measure.

Second, we consider alternative definitions of key domestic variables. We replace headline CPI inflation with core CPI inflation, bilateral exchange rates against the U.S. dollar with nominal effective exchange rates (NEERs), and overnight market rates (or shadow rates) with policy rates that more closely reflect the intended stance of monetary policy (despite less variability). [34]Across these alternative specifications, the responses of policy interest rates remain broadly consistent with the baseline results. Importantly, robustness extends beyond interest-rate responses. The estimated responses of inflation and exchange rates under the alternative specifications closely resemble those obtained in the benchmark model (not shown). This finding suggests that the baseline results are not driven by specific measurement choices for domestic variables and that the transmission of global supply shocks is robust across alternative definitions of inflation, exchange rates, and monetary policy instruments.

Alternative Country Groups. To assess whether the benchmark results are driven by the inclusion of large regional economies or by differences in monetary policy frameworks, we re-estimate the panel SVAR for alternative country groups.

First, we restrict the sample to the five ASEAN economies, excluding China, Japan, and Korea. The results remain broadly consistent with the baseline findings. Adverse global supply shocks continue to generate positive and statistically significant increases in policy interest rates, indicating that the baseline results are not driven by the larger economies in the ASEAN+3 group. Second, we estimate the model for economies with explicit inflation-targeting (IT) frameworks, including Indonesia, Japan, Korea, Thailand, and the Philippines. The results for this subsample reveal somewhat stronger and more persistent policy-rate responses to global supply shocks, consistent with the greater emphasis placed on price stability under inflation-targeting regimes. In particular, policy responses appear more closely aligned with inflation dynamics and inflation expectations, reinforcing the paper's central finding that monetary policy reactions are shaped primarily by the inflationary content and persistence of supply shocks.

Country-Specific Estimation. The benchmark results are obtained from panel SVAR models that exploit both the time-series and cross-sectional dimensions of the ASEAN+3 sample. To assess whether the findings are driven by a small number of economies or by the pooling assumptions inherent in the panel framework, we estimate country-specific SVAR models for each economy.

As briefly explained in Section IV.4, the country-level results broadly confirm the panel evidence while revealing meaningful heterogeneity across monetary policy frameworks. Most economies exhibit systematic monetary tightening following adverse global supply shocks, particularly in the post-1999 period. However, the magnitude and timing of policy responses differ across countries, possibly reflecting differences in monetary policy regimes and exchange-rate arrangements.

Several notable exceptions emerge. A few economies without explicit inflation targeting exhibit more accommodative interest-rate responses to global supply shocks than others. These results are consistent with the distinctive features of their monetary policy frameworks. The economies either conducts monetary policy primarily through exchange-rate management rather than short-term interest rates or their framework places broader emphasis on output

[34] More specifically, shadow policy rates are used for Japan and Korea for the period of 1995-2024. For the remaining economies, overnight money-market rates are used when available over the sample period, while official policy rates are employed for periods or economies where market rates are unavailable or only available in recent years. Compared with overnight market rates (or shadow rates), policy rates more closely reflect the intended stance of monetary policy, although they generally exhibit less month-to-month variation. The baseline results are robust to these alternative definitions of domestic interest rates.

stabilization, credit conditions, and financial stability. Despite these differences, the broad shift toward stronger inflation stabilization in the post-1999 period is evident across most economies.[35]

Alternative Approaches to Explaining Policy Responses. The main text employs conditional impulse response functions (IRFs) to assess how monetary policy responses vary with inflation dynamics, inflation expectations, output responses, exchange-rate movements, and structural transmission parameters. To verify that the conclusions do not depend on the conditional-IRF methodology, we conduct several complementary exercises.

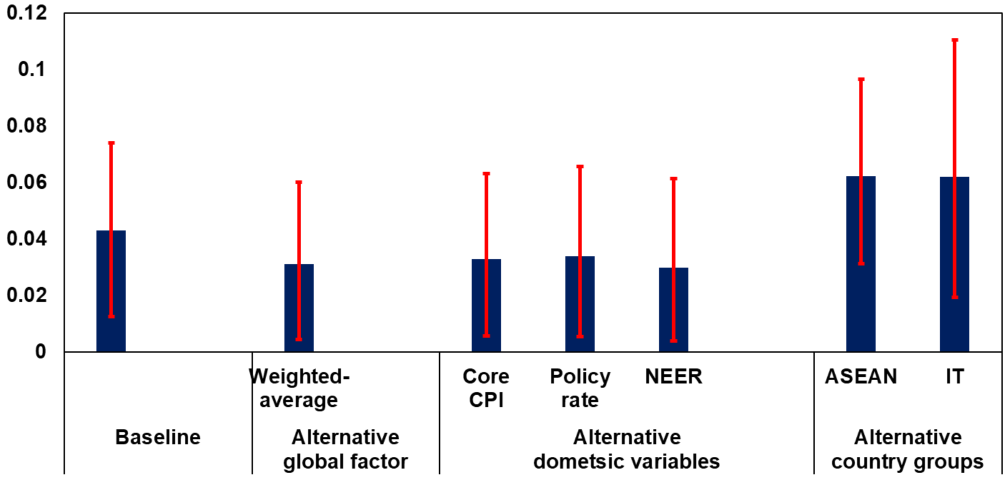
First, we examine cross-shock correlations between cumulative policy-rate responses and the corresponding cumulative responses of key macroeconomic variables (Section D1). Scatter plots reveal that monetary policy responses are most strongly associated with inflation outcomes and inflation expectations, while the relationships with output and exchange-rate responses are considerably weaker. Second, we estimate simple regressions using posterior draws of cumulative impulse responses and structural parameters. The regression results closely mirror the ranking implied by the conditional-IRF analysis (Appendix D4). Inflation responses explain the largest share of the variation in policy-rate responses, followed by inflation expectations and measures of inflation persistence. Exchange-rate responses and output outcomes exhibit statistically significant but economically modest effects, while the Phillips-curve and IS-curve proxies contribute little additional explanatory power.

Taken together, these alternative methodologies reinforce the central message of the paper. Monetary policy responses to global supply shocks are driven primarily by inflation dynamics, inflation expectations, and the persistence of inflationary pressures, rather than by the structural sensitivity of output or inflation to policy changes. The consistency of the results across multiple identification strategies, estimation frameworks, and empirical methodologies strengthens confidence in the robustness of the main findings.

[35] Finally, to assess the external validity of the results, we replicate the analysis for a sample of advanced economies (that are used for the estimation of global factors in this paper). The responses of policy rates, inflation, and exchange rates are qualitatively similar to those observed in the ASEAN+3 economies, although the magnitude of the responses differs somewhat across country groups. Overall, the evidence suggests that the central role of inflation dynamics, inflation expectations, and shock persistence in shaping monetary policy responses to global supply shocks is not specific to ASEAN+3 economies but reflects broader features of modern monetary policy frameworks.

Figure E1. IRF of interest rates: Robustness checks

(Percentage points; Panel SVAR; PCA GS shock; 8 ASEAN+3 economies)



Note: This figure reports cumulative impulse response functions (IRFs) of the domestic policy interest rate to a one-standard-deviation global supply shock, estimated from panel SVAR models for eight ASEAN+3 economies over 1999–2024. The benchmark specification employs the PCA-based composite global supply shock measure and the baseline set of domestic variables. The figure assesses the robustness of the baseline results along three dimensions. First, the second bar replaces the benchmark dynamic-factor measure with a weighted-average global supply shock index constructed directly from the underlying cross-country indicators. Second, the middle three bars consider alternative domestic specifications by replacing headline CPI inflation with core CPI inflation, bilateral exchange rates against the U.S. dollar with nominal effective exchange rates (NEERs), and overnight money-market rates with policy rates. Third, the final two bars examine alternative country samples by restricting the panel to ASEAN economies only and to economies with formal inflation-targeting (IT) regimes. Bars denote posterior median cumulative policy-rate responses, while red error bars indicate 90 percent posterior credible intervals.

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