# *Heaven or Earth?*
# The Evolving Role of Global Shocks for Domestic Monetary Policy

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MIT MANAGEMENT SLOAN SCHOOL

This paper is currently being reorganized and revised. Therefore, we will start with a short presentation that highlights the motivation, structure, and key results from the paper. This should be easier for you review—especially if you have a large number of submissions. Then after the summary slides is an initial draft of the paper. This has all of the technical analysis and key results—but is hard to follow

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## Intro



***Heaven or Earth?***
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***March 20, 2025***

This paper is currently being reorganized and heavily revised. Therefore, we thought it might be easier for you to review a short presentation that highlights where the paper is going—including the motivation, structure, methodology, and key results from the paper. This should be easier for you to assess the main contributions of the paper—especially if you have a large number of submissions to read through. If you would like more details, however, we are including a draft of the paper after this slides. This has all of the technical analysis and key results—but is hard to follow—and we are currently restructuring the whole paper. It will be ready soon (and well in advance of the summer institute).
Please let us know if you have any questions.

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# Motivation



***In this era of hyperglobalisation, are central banks still masters of their domestic monetary destinies? Or have they become slaves to global factors?***

*--- Mark Carney (2015)*

*Prime Minister of Canada, former Governor of BoE and BoC*

***... if you know Heaven and know Earth, you may make your victory complete...***

*--- Sun Tzu (5th century BC)*

*Chinese military strategist, philosopher and author of* The Art of War



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# Motivation



- **Monetary policy decisions have become more synchronized around the world**
  - While many central banks have struggled to meet domestic mandates
- **How important are global and domestic factors to the fluctuations in interest rates (and related macroeconomic variables)?**
  - How have they changed over time (55 years)? Why?
  - How important are different types of global (and domestic) shocks?
  - How does the importance of these shocks vary across dimensions critical for monetary policy?
- **Richer understanding of the shocks behind rates, inflation and growth should improve central bank's ability to set monetary policy**
  - Particularly role of global shocks – growing role & often not differentiated
  - Sun Tzu: need to understand "heaven and earth" to design a successful battle strategy



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# Approach



- **Initial assessment: dynamic factor model estimating role of global factor in explaining movements in interest rates, inflation and output growth**
  - Advanced economies, 1970-2024
- **Main focus: new factor-augmented vector autoregressive model (FAVAR) to identify distinct roles played by 7 different shocks to explain fluctuations in interest rates (and inflation & output)**
  - 4 global shocks (oil prices, demand, supply, monetary policy)
  - 3 domestic shocks (demand, supply, monetary policy)
  - Richer decomposition and analysis than in past work, possible due to longer time-series combined with cross-section, building on Forbes, Ha and Kose (2024)
  - Allows us to address key questions to improve our understanding of the role of global shocks

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# 3 Sets of Questions *on Monetary Policy & Global Shocks*



1. **Has the importance of global shocks changed over time?**
   – Why has the role increased over time? (Larger shocks vs greater country sensitivity?)
2. **Which types of global shocks are more important?**
   – Which global supply shocks matter? (oil/geopolitical risk/supply chain disruptions?)
3. **Does the role of global shocks vary across key dimensions of monetary policy?**
   – Tightening versus easing phases?
   – Interest rates versus inflation and growth?
   – Different countries?

**Overall: Role of global shocks has increased meaningfully over time and a richer understanding is critical for setting optimal monetary policy**

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# 1. The Global Factor



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## Dynamic Factor Model



- **Estimate global common factors for each country *i* in month *t* for**

Interest rates: $R_t^i = \beta_{global}^{R,i} f_t^{R,global} + e_t^{R,i}$

Inflation: $\pi_t^i = \beta_{global}^{\pi,i} f_t^{\pi,global} + e_t^{\pi,i}$

Output growth: $Y_t^i = \beta_{global}^{\pi,i} f_t^{Y,global} + e_t^{Y,i}$

- Monthly data for 1970-2024
- 13 advanced economies (including EA); or 24 economies (including individual EA members, for cross-country analysis)
- Standard variables, shadow rate for interest rates in baseline (policy rate in sensitivity analysis)



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# Identification



$$\begin{bmatrix} u_t^{R,global} \\ u_t^{y,global} \\ u_t^{\pi,global} \\ u_t^{op,global} \\ u_t^{R,domestic} \\ u_t^{y,domestic} \\ u_t^{\pi,domestic} \end{bmatrix} = \begin{bmatrix} + & + & * & * & 0 & 0 & 0 \\ - & + & + & - & 0 & 0 & 0 \\ - & + & - & + & 0 & 0 & 0 \\ * & + & + & + & 0 & 0 & 0 \\ * & * & * & * & + & + & * \\ * & * & * & * & - & + & + \\ * & * & * & * & - & + & - \end{bmatrix} \begin{bmatrix} \varepsilon_t^{GMonPolicy} \\ \varepsilon_t^{GDemand} \\ \varepsilon_t^{GSupply} \\ \varepsilon_t^{GOilPrice} \\ \varepsilon_t^{DMonPolicy} \\ \varepsilon_t^{DDemand} \\ \varepsilon_t^{DSupply} \end{bmatrix}$$

- * = unrestricted initial response.
- Domestic shocks do not affect global variables contemporaneously.
- Global shocks can affect domestic variables without any sign or zero restrictions
- Based on: Uhlig (2005, 2017), Madeira, Madeira, & Monteiro (2023), Dees et al. (2010), Gerlach & Smets (1995); Dolado (2014); Ha et al. (2024); Melolinna (2015); Charnavoki & Dolado, (2014)

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# Key Findings



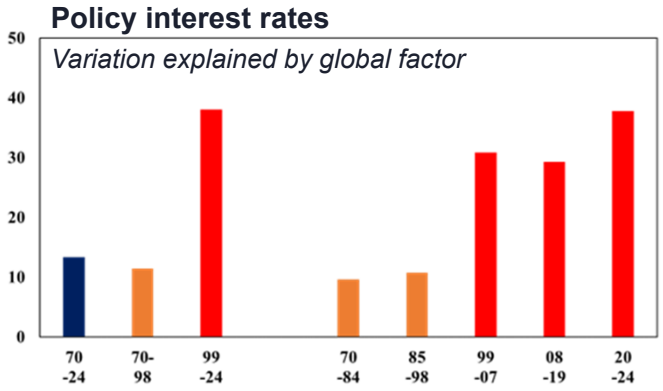
- **Lots of interesting patterns….**
- **One set of results: changes over long historical windows**
  - ***1970-84:*** 2 global recessions; oil price shocks
  - ***1985-98:*** 2 global recessions and series of debt defaults and EM crises
  - ***1999-07:*** ECB launches; tech bubble & 2001 global downturn, lead up to the 2008 GFC
  - ***2008-19:*** GFC & global recession, EA debt crisis, and oil price collapse
  - ***2020-24****:* COVID-19 pandemic and global recession, the Russian invasion of Ukraine and commodity price shock

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# Role of Global Factor Increasing






**Global factor explains ~40% of variation in interest rates over 1999-2024**

- 4x increase since 1970-98
- Not just pandemic window

**Global factor more important for rates than inflation & output**

- Larger increase to higher level (outside pandemic growth fluctuations)

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# *2. Drivers of Interest Rate Cycles*

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# Factor-Augmented VAR (FAVAR) Model



$$B_0 Z_t = \alpha + \sum_{i=1}^{L} B_i Z_{t-i} + \varepsilon_t \qquad \varepsilon_t \sim N(0, \sum_t),$$

$Z_t$ **:** global interest rates, global inflation, global output growth, oil price growth, **domestic interest rates, domestic inflation and domestic output growth**

**$\varepsilon_t$ is a vector of orthogonal structural innovations, with 7 shocks:**

- 4 global shocks: (1) global monetary policy (2) the global demand ; (3) global supply; and (4) oil prices
- 3 domestic shocks (1) domestic monetary policy; (2) domestic demand; (3) domestic supply

Model assumptions and estimation:

- **1970-24, monthly data** with 4 lags; Gibbs sampling, **limited availability for some data in early years**
- Stochastic volatility of the structural shocks
- Shocks are independently (but not identically) distributed across time
- Identification using sign and zero restrictions, building on literature on drivers of inflation and monetary policy
- Related research: Smets & Wouters (2007) ; Del Negro et al. (2013, 2022); Uhlig (2005, 2017); Antolin-Diaz & Rubio-Ramirez (2018); Akinci et al. (2025)

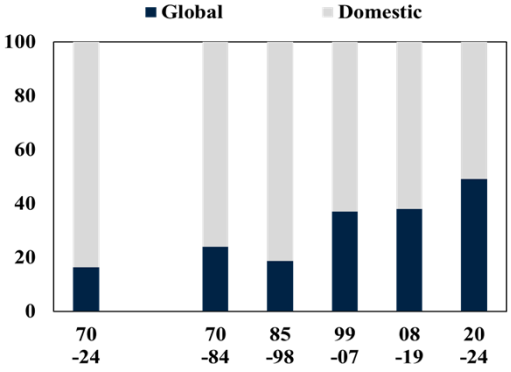
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# 1. Has the Role of Global Shocks Changed over Time?



**Contributions of Shocks to Interest Rate Variation**
*(mean in sample of advance economies)*




- **Role of global shocks has increased over time**
- Role of global shocks>domestic shocks in 2020-24
- Note: contributions varies across economies

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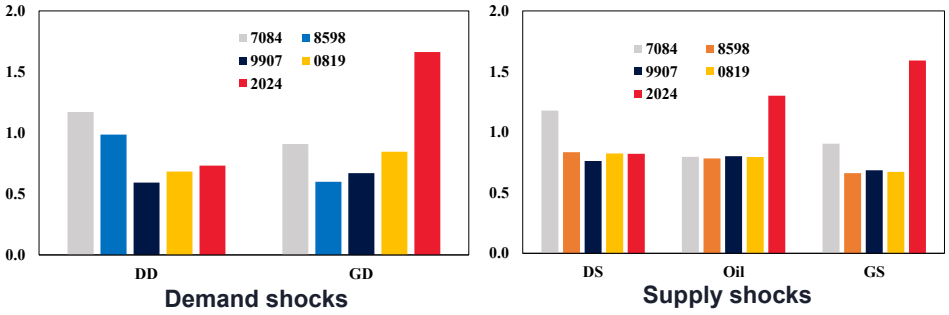
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# 1b. Why Has the Role of Global Shocks Increased?



## Hypothesis #1: Greater volatility of global shocks?

**Shock volatility** ***(Average across economies, long-term volatility = 1)***




**YES!**

- Over time & 2020-24 for global demand
- Over 2020-24 for oil & global supply

****Note—data limited for 1970-84**

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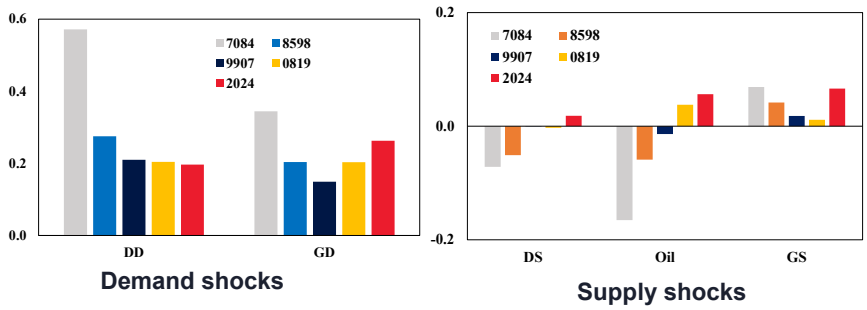
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# Why Has the Role of Global Shocks Increased?



## Hypothesis #2: Greater sensitivity to global shocks?

**Sensitivity to Structural Shocks** ***(Average across economies, percentage point)***




**YES!**

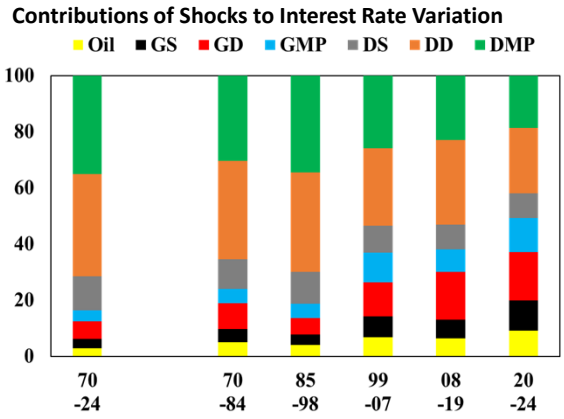
- More vulnerable to all global shocks
- **NO increased sensitivity to domestic demand shocks**
- Preliminary evidence on what affects sensitivity

****Note—data limited for 1970-84**

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# 2. Which Global Shocks Matter?





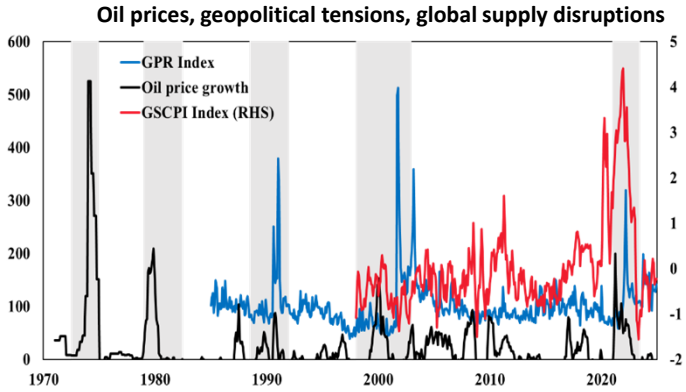

Note: "Oil" = oil price shock, "GS" = global supply shock, "GD" = global demand shock, "GMP" = global monetary policy shock, "DS" = domestic supply shock, "DD" = domestic demand shock, "DMP" =domestic monetary policy shock.

- Role of oil shocks & global supply shocks increased in 2020-24 to record highs
- But larger role for global demand
- Consistent with other decompositions: demand shocks play larger role than supply

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# 2b. Which Global Supply Shocks?






**Sources:** Federal Reserve of New York, Iacoviello (2022), World Bank (Pink sheet data). Note: GPR index = geopolitical risk index, GSCPI index = supply-disruption index. Oil price growth is based on year-on-year. Shaded areas indicate the periods with persistently positive contributions of supply shocks.

**Focus on 3 measures**

1. Oil prices (inc. other commodities)
2. Geopolitical risk
3. Global supply chain disruptions

Note: Limited time series for some

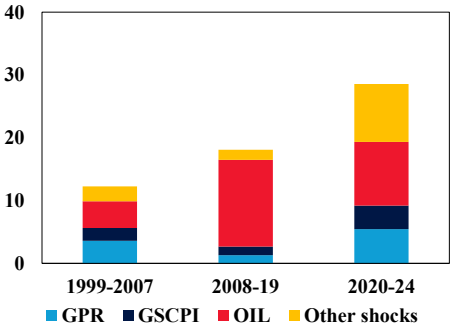
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# Which Global Supply Shocks?



**Variance share of exogeneous global supply-driven shocks: Cholesky FAVAR (Percent of total variation)**




Notes: "Oil" = oil price shock, "GPR"= geopolitical risk shock, "GSCPI"=global supply disruption shock, and "other shocks" = other structural shocks that drives the innovation in global inflation.

- Roles vary over time
- "Oil" important (also captures other commodities)
- Increased role of geopolitical risk and supply chain disruptions

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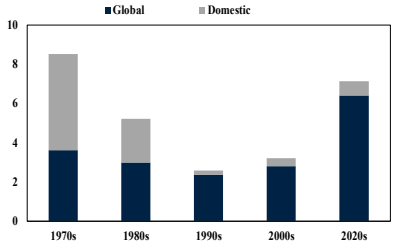
# 3a. Are the Effects Asymmetric?



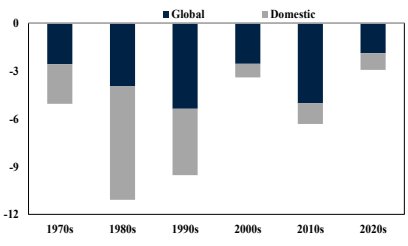
## Does the role of global shocks differ during monetary tightening vs. easing?

**Contributions of Shocks to Interest Rates (averages across economies)**

**Tightening episodes**




**Easing episodes**




**YES!**

- Greater role during tightening phases
- Global shocks dominant since 1990s
- Note differences versus 1970s oil shocks

**Notes:** Based on database for dates of tightening and easing phases from Forbes, Ha and Kose (2024).

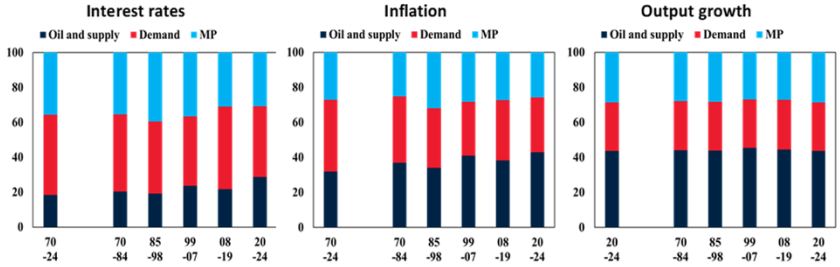
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# 3b. Does the Role Differ for Rates, Inflation and Growth?



**Contributions of shocks** *(Average across economies, percent of variation)*




Note: "Oil and supply" = Oil+GS+DS; "Demand" = GD+DD; "MP" = GMP+DMP. "Oil" = oil price shock, "GS" = global supply shock, "GD" = global demand shock, "GMP" = global monetary policy shock, "DS" = domestic supply shock, "DD" = domestic demand shock, "DMP" =domestic monetary policy shock.

**YES!**

- Demand shocks more important for interest rates
- **Supply/oil shocks more important for inflation & output growth**
- Explains seeming inconsistency between some work (eg Akinici et al. '25)
- Consistent with monetary policy looking through supply shocks

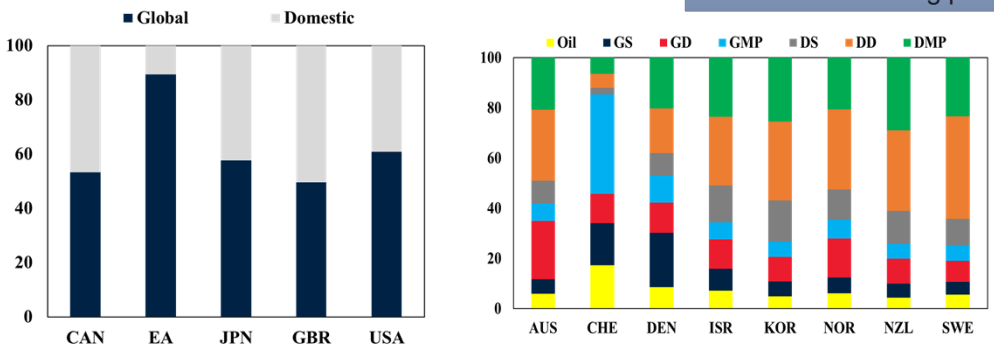
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# 3c. Do the Roles Vary Meaningfully Across Economies?



**Contributions of Shocks to Interest Rate Variation**
***Pandemic period: 2020-24***




**YES!**

- Lots of interesting patterns….

Note: "Oil" = oil price shock, "GS" = global supply shock, "GD" = global demand shock, "GMP" = global monetary policy shock, "DS" = domestic supply shock, "DD" = domestic demand shock, "DMP" =domestic monetary policy shock.

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## Series of Robustness Checks



- Different groups of economies (G-5 vs. larger sample)
- Alternative sign restrictions
- Alternative measures of global variables
- Alternative weighting schemes for global variables
- Time-varying coefficient estimates

**Key results reported above consistent across tests**

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# *Conclusions*

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# Questions and Answers *on Monetary Policy & Global Shocks*



1. **Has the importance of global shocks changed over time?**
   - Yes…increased over time to explain about 50% of interest rate variation in 2020-24
   - **Why has the role of global shocks increased over time?**
     - Greater volatility and greater sensitivity of individual economies to shocks (particularly for global demand)
2. **Which types of global shocks are more important?**
   - Global demand remains dominant, but role of oil & global supply shocks increased to historical highs in 2020-24
   - **Which global supply shocks matter?**
     - Varies over time, oil/commodities consistently important, geopolitical risk & supply chain disruptions inc. recently
3. **Does the role of global shocks vary across key dimensions for monetary policy?**
   - **Tightening versus easing phases?**
     - Yes. Global shocks drive larger contribution of tightening than easing phases
   - **Interest rates versus inflation and growth?**
     - Yes. Smaller role of supply shocks for rates, consistent with monetary policy looking through supply shocks (inc. oil)
   - **Different countries?**
     - Yes. Larger role of supply shocks for EA over 2020-24….lots of neat patterns!

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# Final Thoughts



- **Key theme: increased role of global shocks—outside the control of any individual central bank**
  - Richer understanding of these shocks important to determine appropriate monetary policy strategies
- **Greater role of global shocks creates challenge for central banks held accountable for domestic inflation and growth**
- **Unanswered question: Should central bank targets and mandates adjust for this greater role of shocks from "heaven"?**
  - Bands vs targets?
  - Length of time to return inflation to target
  - Target more "earthly" variables (i.e., core instead of headline inflation)

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# Heaven or Earth?
# The Evolving Role of Global Shocks for Domestic Monetary Policy

Kristin Forbes, Jongrim Ha, and M. Ayhan Kose*

February 20, 2025

**PRELIMINARY DRAFT – COMMENTS APPRECIATED**

***Abstract:*** Although central bank mandates focus on domestic goals, monetary policy decisions have become more synchronized around the world. This paper analyzes this increased "globalization" of interest rates to better understand the drivers and implications for central banks' ability to meet domestic targets. We estimate the global factor in interest rates for a sample of 24 advanced economies from 1970 through 2024 and then use a new FAVAR model to decompose movements in interest rates, inflation, and output growth into four global shocks (demand, supply, oil, and monetary policy) and three domestic shocks (demand, supply, and monetary policy). The role of global shocks has steadily increased, roughly doubling from 1970-84 through 2020-24 to explain half the variation in interest rates, and these global shocks are more important in explaining the tightening (as compared to easing) in monetary policy. This increased role of global shocks reflects not only a larger magnitude of these shocks, but also greater country sensitivity to a given shock. The prominent driver of these global shocks is demand, although the role of supply shocks increased sharply over 2020-24 to reach its highest level in our sample. The drivers of global supply shocks have varied over time, with an outsized role of supply chain disruptions over 2020-24, combined with heightened geopolitical risk and oil price fluctuations (which were more dominant in earlier periods). The importance of different types of shocks also varies meaningfully across macroeconomic variables and countries. For example, demand shocks were the primary drivers of interest rate movements in most economies, while supply shocks were the main drivers of inflation and output growth, a pattern consistent with monetary policy responding less to supply shocks. Although "heavenly shocks" (i.e., factors outside the control of central banks) are likely to continue to play a prominent role in monetary policy decisions, a better understanding of their drivers and effects should improve central banks' ability to attain their "earthly" (i.e., domestic) goals.

***Keywords***: Monetary policy; demand shocks; supply shocks; geopolitical risk; oil prices; supply-chain disruptions, Federal Reserve
***JEL Classification***: E52, E31, E32, Q43

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*... if you know Heaven and know Earth, you may make your victory complete ... Sun Tzu ($5^{th}$ century BC)*

*In this era of hyperglobalisation, are central banks still masters of their domestic monetary destinies? Or have they become slaves to global factors? ...* Mark Carney (2015)

## I. Introduction

In the fifth century BC, a Chinese philosopher and military strategist named Sun Tzu wrote of the importance of understanding the impact of "heaven" (events outside a general's control) and "earth" (constraints of the local territory) when designing a battle strategy. Similarly, central banks must understand the role of shocks outside their control and how they interact with their domestic decisions, structures and constraints when setting monetary policy. Understanding these issues has become even more important over the last two decades as a series of severe global shocks has driven sharp swings in activity and inflation, corresponding to more synchronized monetary policy decisions. At the same time, central banks in most advanced economies have struggled to meet their domestic mandates for extended periods, with inflation too low during much of the 2010s and too high in the early 2020s. This has generated important questions about the roles played by different types of global and domestic shocks and, in turn, how monetary policy should best respond (Lagarde 2024).

This paper addresses these issues by providing the first systematic, cross-country analysis of the different global and domestic drivers of fluctuations in interest rates and related macroeconomic variables over the past 55 years. While other work has explored these issues for individual countries or over short windows of time, our panel dataset over such a long window allows us to develop and estimate a more detailed decomposition of the underlying shocks, including a more precise breakdown of the different types of global shocks. It also allows us to more fully explore important underlying relationships between interest rates and economic outcomes, such as the role of asymmetries, role of geopolitical risk and supply-chain disruptions, and individual country sensitivities to different types of shocks. The long time series also allows us to compare recent experiences—particularly around the COVID-19 pandemic and subsequent series of geopolitical and other supply shocks—with historical precedents (including the oil and geopolitical shocks of the 1970s).

A series of results clearly shows that fluctuations in growth, inflation and interest rates in advanced economies have become more synchronized globally since the 1970s, and even more so for interest rates than the macroeconomic variables to which monetary policy responds. To better understand these patterns, we utilize a rich panel dataset and our new framework examining the causes of these fluctuations, focusing on the relative importance of global versus domestic shocks, as well as the relative importance of shocks to supply, demand, monetary policy and oil prices. The role of global shocks in explaining interest rates has been increasing steadily over time, and although predominately driven by changes in global demand, the role of global supply shocks increased to sample highs after the pandemic. This increasing role of global shocks reflects not only a larger magnitude of the underlying shocks (including of geopolitical risk and supply chain disruptions since 2020), but also a greater sensitivity of individual economies to these shocks. Global shocks are also asymmetric in the sense that they are more important in explaining tightening episodes for monetary policy (as compared to easing episodes).

There are also important differences in how these shocks affect inflation, economic growth, and interest rates, consistent with economic theory that monetary policy should respond more forcefully to certain shocks (e.g., demand shocks) relative to others (e.g., oil prices or global supply shocks). Finally, the results showing how the roles of specific global and domestic shocks vary not only over time, but also across countries during the same period, can explain some of the divergences in monetary policy stances. The decompositions can help explain why some central banks today are lowering interest rates aggressively, while others are holding rates steady at recent highs and yet others are raising rates.

A large body of literature uses various methods to identify cycles in macroeconomic and financial variables in order to better understand the current economic situation, predict the evolution of the macroeconomy, and assess the interactions with monetary policy. These studies often focus on various types of cycles, including business cycles (Burns and Mitchell 1946; Harding and Pagan 2002), inflation cycles (Ciccarelli and Mojon 2010; Forbes 2019; Ha et al. 2024), credit and financial cycles (Claessens, Kose, and Terrones 2011; Rey 2013), and capital flow cycles (Forbes and Warnock 2012, 2021).[1] A subset of this literature attempts to understand the shocks behind this cycles, usually focusing on the role of demand and supply (and sometimes monetary policy or oil) shocks (e.g., Dees et al., 2010; Giannone and Primiceri, 2024).

Another strand of the literature studies how central banks adjust monetary policy, including historical accounts of monetary policy decisions.[2] Interest rate fluctuations often mirror business and financial cycles, although there are also periods when monetary policy decisions do not appear to correspond to fluctuations in real variables or inflation as predicted in standard models. Moreover, even within a given cyclical phase (such as a recession or a financial downturn), central banks can adjust monetary policy in different ways—with different effects on activity and inflation. To the best or our knowledge, however, no work has examined the drivers of historical "interest rate cycles" (except for the related paper, Forbes, Ha and Kose, 2024), and none of the papers providing shock decompositions for other types of cycles differentiate between global and domestic shocks for each of their categories (i.e., demand, supply and monetary policy), nor differentiate between different types of global supply shocks (i.e., geopolitical uncertainty, oil price fluctuations, and supply chain disruptions).

In order to analyze the fluctuations in interest rates and how they relate to inflation and activity, Section II begins by documenting the synchronization in interest rates,[3] inflation and growth across a sample of 24 advanced economies from 1970 through 2024. This shows striking "waves" of synchronization, i.e., periods when almost all economies adopt similar monetary policy stances. Not surprisingly, these "waves" often correspond to synchronized developments in growth and inflation—variables which are central to monetary policy decisions. The periods with a high degree of synchronization—and several short windows when a large share of advanced economies suddenly and simultaneously shift their monetary policy stances in the same direction—suggest an important role for global shocks, i.e., shocks from "heaven" that are outside the control of any

[1] Related research examines the interactions between different types of cycles, particularly business, credit, and financial cycles, e.g., Bernanke and Gertler (1989), Kiyotaki and Moore (1997), Stock and Watson (1999, 2015), Kose, Otrok, and Whiteman (2008), Claessens, Kose, and Terrones (2012), and Jordà, Schularick, and Taylor (2017).

[2] For examples of the extensive literature on historical monetary policy decisions, see Hartmann and Smets (2018) for the ECB and Romer and Romer (2023) for the Federal Reserve.

[3] This section, as well as the rest of the paper, focuses on changes in interest rates to assess changes in monetary policy (measured using the policy, overnight, or shadow rate), as this is the primary tool employed by central banks to shape the monetary policy stance today. Focusing on policy interest rates also has the important advantage of being straightforward to observe, with data widely available across countries over long periods.

individual economy. There are also certain periods, however, with a substantial divergence in interest rates, inflation and growth across the sample, or when interest rate cycles do not correspond to those for inflation and growth, suggesting the role of different types of shocks (including that played by global shocks) varies meaningfully over time.

Section III develops a model that provides an initial assessment of the varying role of global shocks: a dynamic factor model to estimate the importance of a global factor in explaining movements in national interest rates, inflation, and output growth. This model allows us to quantify the extent of synchronization in interest rate movements, how this synchronization has evolved over time, how these patterns compare with the synchronization in business and inflation cycles, and how they correlate to domestic macroeconomic characteristics. To estimate this model, we use cross-section and time series data that covers up to 24 advanced economies from 1970 to 2024. Results show that the importance of the global rate factor in explaining fluctuations in national interest rates has increased significantly over time, jumping from explaining only about 10 percent of the variation in interest rates over 1970-84, to about 30 percent over 2008-19, and almost 40 percent over 2020-24. The importance of the global factors in inflation and business (i.e., growth) cycles has also increased over time, but to a lesser extent. Why are interest rates becoming "globalized" at a faster rate than measures of activity and inflation that should impact monetary policy decisions—even before the highly synchronized shifts in monetary policy that occurred around the 2020 pandemic?

To better understand what is driving this increased "globalization" of inflation, output growth, and particularly interest rates, Section IV develops the central contribution of the paper: our new factor-augmented vector autoregressive (FAVAR) model. This model can identify the role of four distinct global shocks (for demand, supply, oil, and monetary policy) and three domestic shocks (for demand, supply, and monetary policy) in the interest rate, inflation and business cycles. This is a substantially richer decomposition than used in past work, a decomposition which is possible due to the long time-series combined with the cross-sectional nature of our data.[4] This model can not only identify the impact of global versus domestic shocks, as well as the role of demand versus supply shocks, and the role of specific supply shocks (such as oil shocks), as well as a range of other decompositions.

Results from this FAVAR model show that the role of global shocks in explaining the variation in interest rates has steadily grown—consistent with the growing synchronization of interest rate cycles documented in Sections II and III. More specifically, across the full period from 1970-2024, global shocks accounted for only about one-sixth of the variation in interest rates on average, and domestic shocks (primarily domestic demand and monetary policy shocks) about five-sixths. Since January 2020, however, global shocks explained almost 50 percent of the variation in interest rates, and 62 percent for the group of G-5 economies (Canada, Euro Area, Japan, the United Kingdom, and the United States). In fact, the period from 2020-24 is the first time in our sample that the contribution of global shocks was larger than that of all domestic shocks. The contributions of different types of global (and domestic) shocks have also changed over time. For example, oil price and other global supply shocks played a larger role during the 2020-24 window, even larger than during the well-known "oil price shocks" of the 1970s and early 1980s, although global demand shocks still made the single largest contribution to the variation in interest rates (as they do in each sub-period).

[4] This analysis currently focuses on 13 advanced economies. We do not include individual members of the Euro area as separate entities for the analysis of interest rates because the ECB has implemented monetary policy in the euro area since 1999.

This approach also allows us to compare how the roles of each shock in explaining interest rates differ from their roles in explaining growth and inflation. The results suggest that the role of global shocks has increased even more for interest rates than the other macroeconomic variables, further supporting a greater "globalization" of interest rates than of key variables that affect monetary policy. At the same time, supply shocks (both global and domestic) explain a larger share of the variation in inflation and output growth than interest rates. This is consistent with models of optimal monetary policy, which suggest that monetary policy should react less forcefully to supply shocks and under certain conditions "look through" at least some of the effects on inflation and growth (Bandera et al. 2023; Tenreyro 2023).

Section V delves into these results to explore three specific angles of the growing role of global shocks, focusing on better understanding why their role behind interest rate fluctuations has increased, an issue critical for central banks attempting to meet domestic targets in a world of large global shocks. First, it provides a more detailed analysis of the impact of geopolitical risk, supply chain disruptions, and oil price fluctuations. Although historical data is limited, the results indicate a growing role for heightened geopolitical risk over time, and particularly large contribution from supply-chain disruptions over 2020-24. Second, it tests whether the increased importance of global shocks reflects a larger magnitude of these shocks (i.e., larger oil price shocks), or a greater sensitivity of individual economies to these shocks (i.e., due to increased integration through trade and financial flows). It finds evidence of both; the magnitude of global shocks (and particularly global supply shocks) has increased while individual economies have also become more vulnerable to these shocks. Finally, it tests if the roles of different types of shocks are asymmetric in the sense that they vary across periods of monetary tightening and easing; it finds that global shocks play a larger role in explaining periods of interest rate increases than decreases, implying that some of the larger impact of recent shocks may reflect their direction (consistent with tighter monetary policy).

Section VI moves from analyzing broad trends across countries—with prior results focusing on means or medians across the sample—to exploring differences across individual economies. These results indicate substantial variation in the role of global shocks (as well as specific types of global shocks) to interest rates, inflation and growth in different economies—even during periods of global crises when the role of global shocks dominates that of domestic shocks. These cross-country differences can go some way in explaining differences in monetary policy during certain windows, particularly in the post-pandemic period. For example, global shocks (particularly global supply and oil price shocks) explain a larger share of the variation in inflation in the euro area since 2020, while demand shocks explain a larger share in the United States, a pattern consistent with interest rates in the euro area being increased by less in response to the post-pandemic inflation shock and then reduced more quickly.

Section VII presents the results of a wide range of robustness exercises. These include alternative identification strategies, alternative definitions of global and domestic variables, different weighting schemes of global variables, and an alternative model with time-varying coefficients.

Section VIII concludes and discusses the challenges of setting monetary policy to meet domestic mandates in a world with a growing and volatile role for global shocks. Should central bank mandates be adjusted to account for the fact that macroeconomic variables such as inflation and growth are increasingly determined by "shocks from heaven"? A better understanding of the role of different shocks is critically important for setting monetary policy and should be considered in ongoing framework reviews for central banks.

## II. Waves of Synchronization in Rates, Inflation and Growth

Monetary policy in most economies has shifted dramatically over the last two decades. Most central banks transitioned from increasing interest rates in the mid-2000s, to reducing them sharply around the 2008 Global Financial Crisis (often followed by an extended period with rates around lower bounds), to additional rate reductions combined with other forms of easing (such as large and broad asset purchase programs) in 2020, and then an unusually aggressive period of tightening policy through higher rates and quantitative tightening starting in late 2021/early 2022.[5] While these sharp swings in monetary policy have often been widely synchronized across most advanced economies, monetary policy has also diverged during certain periods. For example, in 2024 some central banks reduced rates (in some cases multiple times or by increments greater than 25bps), while others continued to hold rates at elevated levels, and Japan raised rates for the first time in 17 years.

In order to put this recent experience in the longer historical context that is the focus of this paper, the top panel of Figure 1 shows the share of central banks in advanced economies that are in an easing or tightening phase for monetary policy over 1980-2024 (based on the sample of 24 advanced economies discussed in more detail in Section III). These phases are defined using the methodology outlined in Forbes, Ha and Kose (2024), with an easing phase (in red) when central banks are lowering interest rates or purchasing assets through a quantitative easing (QE) program, and a tightening phase (in blue) when a central banks are raising policy interest rates.[6] The lighter shades of each color denote the share of economies with monetary policy "on hold" at the end of each easing and tightening phase.

This top panel shows striking "waves" or "mountains"—periods when there is a high degree of synchronization in how central banks adjust monetary policy. For example, all central banks were easing monetary policy around the 2008 Global Financial Crisis and 2020 pandemic, while most were tightening monetary policy afterwards in response to the post-pandemic inflation (with the only exception Japan). There are also periods, however, when different central banks follow asynchronous strategies. For example, at the start of 1992, the sample is split between those easing and tightening monetary policy (and in the half of the sample that is in a tightening phase, about 1/3 have rates on hold). This was a period after the 1991 global recession, oil shocks around the first Gulf War (1990-91), and the collapse of the Soviet Union. It was also just before the ERM crisis, which partly resulted from this divergence in policy rates. These periods of "waves" and then "calm" in the share of the sample adjusting monetary policy in the same direction suggest that the impact of global factors on interest rates may change over time.

Also noteworthy is the steepness of the blue "mountains". The upward slope of the blue mountains suggests fairly rapid and highly synchronized shifts of a large share of the sample from an easing to a tightening phase, and the downward slopes indicate the subsequent shifts from tightening to easing. The downward slopes can be equally steep—showing a rapid and synchronized easing of monetary policy—or can be more gradual—suggesting a less synchronized transition towards easing policy, often combined with a "glacier" indicating a period of rates are on hold . The periods when policy suddenly shifts in most—if not all—the sample is likely caused by some type of shared, global shock from "heaven" that is outside the control of each individual central bank.

[5] See Forbes, Ha and Kose (2024) for detailed characteristics of these "rate cycles" over time, including how the post-2020 tightening was more aggressive when measured by the velocity, amplitude, pace, and number of rate hikes.

[6] To be in a tightening or easing phase, the economy does not need to be adjusting monetary policy each meeting. See Forbes, Ha and Kose (2024) for details on how these tightening and easing phases are defined and the specific dates for each economy.

Since central banks set monetary policy to achieve their mandates for inflation (and often activity), these synchronized shifts in monetary policy are also likely to reflect shifts in inflation and growth. As a preliminary look at whether the waves apparent for interest rates are shared in other measures of macroeconomic activity, the middle and bottom panels of Figure 1 show the extent to which inflation and growth were synchronized over the same period and for the same 24 economies.[7] More specifically, the middle panel shows the share of advanced economies defined as being in a recession (with annual real GDP growth <0%), with "stagnant" growth (between 0% and 1%), or "solid" growth (greater than 1%). The bottom panel shows the share of advanced economies with CPI inflation defined as "too hot" in red (above 2.5%), "too cool" in blue (defined as below 1%), and "just right" in green (defined as from 1.5% to 2.5%).

These two graphs also show waves over time, periods when swings in activity and inflation are shared broadly across advanced economies. For example, almost all economies experienced a recession around the 2008 global financial crisis and 2020 pandemic, and most economies experienced inflation that was "too cool" in 2015 and "too hot" in 2022. Once again, there are periods when different countries have more diverse economic performance, such as in 2003 when the sample was almost evenly split between those with inflation "too hot", "too cool" and "just right". The last two decades, however, are largely dominated by periods when economic activity and inflation are highly synchronized across a large portion of advanced economies.

Not surprisingly, many of these movements in inflation and activity correspond to swings in monetary policy (from the top panel). For example, the periods when most advanced economies are easing monetary policy overlap with periods when most economies are experiencing a recession or stagnant growth (such as the 2008 GFC and 2020 pandemic) or when inflation was "too cool" in most economies in the 2010s. Similarly, periods when most economies were actively tightening monetary policy overlap with the post-pandemic period when inflation was "too hot." This high degree of comovement between macroeconomic variables and central bank decisions during certain periods is to be expected; synchronized central bank decisions are a natural response to sharp, synchronized movements in the key variables that affect monetary policy.

But can we go further in explaining what drives these periods of synchronization? Have the shocks causing movements in interest rates, inflation, and growth changed over time? Will this high degree of synchronization continue—or will we see more divergence in the future?

## III. The Global Factor: Dynamic Factor Model, Data and Results

To understand the synchronization of interest rate fluctuations, inflation and output growth, this section estimates a global common factor in each of these three macroeconomic variables across economies. This allows us to assess the behavior of the global factor over time and calculate the share of the variance of national interest rates, inflation and activity explained by these global factors. Since the global interest rate factor could be considered an approximate measure of the commonality in responses of national central banks to movements in inflation and output, this also allows us to analyze the relative importance of each of the three global factors in driving their respective national variables and if the relationship with the monetary policy response has evolved over time.

This section begins by explaining the methodology behind the dynamic factor model and then it describes the data that will be used to estimate the global factor for interest rates, inflation, and

[7] Data is from the IMF's World Economic Outlook database, October 2024.

output growth. Then it presents two sets of results: how the global factor for each variable has evolved over time and finally the share of the variation in interest rates, inflation and growth that can be explained by these factors.

### III.1 The Dynamic Factor Model

We use a simple dynamic factor framework to estimate the global common factors for interest rates, inflation, and output growth (Ha et al., 2024). Specifically, we estimate the following models:

$$R_t^i = \beta_{global}^{R,i} f_t^{R,global} + e_t^{R,i}$$

$$\pi_t^i = \beta_{global}^{\pi,i} f_t^{\pi,global} + e_t^{\pi,i}$$

$$Y_t^i = \beta_{global}^{\pi,i} f_t^{Y,global} + e_t^{Y,i}$$

where $R_t^i$, $\pi_t^i$, and $Y_t^i$ refer to interest rates, inflation, and output growth in country $i$ in month $t$, respectively. The $f_t^{R,global}$, $f_t^{\pi,global}$ and $f_t^{Y,global}$ are the global common factors for interest rates, inflation, and output growth in month $t$, respectively. As is standard in this literature, the factors and error terms follow independent autoregressive processes. The error terms are assumed to be uncorrelated across countries at all leads and lags. We estimate the model using standard Bayesian techniques, as described in Kose, Otrok, and Whiteman (2003, 2008).

### III.2 Data

In order to estimate this model, we employ monthly data for interest rates, output growth, and inflation from January 1970 through September 2024 for 13 advanced economies (Australia, Canada, Denmark, euro area, Israel, Japan, New Zealand, Norway, Switzerland, Sweden, Korea, the United Kingdom, and the United States). We include the euro area as a single entity for the baseline analysis, but also use the data for 11 member economies for robustness checks and additional analysis. The included member countries are: Austria, Belgium, Germany, Finland, France, Greece, Ireland, Italy, the Netherlands, Portugal, and Spain, as also listed in Appendix Table A1.

We focus on these economies primarily because of their size and the availability of data on the policy interest rate, output, and inflation for the full sample period. Specifically, our selection of these 24 advanced economies is based on the following criteria: (i) they are defined as advanced economies in the World Bank's Global Economic Prospects report, January 2024 (World Bank 2024); (ii) they are independent countries with GDP of at least $100bn in 2023; (iii) they have data for GDP, inflation and interest rates from at least 1980; and (iv) they have not primarily set interest rates in order to target the exchange rate since 1999. For the analysis of interest rates, we consider the euro area as an economic entity since 1999 when the ECB became the single entity implementing monetary policy for member countries.

To measure interest rates, we use the nominal interest rate defined as the policy rate by the economy's central bank.[8] We supplement the data with the shadow interest rate starting in 1995 for Australia, Canada, the euro area, Japan, New Zealand, Switzerland, the United Kingdom, and

[8] The interest rate that the central bank identifies as the policy rate has changed over time in most countries. Also, in many economies, the policy rate was substantially more volatile in earlier periods when it was not the central bank's operating target (e.g., in the 1970s and 1980s, some central banks allowed their policy rates to adjust more flexibly as they aimed to meet operating targets for the money supply).

the United States.[9] The shadow rate better captures these countries' "true" policy rates, particularly since 2008 when central banks began using various types of unconventional tools more often (such as quantitative easing). For the other economies (or for some periods) where (when) policy or shadow rates are not available, we employ overnight market rates (e.g., discount rates) or 3-month Treasury bill yields. To estimate the global factor in interest rates, we treat the euro area as a single economy and use a weighted average of the euro area members' policy rates until December 1998 (and then use the shadow rate for the euro area).

We measure inflation based on the headline CPI price index, and measures output growth as the growth rate of industrial production (which is more widely available than GDP growth at a monthly frequency, particularly early in the sample). All variables are month-on-month, demeaned, and stationary.

### III.3 Behavior of the Global Factors

Figure 2 shows the evolution of the global factors for interest rates, inflation, and output growth, estimated by the dynamic factor models (described in Section III.1) and using the data described above (in Section III.2). These three factors display movements that are broadly consistent with well-known fluctuations in the respective variables and that correspond to the highly synchronized periods since 1970 of interest rate adjustments, above- or below-target inflation, and weak growth, as shown in Figure 1.

Starting with the global rate factor, it generally declines sharply around the dates of the global recessions and downturns highlighted in grey (in 1975, 1982, 1991, 1998, 2000-01, 2009, and 2020).[10] This corresponds to the periods of synchronized rate cuts and high incidence of stagnant growth shown in Figure 1. The global interest rate factor increases substantially in 1973-74, 1979-80, 1988-90, and 2021-23, all of which are periods characterized by major disturbances in oil markets, disruptions in cross-border supply chains, and demand pressures associated with accelerating output growth. In fact, over 2021-22 the global interest rate factor jumps to its highest level in over forty years (since 1979-80), as central banks around the world increased interest rates in response to the soaring inflation largely driven by rebounding activity, significant increases in oil prices, and widespread supply chain interruptions. Not surprisingly, the global inflation factor also jumps during these two peaks in the global interest rate factor.

The global interest rate factor also displays larger swings from the start of the sample in 1970 until the mid-1980s. This partly reflects sharp fluctuations in nominal interest rates (Cook and Hahn 1989) in a period of high inflation. However, this also reflects a different monetary policy framework in many economies, as some advanced economies (such as the United States) focused on money supply targets (Brimmer 1983; Friedman 1982) and others (such as members of the ERM) focused on the exchange rate. As a result, volatility in the global rate factor and underlying policy rates in this earlier period also reflects the impact of financial markets on interest rates, and not just central banks' decisions to adjust policy rates. The global rate factor was relatively stable in the 1990s and early 2000s during the "NICE" decade (Non-Inflationary Consistent Expansion), before becoming more volatile again around the 2008 Global Financial Crisis and

[9] The shadow interest rate is estimated as the shortest maturity rate based on the shadow yield curve (Krippner 2013). Specifically, the rate is estimated using a dynamic factor model with variables closely associated with different types of monetary policy operations. The resulting shadow rate is essentially equal to the policy interest rate in "non-lower" bound or unconventional monetary policy environments. We use the shadow rate for all economies for which it is available, and otherwise the policy rate.

[10] A global recession is defined as a contraction in annual global real per capita GDP and a global downturn as a period of historically weak growth outside of global recessions (Kose, Sugawara, and Terrones, 2020).

corresponding global recession. The volatility of the global rate factor also increases sharply around the 2020 COVID pandemic and subsequent spike in inflation.

The behavior of the global factors for inflation and output (in the bottom two panels of Figure 2) is also consistent with well-known global events. For example, the global inflation factor falls sharply around global recessions, especially those associated with the 2008-09 Global Financial Crisis and the COVID-19 pandemic, but also around the 1975 and 1982 global recessions. In addition, the global inflation factor falls during periods when oil prices decline sharply (in 1986, 1990-91, 1997-98, 2001, 2008, 2014-16, and 2020).[11] The global output factor (measured by the highly volatile monthly industrial production series) shows even more short-term volatility, with even more notable plunges during global recessions and sharp rebounds during the subsequent recoveries. The collapse and subsequent spike in output around the COVID-19 pandemic is particularly noteworthy and much more extreme than any other period in the sample of over 50 years.

Finally, and as a preliminary look at what could be driving movements in interest rates cycles before the more formal analysis below, we compute correlations between the global interest rate factor and several variables identified as correlates of interest rates in the literature. More specifically, we include: the global output factor, the global inflation factor, a global activity index, oil production, the global supply disruptions index, various measures of economic uncertainty, and various measures of monetary and fiscal policy shocks available from the literature. The resulting (absolute) correlations between the global interest rate factor and these variables (in Appendix Table A2) range from 0.1 to 0.4 over the period 1970-2024. The largest correlations are with an economic conditions index, global supply disruptions index, and central bank information shock—suggesting that global demand, global supply, and monetary policy shocks all play a role. Figure A1 shows the evolution of a subset of these correlations over time; many of all of the correlations with the global rate factor vary meaningfully across time and swing between positive and negative, indicating that the links between global interest rates and these variables can shift and likely depend on the underlying forces driving any such movements.

### III.4 Importance of the Global Factors

As a final analysis of the importance of global factors in explaining variations in national interest rates, inflation, and output, we estimate the contributions of each of the three global factors to the variances of each of the macroeconomic variables. To analyze how the importance of the global factors changes over time, we calculate these contributions for five sub-periods. Each of these sub-periods includes some type of recession/crisis and recovery period, with the dividing lines between them marking major global events that might have changed the nature of interest rate cycles:

- ***1970-84***: the global recessions of 1975 and 1982, and the first and second oil price shocks of the 1970s;
- ***1985-98***: the 1991 global recession, the global downturn in 1997-98 associated with the Asian and Russian financial crises, and a series of debt defaults and emerging market crises;
- ***1999-2007***: the bursting of the tech bubble, the 2001 global downturn, and the lead up to the 2008 Global Financial Crisis;

[11] Baffes et al. (2015) presents an analysis of the periods of sharp declines in oil prices. Ha et al. (2023) examines the role of oil prices in driving national inflation.

- ***2008-19:*** the Global Financial Crisis and the 2009 global recession, the 2012 global downturn associated with the euro area debt crisis, and the 2014-16 collapse in oil prices; and
- ***2020-24:*** the outbreak of the COVID-19 pandemic and corresponding 2020 global recession, the Russian invasion of Ukraine in 2022 and corresponding commodity price shock and the post-pandemic spike in inflation.

The first two sub-periods (from 1970-1998) also include individual cycles for countries that are currently members of the euro area, while the later periods (from 1999-2024) include one euro area cycle (with no cycles for individual member countries) as the ECB set monetary policy for the group.[12] The sub-periods before 1999 were also when central banks used a wider range of monetary policy tools, frameworks, and strategies than in the subsequent periods—with some central banks putting more weight on monetary targets (and interest rates determined partly by markets as well as central bank operations). Over the 1990s and 2000s, however, most central banks transitioned to some form of inflation targeting, albeit this more comparable framework also involved its own evolution of tools and frameworks (such as the greater use of balance sheet policies and forward guidance).

The resulting estimates of the contributions of each of the three global factors to the variances of national interest rates, inflation and output are shown in **Figure 3** and suggest four noteworthy insights. First, the global interest rate factor plays a significant role in driving fluctuations in national interest rates; it accounts for nearly 15 percent of the interest rate variation, on average, over the full period.[13] Although this share is lower than the global factor in inflation and output growth over the full period, it is sizable considering that our sample includes a diverse group of countries with monetary policy frameworks that have changed meaningfully over this long period lasting over 50 years.[14]

Second, the importance of the global interest rate factor has increased significantly since the end of the 1990s.[15] On average, this global factor explained about 40 percent of the interest rate variation over 1999-2024, almost four times more than the share over 1970-98. Since the variance share explained by the global interest rate factor measures the degree of common interest rate movements, this implies that national interest rates have become increasingly more synchronized across economies over time. When the variance shares are estimated for the five shorter sub-periods (on the right of the figure), the increased importance of the global interest rate factor

[12] Robustness exercises also treat the countries in the euro area as one economy pre-1998. For some pieces of analysis, we also split the sample into two longer sub-periods (1970-1998 and 1999-2024) to account for when the ECB began setting policy rates for its member countries.

[13] Over the full period, the global interest rate factor accounted for the largest share of variation in the euro area (47 percent), followed by Switzerland (32 percent), Japan (17 percent), and Canada (12 percent). In the post-1999 period, the role of the global rate factor became more pronounced in almost all economies and was particularly important in explaining the interest rate variation in the United States (59 percent), the euro area (57 percent), Canada (53 percent), and Australia (47 percent), but much smaller in Japan (19 percent).

[14] Other studies on the cross-country comovement of interest rates include Lindenberg and Westermann (2012), Mandler and Scharnagl (2022), and Henriksen, Kydland, and Sustek (2013). Studies on the importance of the global factor in interest rates include Ha et al. (2020), Chatterjee (2016), and Crucini, Kose and Otrok (2011).

[15] As a robustness check, we calculate the variance contribution of the global rate factor using other sub-sample periods (which are not based on when the ECB began setting interest rates for the group) or excluding some large economies (such as the United States or the euro area). The key patterns reported above on how the importance of the global rate factor has evolved over time are unchanged.

starting in 1999 is even more pronounced. Interest rate cycles appear to have become much more synchronized over the past quarter century.

Third, to better understand these changes in the synchronization of interest rates over time, Appendix Figure A2 estimates the same variance shares due to the global interest factor, but over shorter, 5-year windows. These results confirm the trend of increased importance of the global interest rate factor beginning in the late 1990s; this does not just reflect an outsized contributions during a short window within the longer periods. Yet, the role of this global factor has also fluctuated since 1999, including over the last decade. More interestingly, local peaks in the share of variance due to the global factor occur during specific sub-periods—e.g., 1976-80, 2000-04, 2008-12, and 2020-24—which coincide with the episodes when a large share of economies eased or tightened interest rates simultaneously (Figure 1).[16]

Finally, this increased global synchronization in interest rates coincides with increased global synchronization in inflation and output growth, although by most measures the comovement in interest rates has increased by even more and to higher levels than for the other macroeconomic measures. More specifically, the share of the global factor in explaining inflation and output also tripled (or more) from the first half of the sample (1970-98) to the second half (1999-2024), albeit levels slightly below that for the synchronization of interest rates (Figure 3 and Appendix Table A3). When this long window from 1999-2024 is broken into the three shorter sub-periods (1999-2007, 2008-19, and 2020-24), the degree of interest rate synchronization easily exceeds that of inflation and output in each subperiod (except for output growth over 2020-24, when the collapse and rebound around the pandemic lockdowns generates brief but highly synchronized swings in output growth). In fact, the estimates from the last window before the pandemic (2008-19) suggest that the global interest rate factor explains 38% of the variation in domestic interest rates, substantially more than the 24% and 13% of the variation in domestic inflation and output growth explained by the global inflation and output factors, respectively.

A range of structural and cyclical factors have likely contributed to this increased global synchronization in growth, inflation, and, particularly, interest rates.[17] Policy frameworks have become more similar over time as a larger share of economies in our sample has introduced inflation targeting. Inflation targets have converged, as many countries have lowered their targets over the past three decades to levels at or around 2 percent. Global integration through trade and financial markets increased rapidly over the three decades prior to the Covid-19 pandemic, and even if the pace of increased integration stalls and/or the nature of integration changes, many economies are still likely to remain more interconnected with the global economy than in the 1970s and 1980s. Research shows that stronger trade linkages combined with the expansion of global supply chains have made domestic inflation more sensitive to global price movements, translating

[16] Fry-McKibbin et al. (2022) also documents changes in the degree of interest rate synchronization around similar windows. For instance, this study finds increased comovement in monetary policy between the United States and other economies during the Global Financial Crisis, and decreased comovement during the post-GFC period when central banks adopted unconventional policies.

[17] There is a lengthy literature discussing these patterns in advanced economies, including that on the "Great Moderation" (Bernanke, 2004) and "Secular Stagnation" (Summers, 2013; Rogoff, 2013). Fernández-Villaverde et al. (2010) documents that the Great Moderation has been attributed to a smaller variance of shocks and positive and stable technological shocks ("good luck") and a more stabilizing monetary policy ("good policies") in the United States. Kollmann et al. (2021) documents that slow growth, low interest rates and low inflation have characterized the macroeconomic environment in the euro area and other advanced economies since the global financial crisis of 2008-09.

into more synchronized changes in national policy interest rates.[18] Other research shows that as cross-border linkages have strengthened, national business cycles have also become more correlated, leading to more synchronized interest rate movements across countries to stabilize cycles.[19]

In order to better understand why changes in interest rates have become more synchronized over time, the next section presents a more technical and systematic analysis of the importance of different types of shocks in explaining interest rate cycles.

## IV. Drivers of Interest Rate Cycles

While the previous section documented the importance of global factors in explaining interest rate movements, this section uses a factor-augmented VAR (FAVAR) to provide a more complete analysis of the individual global and domestic sources of interest rate movements.[20] This model includes three domestic variables (output, inflation, and interest rates), the same variables used in the previous section and similar to those used in some earlier studies of monetary policy (e.g., Uhlig 2005 and 2017, Dees et al. 2010, and Madeira, Madeira, and Monteiro 2023).[21] The model also incorporates four global variables (global interest rates, global inflation, global output growth, and global oil price growth). This is a richer decomposition of shocks than traditionally used in this literature (particularly of global shocks), building on the body of evidence and the results above showing that global factors have become increasingly important drivers of domestic macroeconomic and financial variables.[22]

This section begins by developing the methodology behind the FAVAR model and then reports the resulting variance decompositions quantifying the importance of the four global and three domestic shocks in driving national interest rates over the full period from 1970-2024. Next it describes how the roles of these different shocks have changed over time (based on the five subperiods used above) and then briefly compares the drivers of interest rates with those of inflation and output. For each part of the analysis, we report simple averages across the countries in the sample in order to focus on the aggregated results of these decompositions and learn from the broader cross-country experience. Section VII of the paper provides results for individual economies.

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[18] Many studies have analyzed the role of different factors in the synchronization of cycles. See Claessens and Forbes (2001), Kose, Prasad, and Terrones (2003), and Imbs (2006) for financial linkages; Auer, Levchenko, and Sauré (2019) for cross-border supply chains; Monacelli and Sala (2009), Kose, Otrok, and Prasad (2012) and Duval et al. (2014) for trade linkages. For literature reviews on the policy changes and structural factors driving inflation synchronization, see Ha, Kose, and Ohnsorge (2019) and Forbes (2019).

[19] Chatterjee (2016) estimates a dynamic factor model of Taylor rule residuals, a measure of monetary policy stance, for five advanced economies from 1980 to 2009. It reports that the common factor becomes more important with a rise in trade integration.

[20] See Bernanke, Bolvin, and Eliasz (2005), Mumtaz and Surico (2009), and Ha et al. (2023) for other applications of (simpler) FAVAR models.

[21] The models in these studies generally include output, inflation, and short-term interest rates, which is often motivated by the standard New Keynesian approach, e.g., Clarida et al. 1999, Woodford 2003, Smets and Wouters 2007.

[22] An extensive literature documents the global synchronization of domestic business cycles (e.g., Kose, Otrok, Whiteman, 2003 and 2008, among many others). A branch of this literature documents the increased global comovement in inflation rates (Ciccarelli and Mojon 2010; Forbes 2019; Auer, Levchenko, and Sauré 2019; Ha et al. 2024).

## IV.1 The FAVAR model

To estimate the roles played by global and domestic shocks in explaining the fluctuations in national interest rates, we employ the following FAVAR model:

$$B_0 Z_t = \alpha + \sum_{i=1}^{L} B_i Z_{t-i} + \varepsilon_t$$

$$\varepsilon_t \sim N(0, \sum_t),$$

where $Z_t$ consists of global interest rates ($f_t^{R,global}$), global inflation ($f_t^{\pi,global}$), global output growth ($f_t^{y,global}$), oil price growth ($\Delta op$), domestic interest rates ($R^{domestic}$), domestic inflation ($\pi^{domestic}$), and domestic output growth ($y^{domestic}$).

The $\varepsilon_t$ is a vector of orthogonal structural innovations, which include the following four global shocks: (i) common changes in monetary policy across countries ("global monetary policy"); (ii) the global demand for goods and services ("global demand shock"); (iii) the global supply of goods and services ("global supply shock"); and (iv) oil prices ("oil price shock"). It also includes the following three domestic shocks: (v) domestic monetary policy ("domestic monetary policy"); (vi) the domestic supply of goods and services ("domestic supply shock"); and (vii) the domestic demand for goods and services ("domestic demand shock").[23] The model assumes stochastic volatility of the structural shocks—the residuals represented by the time-varying residual covariance matrix $\sum_t$. These shocks are independently (but not identically) distributed across time.[24]

We estimate the FAVAR model using monthly data with four lags (based on the AIC and SIC information criteria). The Bayesian routine we employ to estimate the model first searches for 500 successful draws from at least 1,000 iterations with 500 burn-ins; the results are based on the median of these 500 successful draws. The estimation process is standard Gibbs sampling, except that the volatility of residuals is endogenously determined. In the estimation of the model, structural shocks are assumed to have unit variance.

We identify the seven shocks using sign and zero restrictions, following previous studies on the drivers of inflation and monetary policy.[25] Postulating that $B_0^{-1}$ in our model has a recursive

[23] Our global and domestic shocks are motivated by theoretical studies on the sources of movements in interest rates, output, and inflation in the United States. For example, Smets and Wouters (2007) develop a model that decomposes the variation in output, inflation, and policy rates into demand shocks (including risk premium, investment, and fiscal shocks), price mark-up shocks (including commodity price shocks), supply shocks, and interest rate shocks. Del Negro et al. (2013, 2022) builds a model analyzing an even wider range of shocks behind U.S. macroeconomic and financial variables.

[24] Typical VAR models assume that the variance-covariance matrix of residuals is constant over time. However, this assumption could be problematic in our exercise since there are several periods with substantially heightened volatility in our long time series, such as around the COVID-19 pandemic and other major global shocks (Lenza and Primiceri, 2022). The variance-covariance matrix of residuals $\sum_t$ is allowed to be period-specific, hence rendering stochastic volatility and introducing heteroskedasticity (Carriero, Corsello, and Marcellino, 2019). $\varepsilon_t$ is serially independent with zero mean and variance $\sum_t$. We assume that $\sum_t = F\Lambda_t F'$, where $F$ is a lower triangular matrix with ones on its main diagonal, while $\Lambda_t$ is a period-specific diagonal matrix whose diagonal elements $\Lambda_{jj,t}$ (the time-varying variances) follow a stochastic process (Cogley and Sargent, 2005).

[25] For related work, see Uhlig (2005, 2017), Antolín-Díaz and Rubio-Ramírez (2018), Forbes, Hjortsoe, and Nenova (2018, 2020), and Ha et al. (2024).

structure such that the reduced form errors can be decomposed according to $u_t = B_0^{-1}\varepsilon_t$, the sign and zero restrictions that are imposed over the first month can be written as follows:

$$\begin{bmatrix} u_t^{R,global} \\ u_t^{y,global} \\ u_t^{\pi,global} \\ u_t^{op,global} \\ u_t^{R,domestic} \\ u_t^{y,domestic} \\ u_t^{\pi,domestic} \end{bmatrix} = \begin{bmatrix} + & + & * & * & 0 & 0 & 0 \\ - & + & + & - & 0 & 0 & 0 \\ - & + & - & + & 0 & 0 & 0 \\ * & + & + & + & 0 & 0 & 0 \\ * & * & * & * & + & + & * \\ * & * & * & * & - & + & + \\ * & * & * & * & - & + & - \end{bmatrix} \begin{bmatrix} \varepsilon_t^{GMonPolicy} \\ \varepsilon_t^{GDemand} \\ \varepsilon_t^{GSupply} \\ \varepsilon_t^{GOilPrice} \\ \varepsilon_t^{DMonPolicy} \\ \varepsilon_t^{DDemand} \\ \varepsilon_t^{DSupply} \end{bmatrix}$$

The * stands for an unrestricted initial response. These restrictions assume the country is a "small" economy in the sense that domestic shocks do not affect global variables contemporaneously. Global shocks, however, can affect domestic variables (without any sign or zero restrictions).

The sign restrictions identifying the shocks are consistent with previous work. A positive global monetary policy shock increases global policy rates while decreasing global output growth and inflation. A contractionary (positive) domestic monetary policy shock lowers domestic output growth and inflation, with an indeterminate effect on oil prices (see Uhlig (2005, 2017), Madeira, Madeira, and Monteiro (2023), Dees et al. (2010), and Gerlach and Smets (1995)).

A positive global demand shock is assumed to increase global output growth, global inflation, the global policy rate, and oil prices. A positive global supply shock raises global output and oil prices, but reduces global inflation and has an indeterminate effect on global interest rates (Dolado (2014) and Ha et al. (2024)). A positive domestic supply shock raises domestic output growth, but reduces domestic inflation, with an indeterminate effect on domestic interest rates. A positive domestic demand shock is assumed to raise domestic output growth, inflation, and policy interest rates.[26] The identification assumptions related to the oil price shocks also closely follow earlier studies (e.g., Melolinna, 2015 and Charnavoki and Dolado, 2014)—which presume that a positive cost (commodity price) shock reduces output and raises commodity prices and inflation.

In order to estimate this model, we use the data for interest rates, inflation and output growth described in Section III.2. for the dynamic factor model. The only new variable is for oil prices; we measure oil price growth as the month-on-month growth rate of the nominal oil price (the simple average of Dubai, West Texas Intermediate, and Brent benchmarks) from the World Bank's monthly Pink Sheet of commodity prices.

## IV.2 Drivers of Interest Rate Cycles over the Full Period (1970-2024)

Table 1 and Figure 4 present the resulting contributions of the seven global and domestic shocks to the variance of national policy interest rates over the full sample period of 1970-2024 based on the FAVAR model. To begin, we focus on the combined contributions of the four global shocks versus those of the three domestic shocks. On average, the global shocks together account for 16 percent of the variation in interest rates in the 13 economies, ranging from 2 percent (in New Zealand and Norway) to 62 percent (in the euro area). Among the global shocks, global demand shocks play the largest role in driving interest rates, accounting for 6 percent of the average

[26] For similar approaches to the identification of supply and demand shocks, see Gambetti, Pappa, and Canova (2008) and Melolinna (2015).

variance in rates. The other global shocks (to monetary policy, supply, and oil prices) explain, on average, 3-4 percent of the variation in interest rates.

In contrast, domestic shocks explain the lion's share of the variance of domestic policy rates, accounting for more than four-fifths of rate fluctuations on average over the full period. Among the domestic shocks, demand shocks are the main drivers of the variation in interest rates, with an average contribution of about 36 percent, followed by domestic monetary policy shocks (accounting for nearly 35 percent). Domestic supply shocks play a much smaller role, with an average contribution of 12 percent.

### IV.3 Drivers of Interest Rate Cycles over Time

Next, we examine how the importance of these global and domestic shocks in explaining the variance of interest rates has changed over time. We estimate the variance decomposition of interest rates over the five shorter sub-periods used above (1970-84, 1985-98 1999-2007, 2008-19, and 2020-24).

These decompositions show that the sample averages reported above mask the growing importance of global shocks in explaining interest rate fluctuations over time. Table 1 and Figure 4 suggest that the total contribution of global shocks to the variance of interest rates roughly doubled from the earlier half of the sample to the latter half (from an average of 19-24 percent over 1970-98 to 37-49 percent over 1999-2024). In fact, the aggregate role of the global shocks increased to explain almost 50 percent of the interest rate variation in the most recent period (2020-24)—such that the contribution of the global shocks was greater than domestic shocks for the first time in the sample as a whole (as well as for many individual economies).[27]

Among the four global shocks, demand shocks continued to make the single largest contribution to the interest rate variance in each sub-period, followed by global monetary policy shocks. The total variance of interest rates due to just these two shocks more than doubled in the post-1998 sample (from 11-14 percent in 1970-98 to 23-29 percent in 1999-2024).[28] In 2020-24, the role of these two global shocks continued to increase—reaching an average contribution of almost 30 percent to the interest rate variation across the 13 economies. While global supply and oil price shocks played relatively smaller roles than global demand and monetary policy shocks, they also accounted for a growing share of the variation in interest rates over time.[29] More specifically, the combined contribution of global supply and oil price shocks to interest rate fluctuations reached 20 percent in 2020-24—its highest level during any of the sub-periods—and notably higher than during the well know oil price shocks of the 1970s and early 1980s.[30]

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[27] It is worth noting that the confidence intervals of the estimated variance shares are large, as is typically found in this approach, as well as reflecting the large number of variables included in the FAVAR model. Many of the differences over time highlighted above, however, are still statistically significant, such as for the increased role of global demand shocks over time.

[28] Despite large oil price movements in the 1970s and 1980s, the contribution of oil price shocks to policy rates is rather muted compared to that for inflation and output (as documented in the next subsection). This may partly reflect less responsiveness by central banks to supply shocks, including oil and other supply shocks, as they were often regarded as transitory.

[29] The larger share of global supply and oil price shocks during the recent episode includes the effects from other commodity prices, such as gas and food prices, particularly after the Russian invasion of Ukraine in 2022. Depending on their contemporaneous correlation with oil prices, these non-oil commodity price shocks will be counted as either oil price shocks or global supply shocks in the FAVAR framework.

[30] These averages are broadly consistent with the country-specific findings. They also align with the literature on the drivers of inflation in 2021-23, discussed in more detail in the next sub-section.

As the role of these global shocks has increased over time, the corresponding importance of domestic shocks has declined, from an average contribution of 76-81 percent during 1970–98 to 51-63 percent after 1999. For each sub-period, demand shocks, followed by monetary policy shocks, accounted for the largest share of the interest rate variation among the three domestic shocks. Despite their declining role, domestic demand and monetary policy shocks still together explained more than 42-54 percent of interest rate movements after 1998. The variance share explained by domestic shocks, however, declined significantly in the 2020-24 period.

Instead of breaking the seven shocks into global and domestic shocks, it is also useful to analyze the share of interest rate variance explained by the type of structural shocks, i.e., of the combined demand (global and domestic) shocks, supply (global, domestic, and oil price) shocks, and monetary policy (global and domestic) shocks. These results are shown in Panel C of Figure 4 for each of the time periods. Demand shocks collectively accounted for the largest share of the variation in interest rates over 1970-2024 (43 percent), followed by monetary policy shocks (39 percent) and a more modest role for supply shocks (18 percent). Both demand and supply shocks became slightly more important over time in driving interest rates; during 2020-24, these two shocks explained nearly 70 percent of the volatility in interest rates.

Finally, Figure 5 shows that the variance decompositions are quite consistent across the individual economies in our sample in terms of the relative shares of the global and domestic shocks, as well as the shares of the demand, supply, and monetary policy shocks. This figure reports the interquartile ranges across the economies of the contributions of specific shocks to the variation in interest rates. These ranges are narrow in most cases, indicating that the variance decompositions are quite similar across the majority of the economies in our sample. For example, in almost all economies, the contribution of global shocks became larger over time; the interquartile range of the contribution of these shocks for 2020-24 does not overlap with those ranges for 1970-84 and 1985-1998. Nonetheless, these results only focus on interquartile ranges, and there are some periods and individual economies for which the role of specific shocks varies meaningfully from the means. We explore these cross-country differences in detail in Section VI.

### IV.4 Drivers of Inflation and Output Cycles

These changing patterns in the main drivers of interest rate cycles over time are consistent with results from similar decompositions estimating the shocks behind inflation and output growth. Figure 6 and Table 2 show the average variance decompositions for inflation and output growth over the full-sample period (1970-24) and the five sub-periods.[31] There are several noteworthy points, particularly in how these results compared to those for the variance decompositions for interest rates.

First, the importance of the global shocks in explaining the variation in output has also increased over time.[32] These shocks accounted for one-fifth of the volatility in output growth throughout all the sub-periods between 1970 and 2019, but this average masks the sharp increase in the contribution of the global shocks to 35 percent in 2020-24. This sharp increase in the most recent period is unlikely to persist, however, as it reflects the unprecedented and highly synchronized

[31] As explained in Section III, the results on interest rates are based on average across 13 economies—that exclude the member countries of euro area. That said the empirical results in this sub-section do not change materially if we focus on a larger group of 24 economies and include each member of the euro area as a separate entity.

[32] One caveat is that the results for 1970-84 and 1985-98 are based only on G-5 economies due to the data availability. Based on the expanded sample with individual economies in the euro area, the share moderately increased from around 20 percent over 1970-98 to 21-24 percent in 1999-2019.

collapse and then bounce-bank in economic activity following the COVID-19 outbreak, lockdowns, and reopenings. During this last period, all four global shocks—global demand, supply, oil price, and monetary policy—contributed roughly equally to the output variance.

Second, the drivers of inflation have also changed over time—but in a different direction than for interest rates and output. The contribution of the global shocks to CPI inflation was the largest during the earliest period from 1970-84 (at 56 percent), possibly reflecting second round and cost-push effects on inflation following the sharp rises in oil prices that occurred during this period. The contribution of the global shocks declined substantially (to 18 percent) in the subsequent period (1985-98), but then rose again (to 28-33 percent) during the two sub-periods between 1999 and 2019. The importance of the global shocks remained sizeable at 32 percent in the 2020-24 period, but did not increase sharply despite the more synchronized movements in output.

Finally, the roles played by demand and supply shocks vary across the three domestic variables. Demand shocks (both global and domestic) contributed 43 percent to the variation of interest rates over 1970-2024, whereas supply shocks (both global and domestic, as well as oil prices) accounted for only 16 percent. These shares are roughly reversed for the variation of inflation, for which demand shocks contributed 32 percent and supply shocks 41 percent. The decompositions for the variation in output growth are also closer to those for inflation than interest rates, with 29 percent of the variation in output growth is explained by demand shocks, and 43 percent by supply and oil price shocks. If monetary policy shocks are included as demand shocks, the differential is even larger for interest rates (with the contribution of the demand shocks now about two times that of the supply shocks), while the overall contribution of the demand shocks to the variation in inflation and output growth is roughly equal to that of the supply shocks. These different weightings indicate that monetary policy is not mechanically adjusted in response to any changes in inflation and output, but instead the sources behind the variation in inflation and output could affect any corresponding adjustment in interest rates.

## V. Understanding the Evolving Role of Global Shocks

The last two sections document an increased role for the global factor in explaining the variation in interest rates, output and inflation, and how this corresponds to an increased role for global shocks, particularly for oil prices and other supply shocks since 2020, but also a larger role for global demand shocks and global monetary shocks in driving the variation of interest rates. Why have these global shocks become more important over time in explaining the variation in key macroeconomic variables? And why have they become more important in accounting for the variation in interest rates than that of variables such as inflation and output—which in turn determine the appropriate monetary policy response?

This section explores three related hypotheses to better understand this evolution of shocks over time. First, what types of events are driving the increased role of global supply shocks? More specifically, does this measure capture heightened geopolitical tensions and/or unusual supply chain disruptions and/or oil price movements? A better understanding of the drivers could have important implications for whether these types of effects will persist, and therefore how monetary policy should respond. Second, does the larger role of global shocks in explaining the variation in interest rates (and other macroeconomic variables) correspond to a larger magnitude of these global shocks (i.e., larger swings in oil prices) or a greater sensitivity of individual economies to these swings (i.e., greater sensitivity to a given oil price movement). Finally, are the effects of shocks asymmetric such that the larger role of global shocks corresponds to the direction and/or magnitude of the shocks? Most recent shocks (particularly in supply and oil prices) have been

large and negative (i.e., increases in oil prices and disruptions to supply chains) and shocks that are larger and that correspond to tightening in monetary policy could have larger effects than comparable positive and/or smaller shocks.

This section extends the FAVAR analysis used in Section IV to explore each of these three related hypotheses, focusing on the role of global shocks in explaining the variation in interest rates. It finds that geopolitical tensions and supply change disruptions have played a meaningful role in explaining periods when the role of global shocks increases sharply. Then it shows that the larger role of global shocks reflects a combination of both larger underlying shocks, combined with a greater sensitivity of economies to those shocks. Finally, it finds important asymmetries in the impact of different shocks, with a greater impact of larger shocks and shocks that correspond to tightening (instead of easing) monetary policy.

### V.1 Drivers of Global Supply Shocks: Geopolitical Tensions, Supply Chains and Oil Prices

The shock decompositions reported in Section IV and shown in Figures 4 through 6 indicate that the impact of global supply and oil price shocks on interest rate fluctuations (as well as inflation and output growth) has grown over time, peaking during the 2020-24 window. These results are aggregated over fairly long windows, however, and include very different types of global supply shocks that could (or could not) impact interest rates. This section explores these relationships in more detail, attempting to better understand exactly which types of global supply shocks explain these patterns and how their roles have changed over time. For this section, we will use the term "global supply shock" more broadly to include any global supply shocks—including those defined as "oil price" in the previous section (a definition which can include commodity price movements if they meet the same restrictions in the FAVAR model). We focus on three types of global supply shocks: geopolitical uncertainty, supply chain disruptions, and oil price movements. Understanding exactly which types of global supply shocks is critically important for monetary policy. For example, if the shock is driven by a temporary shock to supply chains—such as an earthquake or ship blocking a major trade route—the optimal monetary policy response is likely to be different than to a global supply shock reflecting a longer lasting shift in geopolitical risk.

To begin, Figure 7 (Panel A) presents average movements in interest rates across our sample of advanced economies from 1970 through 2024 (in grey solid line) and then the contribution of global supply shocks to these interest rate fluctuations (in red) based on the estimates from the FAVAR model in Section IV. The red bars have become more prominent in the 2020-24 window, consistent with the earlier results of the increased role for global supply shocks during this recent period, but there are also shorter windows of large red bars in earlier periods—particularly the mid-1970s and early 1980s.

As an initial look at what is driving these shocks, we identify periods when these supply-driven shocks contribute over one standard deviation to the interest rate variation and then denote these windows with light grey shading in the figure. Since 1970, there have been five such events when the supply-driven shocks contributed significantly and persistently to interest rate fluctuations: in the mid-1970s, from the late-1970s to the early 1980s, from the late 1980s to early 1990s, from the late 1990s to early 2000s, and then in the early 2020s. To simplify the following discussion, we will refer to these five windows of a heightened role for global supply shocks as the mid-1970s, early 1980s, early 1990s, early 2000s, and early 2020s.

Do these windows correspond to periods of heightened geopolitical tensions and/or supply chain disruptions and/or oil price shocks? Panel B of Figure 7 graphs three different measures to explore which types of events drive the increased contribution of global supply shocks: the percent change in oil prices, the GPR index measuring geopolitical risk (from Iacoviello, 2022) and the GSCPI

measure of supply chain disruptions (compiled by the Federal Reserve Bank of New York). To simplify comparisons, the five periods when supply-driven shocks contribute over one standard deviation to the interest rate variation that are marked in grey bars in panel A are copied to panel B. Unfortunately the measures of geopolitical risk and supply chain disruptions are not available since 1970—limiting our ability to make some comparison with the earlier windows—but some patterns are still noteworthy and informative.

The data available suggests that the types of shocks explaining the periods of large contributions of global supply shocks to the variation in interest rates have varied over time. Oil price movements are larger during the mid-1970s and early 1980s than in the later windows. Although oil prices also spike and contribute to the increased role of global supply shocks in the later three windows, these price movements are dominated by spikes in geopolitical uncertainty in the early 1990s and early 2000s—corresponding go the Gulf War in 1990-91 and Afghanistan/Iraq wars after 2001. Moreover, in the early-2020 window, both of these global supply shocks are dominated by the increase in supply chain disruptions. This increased role of supply chains in the most recent period is not surprising given the disruptions around the COVID-19 pandemic and Russia/Ukraine war, but it is also noteworthy that despite the severe disruptions to commodity markets, oil prices, and increase in geopolitical tensions around the Russia/Ukraine war, the increase in geopolitical uncertainty is less than in the early-1990 and early-2000 episode, and the increase in oil prices is less than the mid-1970 and early-1980 episodes. Critically important, however, these comparisons only document the size of movements related to these supply shocks (i.e., the change in oil prices, the geopolitical risk index and supply chain disruption index) and they do not capture how a given shock affects interest rates.

Next, to estimate how these global supply shocks contribute to the fluctuations in interest rates, as well as to test the robustness of these results to alternative identification schemes, we add use these more explicit measures of the three different types of global supply shocks to our baseline model. More specifically, we estimate the FAVAR model described in Section IV and continue to control for oil price movements, but replace our measure of other global supply shocks with the variable for geopolitical tensions or for supply disruptions (measured using the same GPR and GSCPI indices, respectively, as described above). These two measures of global supply shocks have two important advantages over our other controls (other than more clearly specifying the source of the shock); they are more exogenous and more "global" (as they are based on variables constructed for all countries in the world and not just the advanced economies in our sample). Based on the assumption that these measures of geopolitical risk and supply chain assumptions are more exogenous than our other variables, we apply a Cholesky restriction that orders these two variables ahead of the other endogenous variables in the baseline model (followed by oil prices, global inflation, global output growth and global interest rates and then the three domestic variables).[33] Although this approach should better identify the impact of specific types of global supply shocks, it is worth noting that many of these shocks are highly correlated and the estimates below may capture shocks which work through multiple global supply channels (such as the Russian invasion of Ukraine increasing geopolitical risk, increasing supply chain disruptions, and raising commodity prices).

Figure 8 shows the central results for the share of interest rate variation explained by geopolitical risk shocks (Panel A, light blue) or global supply disruptions (Panel B, in thick blue), or both, (Panel C) as well as the corresponding shares explained by oil price shocks (in red) and all other

[33] This ordering allows us to efficiently focus on estimating the effects of these different types of supply shocks on interest rate fluctuations rather than running the entire sign-restricted FAVAR model. The empirical results do not change meaningfully when we change the order between oil price growth and the geopolitical risk index or supply disruption index.

global shocks that drove global inflation (in yellow). We continue to focus on the longer windows used throughout this paper, albeit limited by the time series available for the two new measures of global shocks. The graphs clearly highlight the key result documented throughout this paper using a range of approaches: the growing importance of global shocks in explaining the variation in interest rates. The role of these global shocks has more than tripled in each model—from explaining less than 10 percent of the variation in the earliest window for which data is available to at least 30 percent over the 2020-24 period. [34]

The results also provide more evidence on exactly which types of global shocks are behind their increased influence. The role of supply chain disruptions jumped in the 2020-24 period—a jump that appears to be reflect the unusual events during this period (i.e., the pandemic) rather than the continuation of a slow-moving trend. Supply chain disruptions only appear to play a modest and fairly stable role in the earlier windows for which data is available. In contrast, the role of geopolitical tensions appears to have increased over a longer period, growing between the mid-1980/1990s window and the early 2000's window, and then increasing again sharply in the 2020-24 period (albeit dipping in the 2008-19 period). Given that this measure of geopolitical uncertainty continues to increase in 2025 after the sample ends, it is unlikely that this source of global supply shocks and the corresponding impact on interest rates will fade in the near future.

Finally, it is also noteworthy that the contribution of global supply shocks based on these new definitions is very similar to that in the baseline. Focusing on the estimates for the 2020-24 period, the combined contribution of these global supply shocks using the two different decompositions accounts for around 20 percent of the variation in interest rates; this is consistent with the 19 percent share in our baseline FAVAR results (Table 1)—which use a more aggregate definition of global supply shocks (and the same measure of oil price shocks). This is a useful robustness test of our baseline model to alternate measures and identification assumptions (before the longer set of robustness tests discussed in Section VII).

### V.2 Role of Shock Size versus Sensitivity

A consistent result throughout this paper is the increasing role of global shocks in driving the variation in interest rates over time—as well as the increased role of global supply shocks (whether defined more broadly or using the more detailed decompositions in the last section). This greater role of global (and especially global supply) shocks, however, could reflect two very different channels: that the size of these global shocks has become larger over time and/or the sensitivity of interest rates to global shocks has increased over time. For example, Figure 7 (panel B) shows that shocks to oil price growth were even larger in the mid-1970's and early 1980's—but if economies have become more sensitive to oil price shocks—the variation in interest rates explained by oil prices shocks could still have increased over time. This section attempts to differentiate between these two explanations through additional variance decomposition and impulse response exercises to better understand if the increased role of global shocks reflects larger underlying shocks or changes in the sensitivity of domestic interest rates to these shocks.

To begin, Figure 9 graphs the volatility of three sets of domestic and global shocks over the five long periods used throughout this paper (with supply shocks in the middle panel). Each of the comparisons—for demand, supply, and monetary policy shocks, shows the same pattern: the magnitude of the domestic shocks has declined over time and the magnitude of global shocks increased sharply to their highest levels in the most recent period from 2000-24. For demand shocks the increased magnitude of global demand shocks in the most recent period reflects a

[34] The results were consistent in the case where we include three types of supply shocks---geopolitical, supply disruptions, and oil shocks together (Panel C).

continuation of longer-term trend of global demand shocks increasing over each period since the mid-1980s (albeit jumping more sharply over 2020-24), while for the other there is no clear trend over time. Also, for each group of variables the global shocks played a larger role in the 1970-1984 window than subsequent periods—until 2020. These patterns are not surprising and consistent with the patterns documented above showing that the role of global supply shocks has increased over time, but been driven by different types of global supply shocks (with a greater role for oil price increases in the mid-1970s and early 1980's and then a larger increase in geopolitical uncertainty in the middle periods and sharp spike in supply chain disruptions over 2020-24 (**Figure 7**).

While the volatility of global shocks has increased—and could in principle and of itself explain the increased role of global shocks in explaining the variation in interest rates over time—is there also any change in how these global shocks are transmitted to interest rates? Has monetary policy become more—or less—sensitive to a given global shock? Theory suggests the effect could go in either direction. As economies have become more closely linked through trade and capital flows, the impact of a global shock on one country could be magnified due to simultaneous effects on neighbors and trading partners. On the other hand, as central banks have become more independent and shifted to inflation targeting regimes, inflation expectations have become more firmly anchored, potentially giving central banks more flexibility to look through global supply shocks, especially if they are believed to be temporary.

To test if interest rates have become more responsive to global shocks than to domestic ones, Panel B of **Figure A6** shows the impulse responses from the FAVAR model of the impact on interest rates of one standard deviation movements in each of our seven global and domestic shocks. The impulse responses are estimated separately for each of the five periods (displayed in the different lines) and show several striking patterns. Over the most recent period from 2020-24, the sensitivity of domestic interest rates to global demand, global supply, oil price shocks and global supply rose significantly—and, for oil prices and domestic supply, this period was the most sensitive economies had been relative to any historical period in our sample. For global demand and supply shocks, the only period with a comparable sensitivity of interest rates was in the 1970-84 window (albeit based a much narrower sample).[35] Also striking, the sensitivity of interest rates to domestic demand and domestic monetary policy shocks fell to historical lows in the 2020-24 window.

In addition to show how the sensitivity of interest rates to different types of shocks has changed over time, these impulse responses also provide evidence on the relative impact of different types of shocks on the variation in interest rates. Since 1999, a one-standard deviation in global demand shocks has a greater impact on interest rates than a comparable shock to domestic demand or to any of the other variables. The greater impact of global demand—relative to domestic demand—shocks is even larger during the 2020-24 period. Over each period, global supply shocks (excluding oil price shocks) also appear to have a greater impact than domestic supply shocks. This series of results highlights the importance of global shocks—of "events from heaven" in setting domestic interest rates.

[35] The sensitivity to global shocks was greatest during the 1970-84 period. However, this finding is based on data from only four major economies, due to limited data availability. As a result, it is challenging to draw direct comparisons with other periods.

Finally, the relative sensitivity of interest rates to demand and supply shocks is worth noting. On average, the sensitivity to supply-side shocks—including global and domestic supply shocks as well as oil prices—is relatively subdued across economies and meaningfully smaller than for demand shocks. This reflects a significant variation across individual economies (as explored in more detail in Section VI), however, including differing directional responses that reflect heterogenous macroeconomic conditions and policy reaction functions. This sensitivity of interest rates to a one-standard deviation supply shock has also evolved in a noteworthy way across time. During the first three sub-sample periods (1970–84, 1985–98, and 1999–2007), interest rates were generally lowered in response to oil price and domestic supply shocks. After 2008, however, the direction of the response reversed, based on averages across countries, with central banks generally increasing interest rates in response to the same shocks. This shift is consistent with central banks placing more weight on mitigating the negative impact of negative oil and other supply shocks on output in the earlier periods, but have since shifted to place more weight on stabilizing inflation, a shift that aligns with the widespread adoption of inflation-targeting frameworks in the advanced economies in our sample.

To summarize, the exercises in this sub-section suggests that the rising contribution of global shocks to interest rate fluctuations are driven by both an increase in the volatility of global shocks as well as an increase in the sensitivity of interest rates to these shocks, although the relative importance of each of these factors appears to have evolved somewhat differently over time and the type of the shock.

### V.3 Role of Asymmetries in the Direction of the Shock

While the previous section documents that the larger impact of global shocks on interest rates reflects a combination of larger global shock as well as a greater sensitivity of individual economies to these shocks. But could these channels be related? More specifically, could the effects of shocks be asymmetric and linked to the direction or size of the shock? For example, if an oil supply shock is negative, would the corresponding increase in inflation cause a larger monetary policy response than in response to the same sized positive oil supply shock? This could occur, for example, if a reduction in oil prices has a smaller impact on inflation because firms absorb the lower oil price through higher margins, as opposed to an increase in oil prices which firms use to justify price increases and thereby not absorb in margins? This type of asymmetry could contribute to outsized role of global shocks in the post-pandemic period, as many of the underlying shocks were not only unusually large by sharply negative (such as the spike in supply chain disruptions, and increase in geopolitical risk and oil prices (shown in Figure 7).

To begin, we consider if the decompositions of interest rate movements vary during periods of increases versus decreases in interest rates—unlike the previous analysis that aggregates across shocks and interest rate movements in both directions. To perform this analysis, we estimate the baseline FAVAR model developed in Section IV explaining the variation in interest rates (as well as inflation and output) as a function of the same seven global and domestic shocks, except now we estimate the model separately for economy-specific tightening and easing phases for monetary

policy, as identified in Forbes, Ha, and Kose (2024). The resulting estimates are shown in Figure 10 for each decade from the 1970s through the 2020s.[36]

The left panel of Figure 10 (Panel A) highlights the dominant role of global shocks behind interest rates during tightening phases from the 1990s. In fact, global shocks accounted for almost all of the increase in interest rates during these cycles in the 1990s, 2000s, and 2020s. Of the four global shocks, global demand shocks continued to explain the largest share of the increases in interest rates, but global supply, global monetary policy, and oil price shocks also contributed meaningfully.

The results for the most recent tightening phases over 2021-24 are particularly noteworthy—a period during which interest rates increased by an average of 7 percentage points for the five economies in the sample. Just global demand shocks explained over three percentage points (42 percent) of this increase in interest rates on average, while global supply and oil price shocks together contributed 2.4 percentage points (30 percent), and global monetary policy shocks added another 0.5 percentage point (7 percent). This latest wave of post-pandemic tightening phases is similar to the tightening phases in the 1970s in terms of the overall amplitude of the interest rate increases, but differs in terms of the relative contributions of global and domestic shocks; global shocks were the dominant force behind tightening phases over 2021-24, whereas domestic shocks explained the majority of the tightening in the 1970s. In line with the results reported above for all phases, demand shocks (both global and domestic) explain the largest share of the increase in interest rates during the tightening phases.

Similar to their growing and recently dominant role in explaining tightening phases, global shocks also accounted for an increasing share of easing phases in recent decades (Panel B). More specifically, global shocks explained about 75 percent of the decline in interest rates during the easing phases since 2000. Of the four global shocks, global demand shocks continued to be the most important drivers of declines in policy rates, particularly around the global recession in 2009. Global demand shocks played a smaller absolute role during the most recent recession in 2020, but were still the dominant shocks explaining the decline in policy rates (and inflation) during this period. Global oil prices and global supply shocks also contributed to the declines in policy rates after the outbreak of the COVID-19 pandemic, albeit played a much smaller role than global demand shocks.

Although the contribution of domestic shocks to easing phases has declined over time, it has still been meaningful in recent decades. For example, during the most recent easing phases around the COVID-19 pandemic, domestic shocks still accounted for 1.1 percentage points (36 percent) of the decline in interest rates, with global shocks responsible for the rest (1.8 percentage points).

Finally, we shift focus from the differential role of global versus domestic shocks to the different categories of shocks (at the right column of Panel B). Demand shocks (both global and domestic) are the primary determinants of changes in interest rates during tightening phases, as well as during easing phases in the 2010s and 2020s. In contrast, monetary policy shocks play a greater role in easing than tightening phases (primarily reflecting domestic monetary shocks) and are the

[36] We switch to using decades as sub-periods for this part of the analysis as turning points may not occur at the same time across economies and the decades provide a rough characterization of the time distribution of the major rate cycles. Specifically, the turning points of rate cycles in the five economies correspond to the following time distribution for tightening phases: 1972-80 (1970s), 1987-91 (1980s), 2003-08 (2000s), and 2021-23 (2020s). Similarly, the time distribution of the easing phases includes: 1974-78 (1970s), 1980-89 (1980s), 1990-99 (1990s), 2001-15 (2000s), and 2019-22 (2020s).

most important shock driving interest rate movements during easing phases in the 1970s-1990s. These shocks reflect adjustments to interest rates after controlling for shocks to demand and supply, and therefore indicate that monetary policy has been more supportive (after controlling for macroeconomic variables) during easing than tightening phases.

The final category of shocks (in addition to demand and monetary policy shocks) is supply shocks, which include shocks to oil prices as well as global and domestic supply. These shocks have historically played only a modest role in tightening phases, but a somewhat larger role in easing phases (particularly pre-2000). Noteworthy, however, is how the role of supply shocks increased during the most recent period in 2020-24, supporting findings from the literature on the importance of these shocks around the pandemic.[37] Supply shocks played a minimal role in explaining the declines in interest rates during the COVID-19 easing phases, but an unusually large role in explaining the sharp increases in interest rates during the post-pandemic tightening. In fact, supply shocks contributed to 2.4 percentage points (31 percent) of the increase in interest rates during this period, primarily reflecting oil shocks and global supply shocks (15 percent, respectively).

As discussed in the previous section, this increased role of supply shocks (which includes shocks to oil prices, as well as to food and other commodity prices) during the post-pandemic tightening phase merits further discussion. The contribution of supply shocks to the increases in interest rates jumped after 2020—whether measured in absolute value or relative to the contribution of other shocks. This contribution of supply shocks increased to higher levels than occurred in the tightening phases of the 1970s and 1980s, which coincided with substantial volatility in oil prices. Despite these jumps in the role of global supply shocks, however, it is worth highlighting that their contribution to changes in interest rates continued to be smaller than the contribution of global demand shocks (as highlighted above during the full sample and for all sub-periods for both easing and tightening phases).

## VI. Interest Rate Variation across Different Groups and Individual Economies

This paper primarily focuses on the average or median drivers of interest rates, inflation and output over time for a panel of 24 economies (or 13 if the individual members of the euro area are treated as one entity). This panel approach allows us to identify patterns that are typical across advanced economies—and not for a single economy—and the cross-country variation allows us to identify our FAVAR model. This focus on averages or medians, however, can mask important differences in these relationships across economies. For example, inflation and output in some economies may be more sensitive to global shocks (if they are more interconnected with the global economy through trade or financial flows) or specific types of global shocks (such as oil price fluctuations or geopolitical risk). Therefore, this section takes a more disaggregated approach, reporting results for a sub-sample of large advanced economies (the G-5), and then eight other advanced economies. The section closes with a closer look at the US, UK and euro area over 2020-24. The empirical findings indicate that global and domestic shocks play distinct roles across different groups of economies, but a better understanding of the role of these various shocks for

[37] A series of papers analyze the drivers of the inflation surge in 2021-23, with most identifying a prominent role of both demand- and supply-side shocks—but substantial debate about the relative role of oil price shocks and supply chain disruptions. Several examples include: Bernanke and Blanchard (2024), Di Giovanni et al. (2022, 2023), Gagliardone and Gertler (2023), Giannone and Primiceri (2024), Ha et al. (2024), Ha, Kose, and Ohnsorge (2021, 2022), and Shapiro (2022).

individual economies can help explain differences in their monetary stances at different points in time.

### VI.1 Results for Country Sub-groups: the G-5 and other Advanced Economies

To begin, we focus on the main results reported above for the G-5 economies (Canada, the euro area, Japan, the United Kingdom, and the United States), using the same data and FAVAR methodology as in our baseline results described in Section IV. Panel A of Table A4 suggests that, over the 1970-2024 period, the global shocks accounted for a sizeable portion (nearly 27 percent) of the variation in interest rates in the G-5 economies, ranging from 14 percent (in the United States) to 62 percent (in the euro area).[38] Among the global shocks, demand shocks played the largest role in driving interest rates (as found for the full sample), accounting for 11 percent of the average variance of interest rates. Among the domestic shocks, demand shocks were also the main drivers of the variation in interest rates, with an average contribution of about 33 percent, followed by domestic monetary policy shocks (accounting for 31 percent).

Compared to the G-5 economies, Panel B of Table A4 shows that global shocks, on average, played a relatively smaller role in the other eight advanced economies in our sample (Australia, Denmark, Israel, Korea, New Zealand, Norway, Switzerland, and Sweden).[39] The share of global shocks in explaining the interest rate variation averaged only 10 percent over 1970-2024, ranging from 2 percent (in Norway) to 46 percent (in Switzerland), much smaller than the average for G-5 economies (26 percent). The larger contribution of global shocks to the interest rate variation in the G-5 economies likely reflects the larger share of this former group in the global economy and financial markets; these economies account for more than half of global GDP and financial flows. Consistent with the results from G-5 economies, however, global demand shocks were the main global drivers of interest rates (accounting for over 3 percent of the variance), and domestic demand shocks were the main drivers of the domestic shocks, followed by domestic monetary policy shocks (both explaining about 38 percent of the variance).

Despite the larger contributions of global shocks to the interest rate variation in the G-5 economies than the other advanced economies, the evolution of these contributions over time is quite consistent across both groups—with sharp increase in the global contributions over time. More specifically, in the G-5 economies the importance of the global shocks increased to explain 62 percent of the interest rate variation in the most recent period (2020-24)—such that the contribution of the global shocks was greater than that of the domestic shocks for the first time—and the importance of just global demand and global monetary policy shocks increased to explain 38 percent of the interest rate variation. Although global supply and oil price shocks played relatively smaller roles, their combined contributions to the variation in interest rates also

[38] Global shocks account for a smaller share of the variation in interest rates than domestic shocks in all of the G-5 economies except the euro area. This larger role of global shocks for the euro area likely reflects the regions stronger international trade and financial linkages and much deeper integration with global supply chains. The dominant role of the global shocks in euro area interest rate cycles is consistent with other studies in the global business cycle literature. For example, Ha et al. (2020) and Kose, Otrok, and Prasad (2012) report a larger share of the global factor or global output factor in the euro area than other economies.
[39] For the economies where the estimates of shadow interest rates are not available, overnight rates (or 3-month treasury bill yields) are instead employed, while official policy rates are tested for a robustness check.

increased over time to reach its highest level (of all the sub-periods) in 2020-24 at roughly 24 percent.[40]

Similarly, among the non-G-5 economies in our sample, the average contribution of global shocks to the variation in interest rates also increased sharply over time, from about 12 percent on average in 1970-84 to 41 percent in 2020-24. Despite this sharp increase, and in contrast to the G-5 economies, however, domestic shocks still played the dominant role in the most recent period (at nearly 60 percent). Also in contrast to the G-5, during the post-pandemic period, the role of global supply and oil price shocks (at 17 percent in total on average) was larger than that for global demand shocks (13 percent) and global monetary policy shocks (11 percent).

### VI.2 Results for Individual Economies: Averages and after the Pandemic

The last section showed that the importance of global shocks, and particularly global supply shocks, in explaining the variation in interest rates has varied between on average for the G-5 economies versus the other advanced economies in our sample. These patterns can also vary meaningfully across individual economies in each of these subgroups, particularly during the post-pandemic period during which global shocks (and especially global supply shocks) played a larger role than any historical window. Appendix A—and the corresponding **Figures A3, A4, and A5** present these results in detail, and this section briefly summarizes key findings.

First, within the G-5 economies, there is a notable difference between the euro area and the other advanced economies in the share of the interest rate variation explained by global shocks. In the euro area, global shocks explain 62 percent of the total variation in interest rates over the full sample period, while in each of the other economies, domestic shocks explain a majority of the variation. Second, there are also noteworthy differences in the role of supply versus demand (not differentiating by their global versus domestic nature) between the euro area and the United States (and other G-5 economies). For example, demand shocks explain 45 percent of the variation in U.S. interest rates over the full sample period, and supply shocks only 16 percent, while in the euro area, supply shocks explain a much larger 29 percent of the variation, while demand shocks contributed a more modest 39 percent.

Third, among the non-G5 economies, interest rate fluctuations in Switzerland are far more sensitive to global shocks than the other advanced economies over the full sample period from 1970 to 2024, and (unreported) estimates for individual members of the euro area suggest that Germany and Portugal are also more sensitivity than other advanced economies and members of the euro area. Fourth, many of these differences are accentuated during the pandemic and post-pandemic period from 2020-24. More specifically, the role of global shocks increases sharply to explain almost all of the variation in interest rates in the euro area (at 89 percent), and almost all of the variation in interest rates in Switzerland (at 85 percent). In other words, monetary policy in these economies was largely a response to shocks "from heaven". It is worth noting, however, that a dominant role for certain types of shocks in explaining the variation in interest rates does not necessarily correspond to a similar for in explaining the variation in other variables. For example, although global shocks explain almost all of the variation in interest rates in Switzerland, particularly over 2020-24, they play a much more muted role in explaining the

[40] These averages are broadly consistent with the country-specific findings. They also align with the literature on the drivers of inflation in 2021-23.

variation in output and growth. This likely reflects the importance of Switzerland as a global financial center.

Understanding this type of cross-country variation in the importance of different types of shocks in explaining the variation in interest rates, inflation and output is an important topic for future research. A full investigation is beyond the scope of this paper, but unreported results find patterns consistent with the existing research on business and inflation cycles. More specifically, existing literature highlights the role of trade openness and participation in global value chains as key determinants of how global shocks impact different economies (e.g., Neely and Rapach 2011; Kose, Otrok, and Prasad 2012; Ha, Kose, and Ohnsorge 2021). Simple correlations and regression analyses using the results reported above support this hypothesis; economies that have a higher degree of trade openness (measured as the ratio of exports and imports to GDP) also have interest rates that are more affected by global shocks—particularly global demand and monetary policy shocks—and less affected by domestic shocks.[41]

## VII. Robustness Exercises

In this section, we present several additional exercises to examine the robustness of our headline results. Our results are robust to various sensitivity exercises, including alternative definitions of global variables, different weighting schemes of global variables, alternative measures of domestic variables, and an alternative model or identification scheme. We explain each of these robustness exercises next.

### VII.1 Alternative Measures of Global Variables and Alternative Weighting Schemes

Given the significant influence of global shocks on domestic interest rate fluctuations, particularly over the post-pandemic period (2020-24), we explore alternative measures of interest rates, commodity prices, output, and inflation. These alternatives include (i) real oil prices (nominal oil prices adjusted for U.S. CPI) instead of nominal oil prices, (ii) the global economic activity index estimated by Killian (2009) and Killian and Zhou (2018) in place of the global industrial production factor, (iii) global core CPI inflation instead of global headline CPI inflation, and (iv) a global policy rate factor instead of the global interest rates factor (estimated using cross-country shadow interest rates). Additionally, we examine different weighting schemes for global variables, constructing a weighted average of the respective variables using nominal U.S. dollar GDP weights, instead of using the global factors based dynamic factor estimations, as explained in Section III.

[41] As illustrated in Figure A5, we examined financial openness as an alternative measure of economic integration to assess its relationship with the contribution of global shocks. Consistent with the findings based on trade openness, the empirical evidence indicates that greater financial openness amplifies the impact of global shocks, particularly global demand shocks. Additionally, other country-specific factors—such as monetary policy, exchange rate regimes, and the scale of commodity imports or exports—may help explain cross-country differences in the underlying drivers of interest rates. However, the results related to these country characteristics are not included in this paper, mainly due to the high correlation between these factors among advanced economies, especially within the euro area, which limits the availability of sufficient variation in the data for robust regression analysis in our sample.

As shown in Table A6 (first four rows labeled "global variables" and "global & domestic variables"), these alternative global variables or alternative weighting schemes do not significantly alter our key findings regarding the importance of global shocks (compared with that of domestic shocks).[42] In addition, the relative significance of global shocks—global demand, supply, oil price, and interest rate shocks—remains consistent across different models, in the full-sample period (1970–2024) and the post-pandemic period (2020–2024).

### VII.2 Alternative Measures of Domestic Variables

We test additional measures of domestic interest rates and inflation. For domestic interest rates, the key variable in our study, we use shadow interest rates and the 3-month Treasury yields for the economies where shadow interest rate estimates are unavailable. For robustness checks, we also examine nominal policy (base) interest rates, despite their smaller variations, particularly during the zero-lower bound period. As shown in Table A6 (rows labeled "policy rates"), the variance contribution of global and domestic shocks to interest rate fluctuations remains broadly consistent with the benchmark case. However, the contribution of global shocks to interest rate variations is moderately smaller when using policy (base) rates for both full- and post-pandemic sample periods, primarily due to the lower volatility in this series. We also replace the baseline headline CPI inflation with core inflation, which excludes the effects of volatile energy and food prices. This alternative measure of inflation does not materially affect the variance decomposition of interest rates, as indicated in the table (row labeled "Core CPI").

### VII.3 Alternative model specifications

As an additional robustness test, we estimate a model specification that incorporates time-varying coefficients (instead of time-fixed coefficients) or an alternative sign restriction requiring a longer (two-month) period of sign constraints (instead of one-month). These alternative model or identification scheme do not change the key findings---resulting in a moderately larger contribution of global shocks compared to the baseline model, though the differences remain quite small.

## VIII. Conclusions

This paper conducts the first systematic, cross-country analysis of the global and domestic factors driving fluctuations in interest rates and related macroeconomic variables over the past 55 years. We show that a global factor has explained a larger and larger share of movements in interest rates over time—even more so for interest rates than output or inflation. To better understand the determinants of this global factor, we use an innovative FAVAR model that breaks down fluctuations in interest rates, inflation, and output growth into four global shocks (demand, supply, oil, and monetary policy) and three domestic shocks (demand, supply, and monetary policy). The role of global shocks has increased to explain over half of the fluctuations in in interest rates over 2020-2024, driven primarily by global demand shocks, but also reflecting a larger role for global supply shocks than any historical period. The factors contributing to global supply shocks have evolved over time, with oil price volatility important in the 1970s and early 1980s, increased geopolitical uncertainty becoming more important in the mid-1990s and early 2000s,

[42] That said, we observe some sensitivity in the country-specific results. For instance, based on the weighted-average global variables, the contribution of global shocks to interest rate increases for the U.S. and Canada and declines for euro area.

and supply chain disruptions playing an outsized role over 2020-24 (albeit combined with important contributions from oil price volatility and geopolitical uncertainty). Not only has the magnitude of global shocks increased, but country sensitivity to these types of shocks has also appeared to increase, and the impact appears to be asymmetric, with global shocks driving a larger share of monetary tightening than easing.

This growing and volatile role of global shocks raises a number of considerations for central banks, considerations relevant for ongoing framework reviews. If global shocks—outside the control of any individual monetary authority—drive more and more of the variation in domestic inflation and growth, should central banks be held accountable for the precise outcomes of these variables? In other words, should central banks be asked to target variables that are increasingly determined by "heavenly" shocks? At the very least, should targets be less rigid (such as including a band for inflation instead of target to one decimal point) in order to allow for a certain amount of variation due to external events? Should central banks target variables that are somewhat less influenced by global shocks—such as core (instead of headline) inflation?

To conclude, a key theme throughout the series of results based on different methodologies in this paper is that the shocks behind interest rates, inflation and growth have changed over time. This reflects a combination of slow-moving and longer term trends—such as the increased role of global shocks and diminished role of domestic shocks. But this also reflects short-term fluctuations in the role of different types of shocks during specific windows (such as a greater role of supply chain disruptions over 2020-24), and for different economies (such as a greater role for global shocks for the Euro area than the United States over 2020-24). Understanding the precise nature of the shocks at any specific time should help central banks better understand if the corresponding fluctuations in growth and inflation will persist, and, in turn, how to design an optimal "battle strategy" for monetary policy.

## Table 1 Contributions of Shocks to Interest Rate Variation

(Percent of total variance, average across 13 economies)

A. All economies

| Shocks | 70-24 | 70-84 | 85-98 | 99-07 | 08-19 | 20-24 |
|---|---|---|---|---|---|---|
| Total Global Shocks | 16.4 | 23.9 | 18.7 | 37.0 | 37.4 | 49.2 |
| Oil Price | 2.8 | 5.0 | 4.0 | 6.7 | 6.4 | 9.2 |
| Global Supply | 3.5 | 4.7 | 3.8 | 7.6 | 6.3 | 10.7 |
| Global Demand | 6.1 | 9.3 | 5.8 | 12.1 | 16.7 | 17.3 |
| Global Monetary Policy | 4.0 | 5.0 | 5.1 | 10.6 | 8.0 | 12.0 |
| Total Domestic Shocks | 83.6 | 76.1 | 81.3 | 63.0 | 62.6 | 50.8 |
| Domestic Supply | 12.1 | 10.7 | 11.4 | 9.5 | 8.9 | 8.9 |
| Domestic Demand | 36.4 | 35.0 | 35.5 | 27.5 | 30.4 | 23.2 |
| Domestic Monetary Policy | 35.1 | 30.4 | 34.5 | 26.0 | 23.3 | 18.7 |

Note: Forecast error variance decompositions of interest rates over the 40-month forecasting horizon, based on country-specific FAVAR models that consist of four global variables (inflation, output growth, policy rates, and oil prices) and three domestic variables (inflation, output growth, and policy rates).

## Table 2 Contributions of Shocks to Inflation and Output Growth Variation

(Percent of total variance, average across 13 economies)

A. Inflation

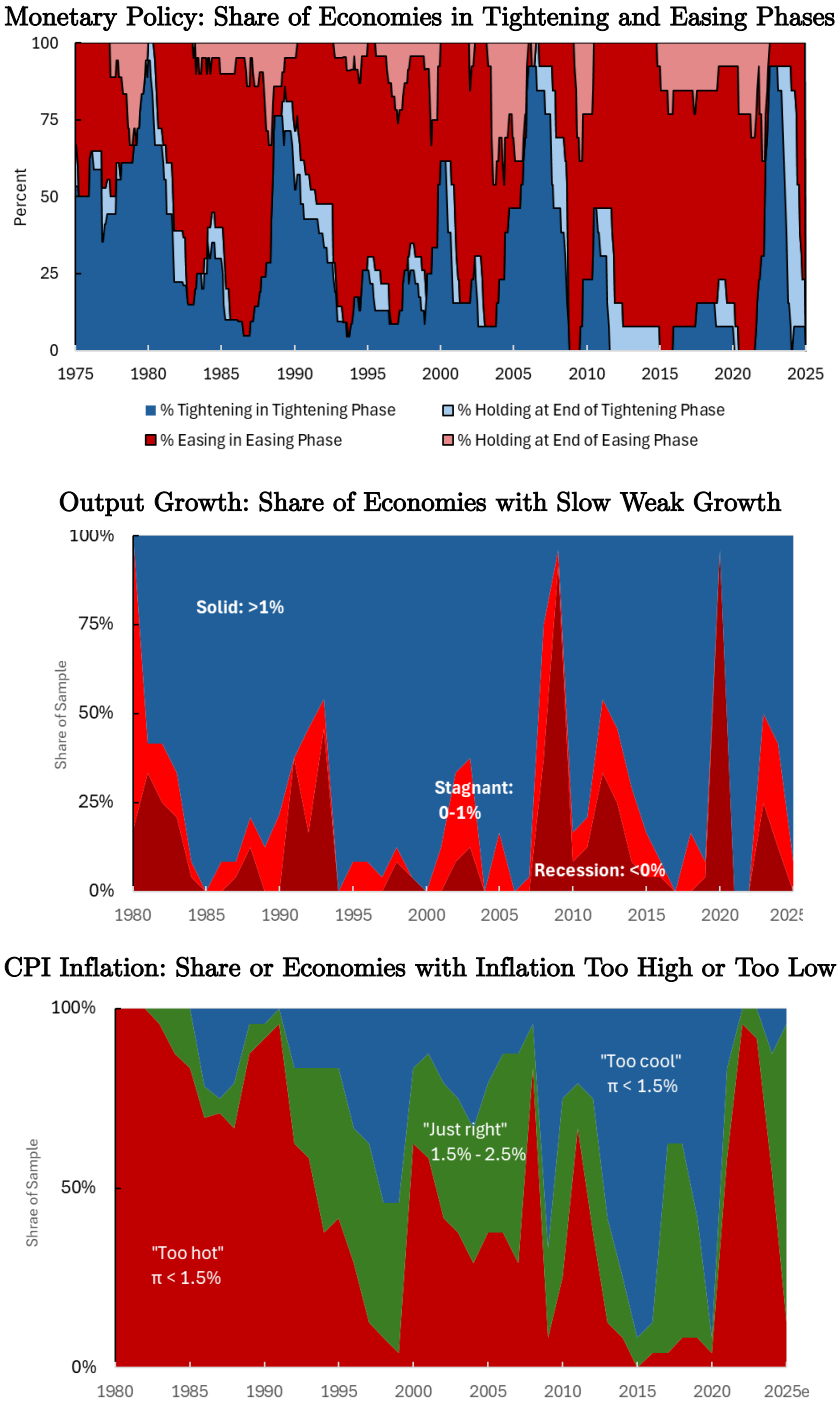
| Shocks | 70-24 | 70-84 | 85-98 | 99-07 | 08-19 | 20-24 |
|---|---|---|---|---|---|---|
| Total Global Shocks | 28.2 | 55.8 | 17.7 | 32.7 | 27.8 | 31.9 |
| Oil Price | 6.8 | 9.6 | 4.3 | 7.5 | 7.1 | 7.6 |
| Global Supply | 4.4 | 11.4 | 3.6 | 5.3 | 3.8 | 5.8 |
| Global Demand | 11.0 | 22.7 | 5.8 | 10.4 | 11.3 | 10.9 |
| Global Monetary Policy | 6.0 | 12.2 | 3.9 | 9.5 | 5.6 | 7.6 |
| Total Domestic Shocks | 71.8 | 44.2 | 82.3 | 67.3 | 72.2 | 68.1 |
| Domestic Supply | 29.9 | 18.6 | 26.1 | 28.2 | 27.4 | 29.6 |
| Domestic Demand | 21.1 | 13.0 | 28.3 | 20.3 | 23.1 | 20.3 |
| Domestic Monetary Policy | 21.1 | 12.6 | 27.9 | 18.8 | 21.7 | 18.2 |

B. Output growth

| Shocks | 70-24 | 70-84 | 85-98 | 99-07 | 08-19 | 20-24 |
|---|---|---|---|---|---|---|
| Total Global Shocks | 20.8 | 26.6 | 23.2 | 22.2 | 20.9 | 35.1 |
| Oil Price | 4.6 | 7.6 | 6.2 | 5.6 | 5.7 | 6.0 |
| Global Supply | 4.7 | 5.1 | 5.1 | 5.5 | 4.7 | 8.3 |
| Global Demand | 6.3 | 7.1 | 6.4 | 5.8 | 6.1 | 9.9 |
| Global Monetary Policy | 5.2 | 6.7 | 5.5 | 5.3 | 4.4 | 10.9 |
| Total Domestic Shocks | 79.2 | 73.4 | 76.8 | 77.8 | 79.1 | 64.9 |
| Domestic Supply | 33.7 | 31.4 | 32.7 | 34.4 | 34.0 | 29.4 |
| Domestic Demand | 23.1 | 20.9 | 21.4 | 21.9 | 22.4 | 17.7 |
| Domestic Monetary Policy | 22.4 | 21.1 | 22.6 | 21.6 | 22.6 | 17.8 |

Note: Forecast error variance decompositions of inflation (A) and output growth (B) over a 40-month horizon are based on country-specific FAVAR models that consist of four global variables (inflation, output growth, policy rates, oil prices) and three domestic variables (inflation, output growth, and policy rates).

Figure 1 Synchronization in Interest Rates, Growth and Inflation in Advanced Economies

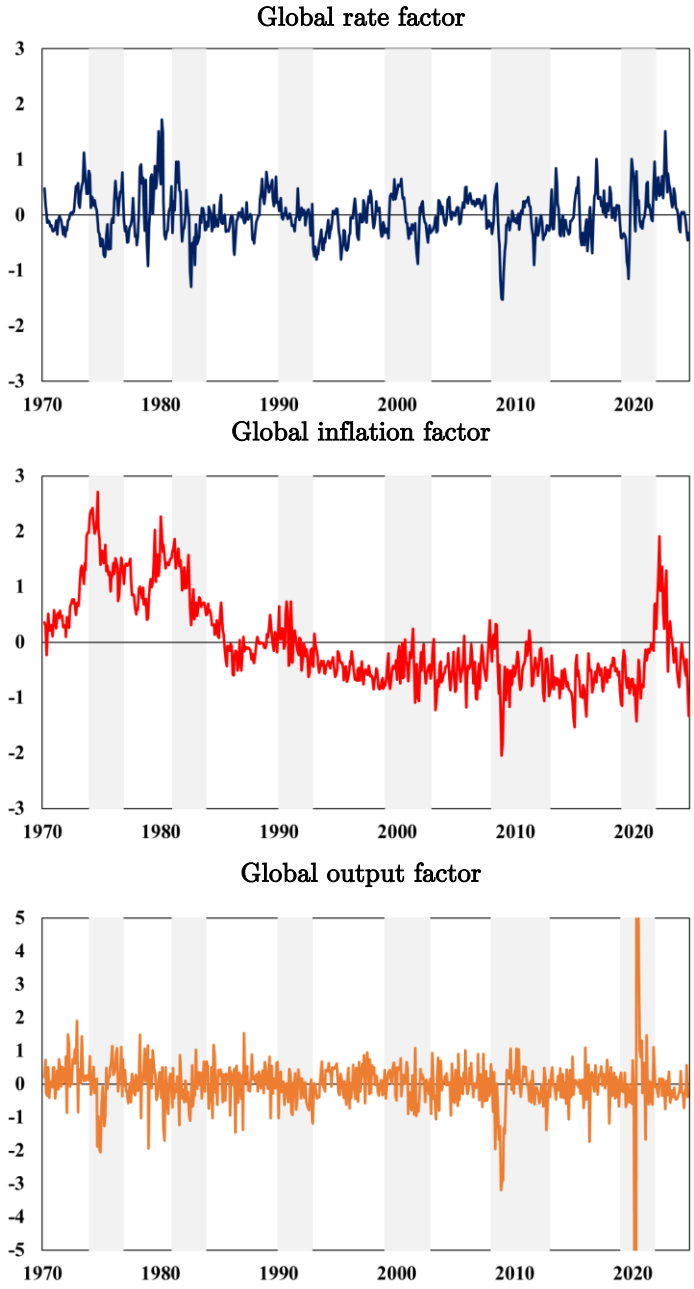



Sources: Top panel is from Forbes, Ha and Kose (2024). Bottom two panels are based on data from the IMF's World Economic Outlook database, April 2024.

Notes: Sample is 24 advanced economies. A tightening phase includes increases in the policy interest rate and an easing phase includes decreases in the policy rate and/or quantitative easing. Holding periods are when there is no change in the policy interest rate and no ongoing asset purchases at the end of a cycle. See Forbes, Ha and Kose (2024) for more details on the calculation of easing and tightening phases. Inflation is average CPI inflation in each year and GDP growth is annual real GDP growth.

## Figure 2 Global Factors

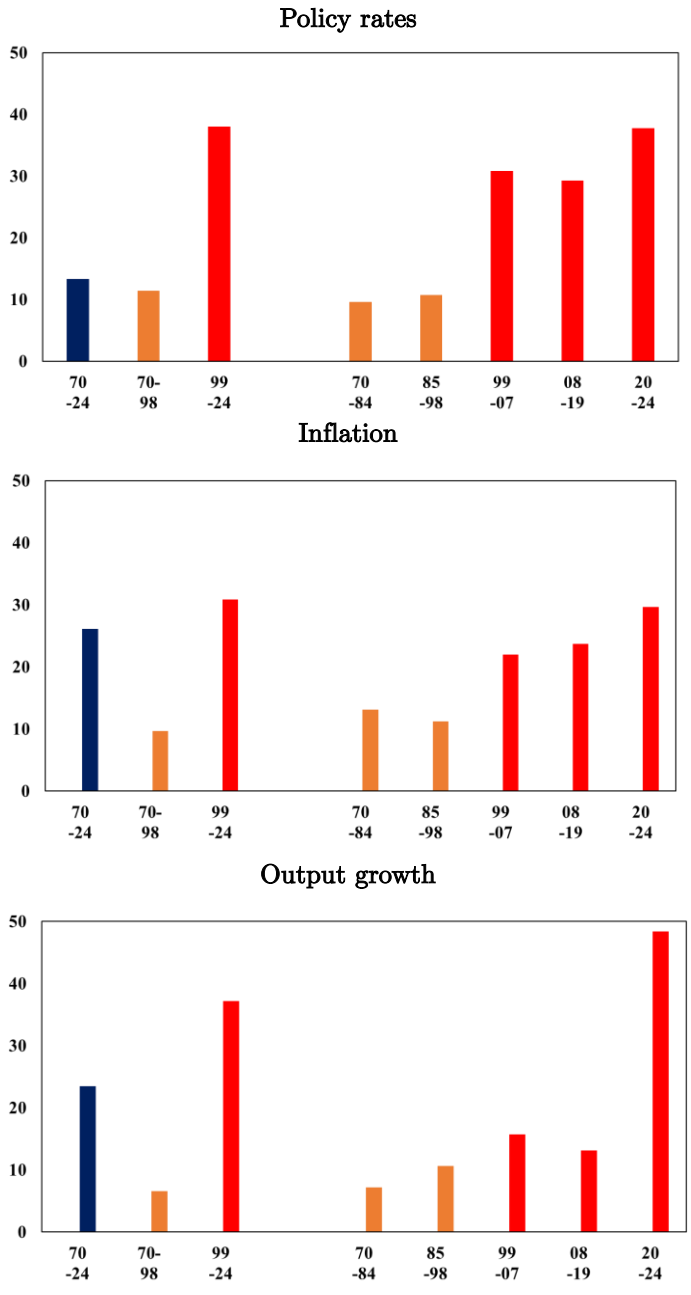
(Percent)




Notes: Global factors for policy rates, inflation, and output growth are estimated using a one-factor dynamic factor model for cross-country data on policy rates (or shadow rates), inflation rates, and growth rates of industrial production. Shaded areas indicate global recessions and downturns (Kose and Terrones 2015; Kose, Terrones, and Sugawara 2020).

## Figure 3 Variance Contributions of the Global Factors

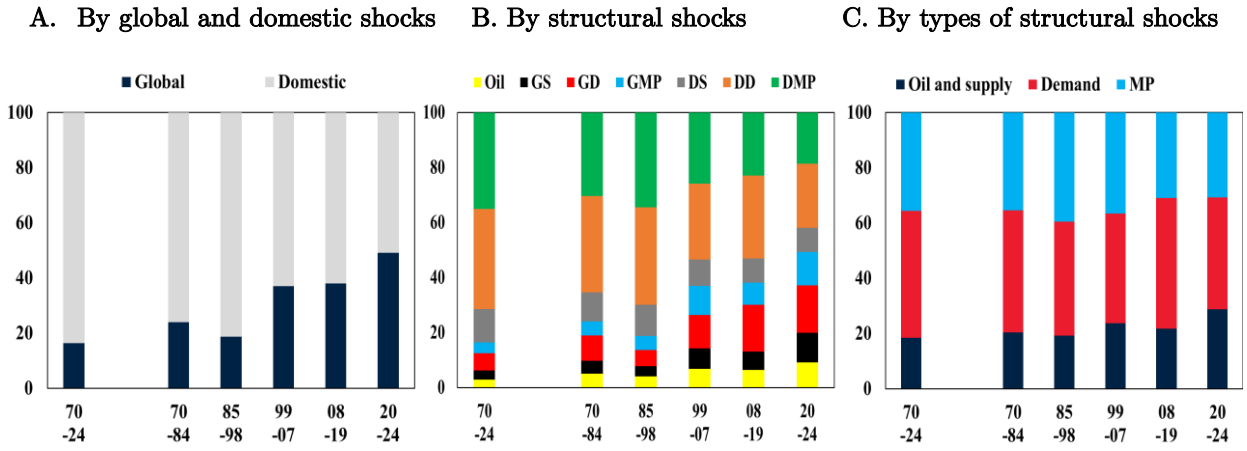
(Percent of total variation)




Sources: Authors' calculations based on data from January 1970 through September 2024.
Notes: The figure presents the average variance contribution of the global policy rate factor to the variations in country-specific policy rates, inflation, and output growth in eight advanced economies.

## Figure 4 Contributions of Shocks to Interest Rate Variation

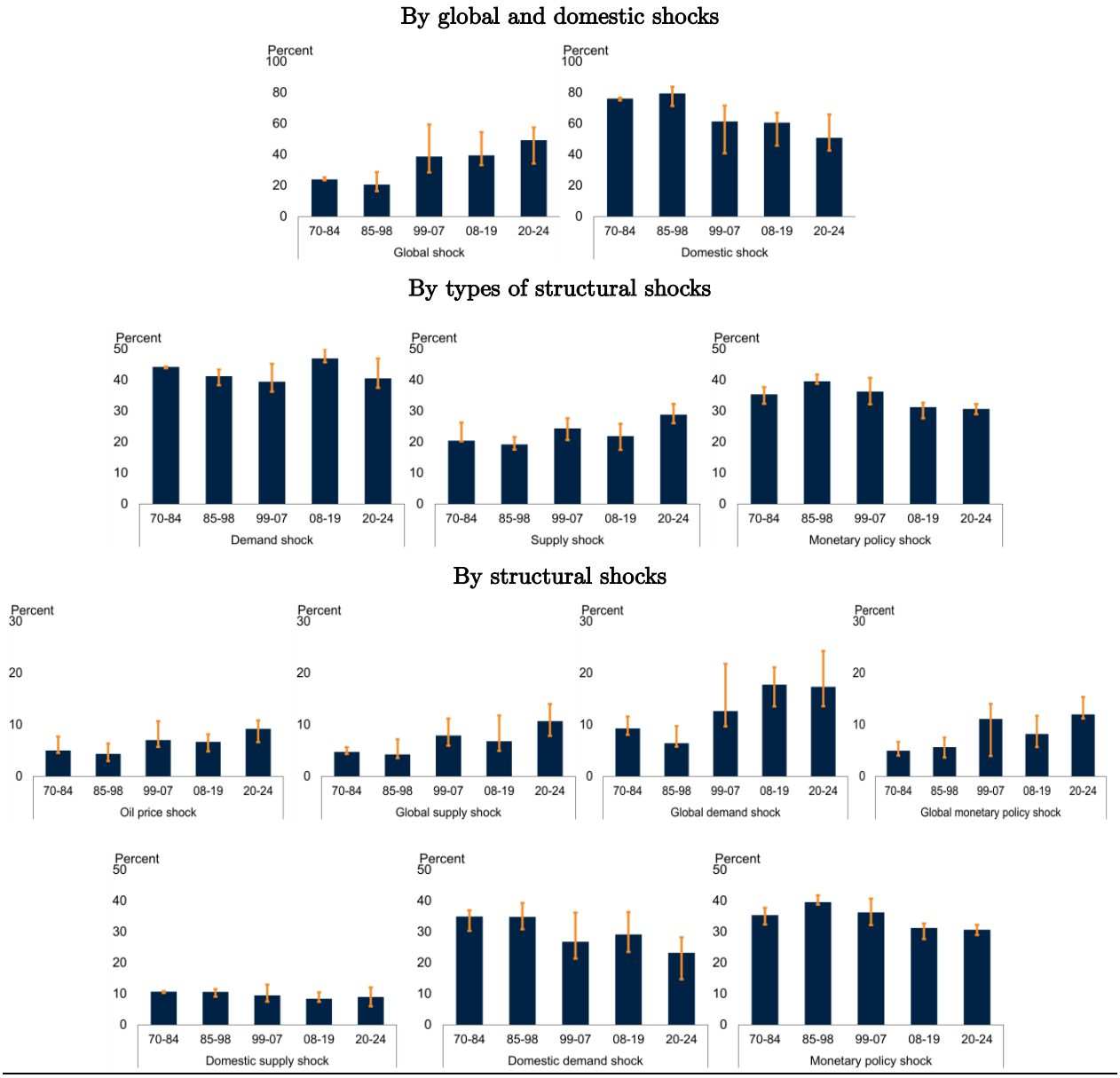
(Average across 13 economics, percent of total variation)




Notes: Forecast error variance decompositions of domestic policy interest rates based on the FAVAR model that consists of four global variables (global output growth, inflation, interest rates, and oil prices) and three domestic variables (domestic output growth, inflation, and interest rates). "Oil" = oil price shock, "GS" = global supply shock, "GD" = global demand shock, "GMP" = global monetary policy shock, "DS" = domestic supply shock, "DD" = domestic demand shock, "DMP" =domestic monetary policy shock, "Oil and supply" = Oil+GS+DS; "Demand" = GD+DD; "MP" = GMP+DMP.

## Figure 5 Contributions of Shocks to Interest Rate Variation

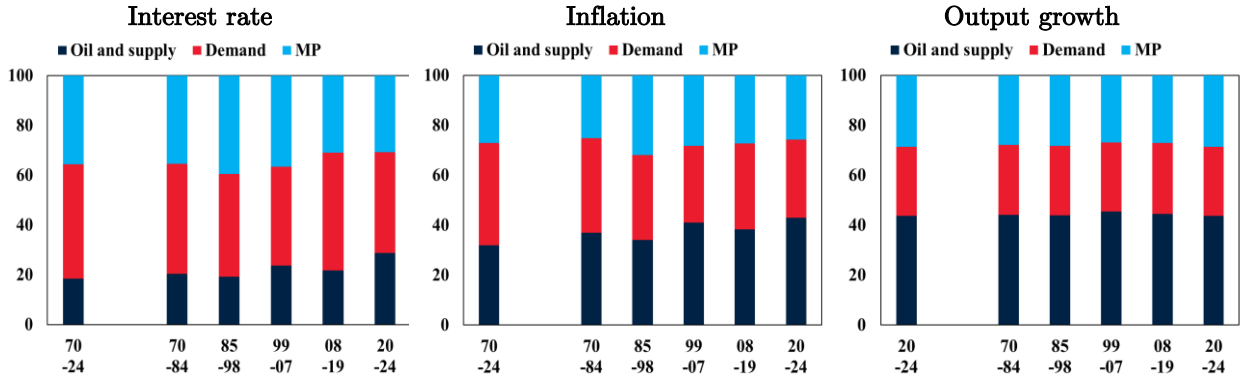
(Average and inter-quartile ranges across 13 economies, percent of total variation)




Notes: Forecast error variance decompositions of domestic policy interest rates are based on the FAVAR model, which consists of four global variables (global output growth, inflation, interest rates, and oil prices) and three domestic variables (domestic output growth, inflation, and interest rates).

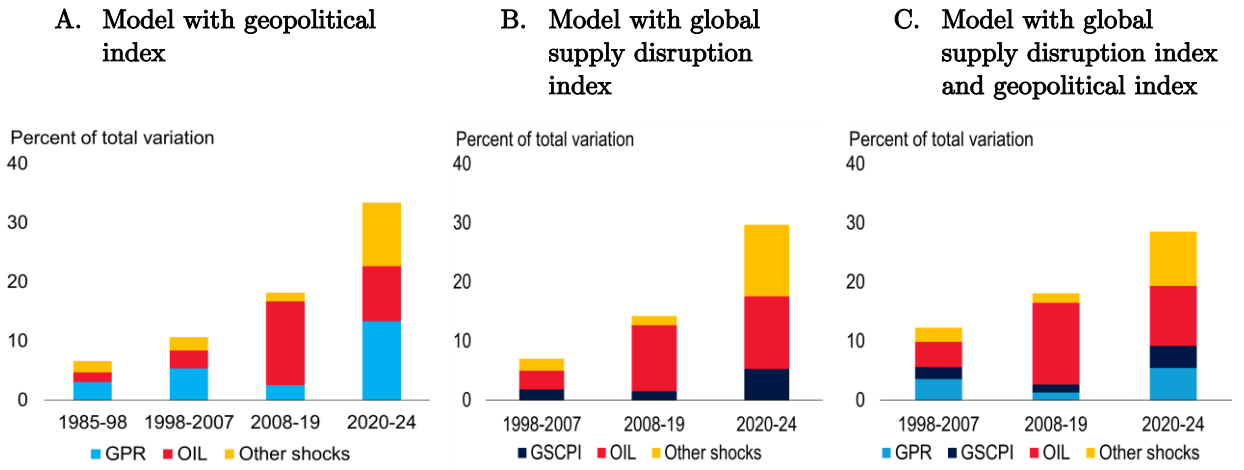
## Figure 6 Contributions of Shocks to Variations of Interest Rates, Inflation, and Output Growth

(Average across 13 economics, percent of total variation)




Notes: Forecast error variance decompositions of domestic variables based on the FAVAR model that consists of four global variables (global output growth, inflation, interest rates, and oil prices) and three domestic variables (domestic output growth, inflation, and interest rates). "Oil and supply" = OP+GS+DS; "Demand" = GD+DD; "MP" = GMP+DMP.

## Figure 8 Variance share of exogeneous global supply-driven shocks: Cholesky FAVAR

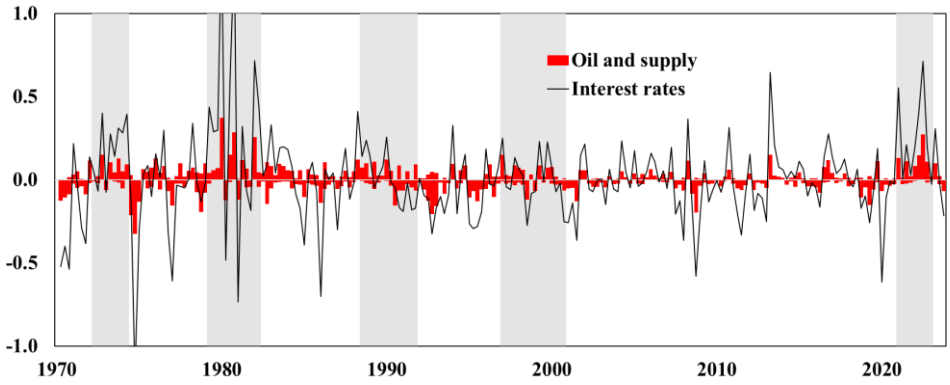



Sources: Iacoviello (2021), Federal Reserve of New York Authors' calculations for data from January 1985-September 2024 for the G5 economies (Canada, the euro area, Japan, the United Kingdom, and the United States).

Notes: Variance decompositions of domestic policy interest rates over the corresponding sub-sample periods defined in Section II. Estimates based on the FAVAR model that consists of five global variables, in this order, (GRP index (A) or GSCPI index (B), or both (C), oil price growth, global inflation, output growth, interest rates) and three domestic variables (domestic output growth, inflation, and interest rates). "Oil" = oil price shock, "GPR"= geopolitical risk index, "GSCPI"=global supply disruption index, and "other shocks" indicate other structural shocks than oil and GPR/GSCPI that drives the innovation in global inflation.

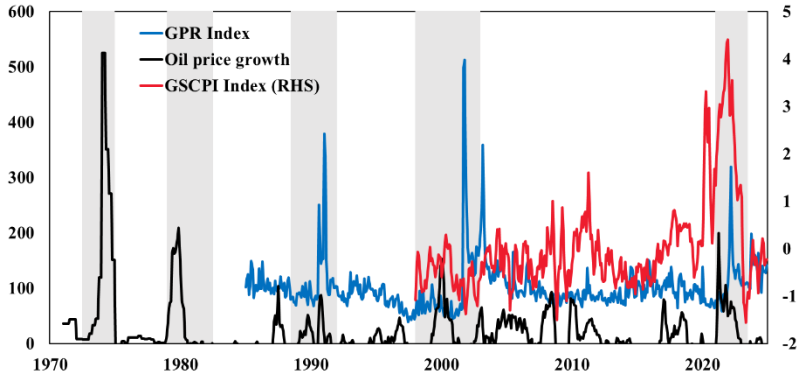
Figure 7 Role of supply shocks to interest rates

A. Historical contributions of supply shocks to policy rates:
(Cross-country averages, percentage points)



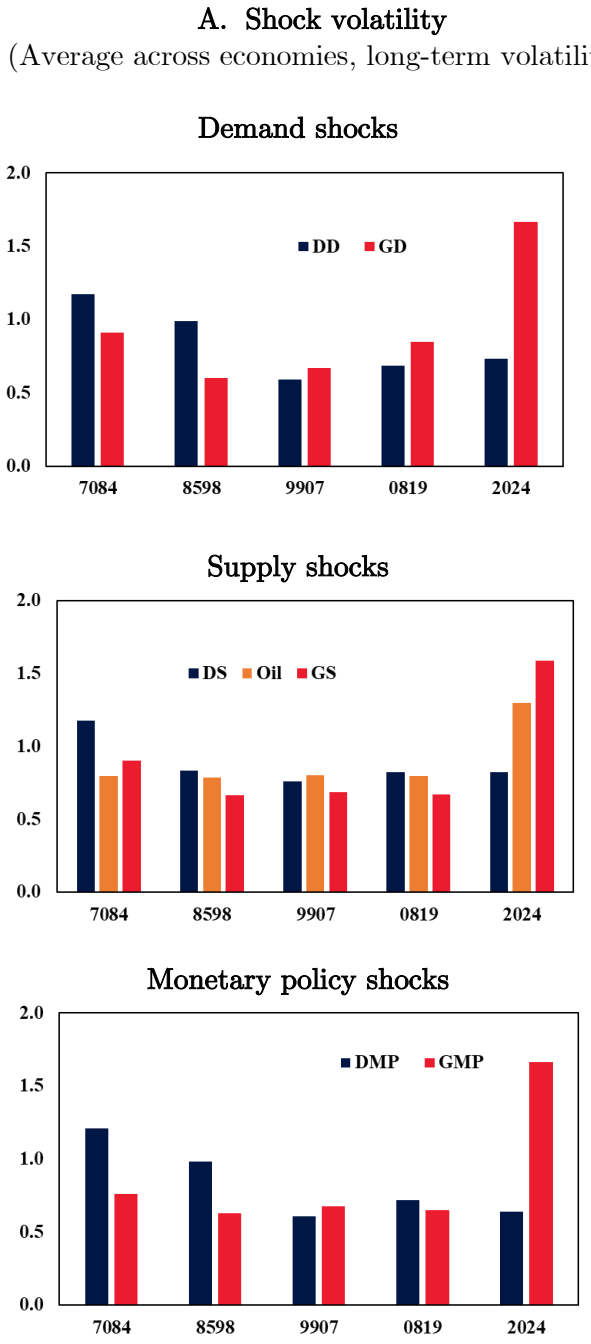

Sources: Authors' calculations based on average across countries.
Notes: Historical decompositions of domestic policy interest rates based on the FAVAR model as defined in Section II. The model that consists of four global variables (global output growth, inflation, interest rates and oil prices) and three domestic variables (domestic output growth, inflation, and interest rates). "Oil and supply" indicates the sum of the contributions from global and domestic supply shocks and oil price shocks. Shaded areas indicate the periods with persistently positive contributions of supply shocks.

B. Periods of elevated geopolitical tensions and global supply disruptions




Sources: Federal Reserve of New York, Iacoviello (2022), World Bank (Pink sheet data)
Note: GPR index = geopolitical risk index, GSCPI index = supply-disruption index. Oil price growth is based on year-on-year. Shaded areas indicate the periods with persistently positive contributions of supply shocks.

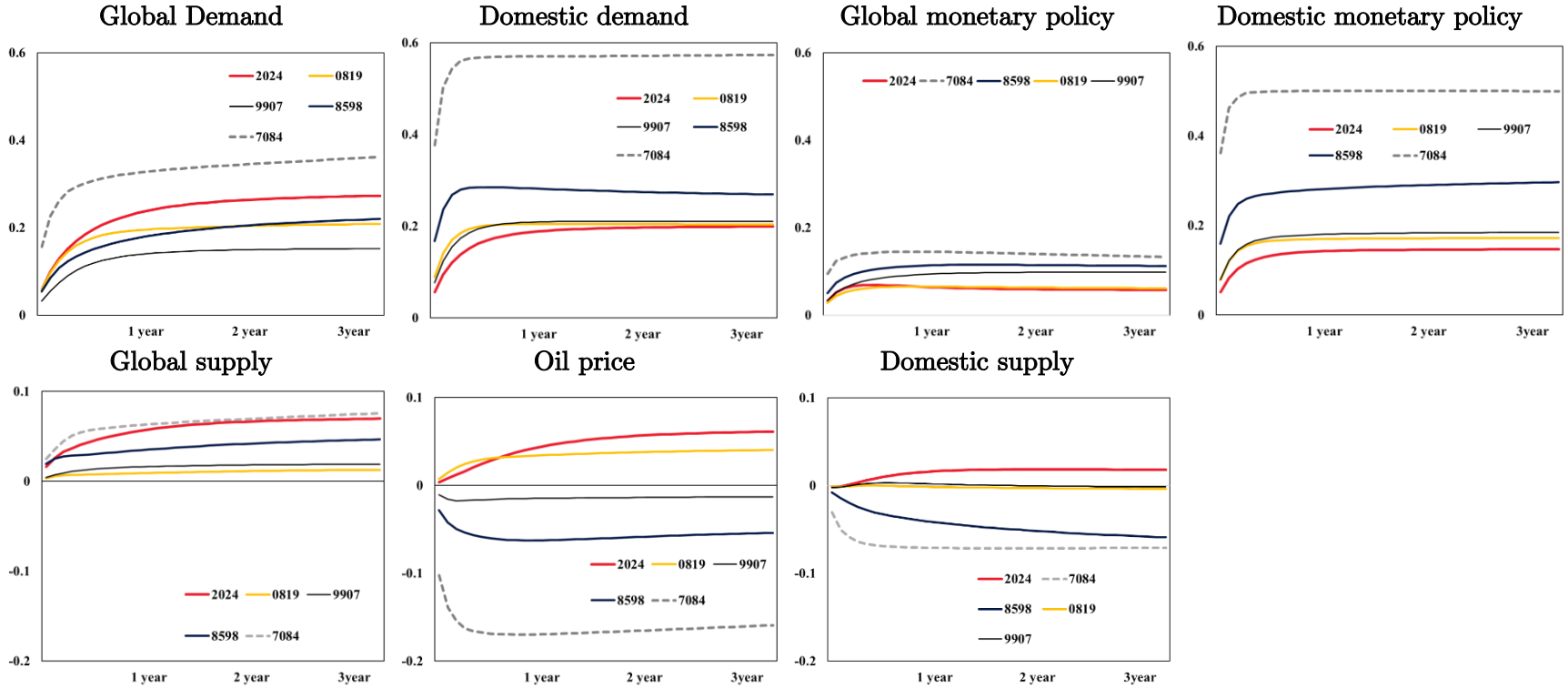
Figure 9 Evolution of shock volatility and sensitivity of interest rates to shocks




Note: The shock volatility is normalized to be one over the full sample period (1970-2024). Shock volatility in the sub-sample periods are calculated using the standard deviation of the shock series over the corresponding periods. "Oil" = oil price shock, "GS" = global supply shock, "GD" = global demand shock, "GMP" = global monetary policy shock, "DS" = domestic supply shock, "DD" = domestic demand shock, "DMP" =domestic monetary policy shock.

## B. Sensitivity to structural shocks

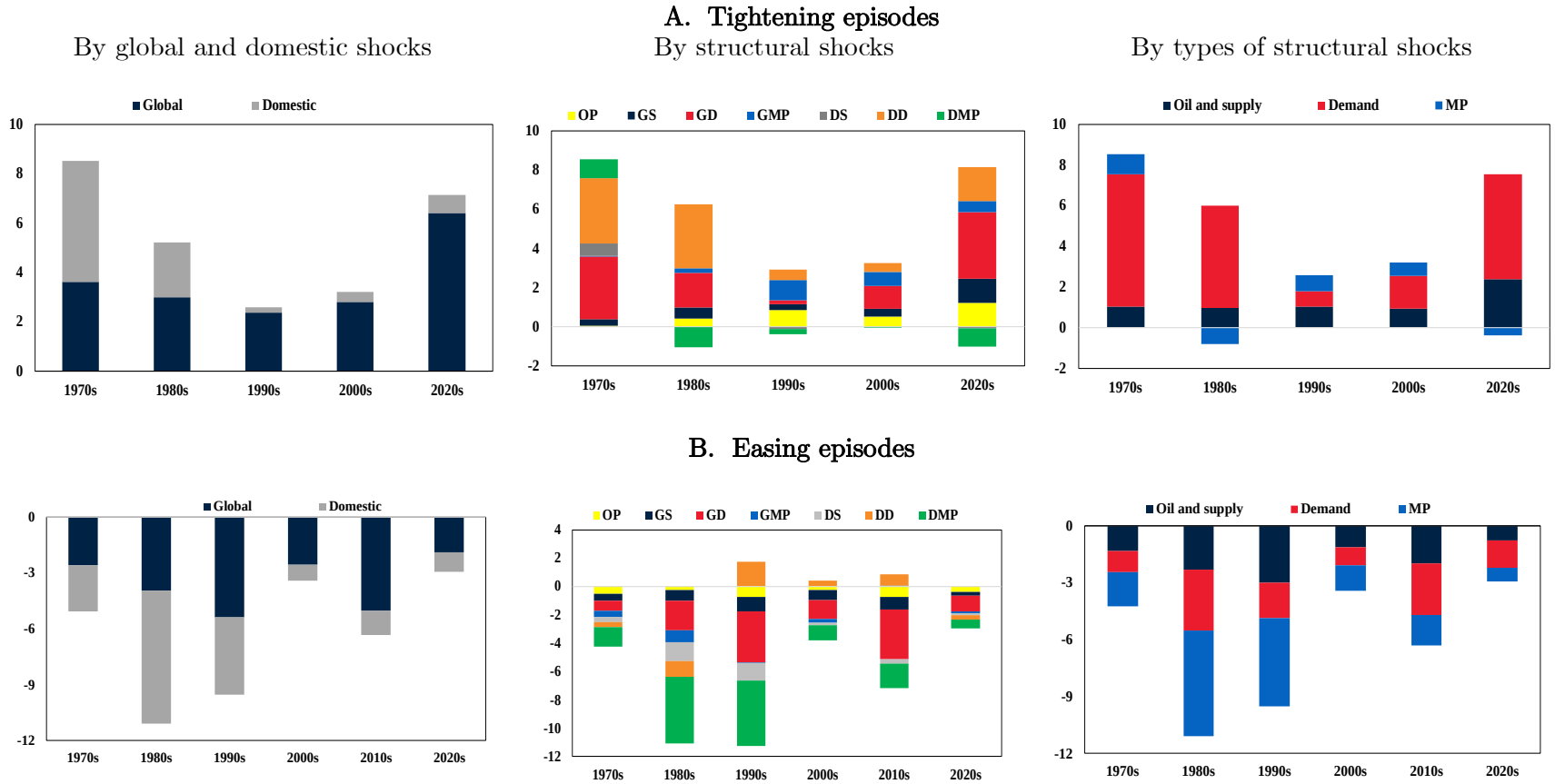
(Average across economies percentage point)




Note: The charts present the sensitivity of domestic interest rates to one standard deviation shocks over the five sub-sample periods, based on cross-country averages. Considering the data limitations, 1970-84 period (grey) was excluded in the comparison.

**Figure 10 Contributions of Shocks to Interest Rate over monetary policy phases**

(Average across economies, percentage points)




Sources: Authors' calculations for data from 1970-2024 for the G5 economies.

Notes: Historical decompositions of domestic policy interest rates around the tightening phases defined in Section II. Estimates based on the FAVAR model that consists of four global variables (global output growth, inflation, interest rates and oil prices) and three domestic variables (domestic output growth, inflation, and interest rates). "OP" = oil price shock, "GS" = global supply shock, "GD" = global demand shock, "GMP" = global monetary policy shock, "DS" = domestic supply shock, "DD" = domestic demand shock, "DMP" =domestic monetary policy shock, "Oil and supply" = OP+GS+DS; "Demand" = GD+DD; "MP" = GMP+DMP.

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# Heaven or Earth?
# The Evolving Role of Global Shocks for Domestic Monetary Policy

Kristin Forbes, Jongrim Ha, and M. Ayhan Kose*

February 2025

**Supplemental Appendix**

**This appendix contains:**

Appendix A. Drivers of Interest Rate Cycles: Country-specific Evidence

Appendix B. Additional tables and figures

## Appendix A Drivers of Interest Rate Cycles: Country-specific Evidence

Building on the results for different groups of economies in Section VI, this Appendix provides more detail on the country-specific results on the drivers of interest rate cycles (with a subset of the results summarized in Section VI.2).

Beginning with the country-specific results for the G-5 economies, Figure A3 shows the estimates from the FAVAR decompositions developed in Section IV. The role of structural shocks varies across these five advanced economies—particularly for the euro area.

First, there is a notably larger role for global shocks in explaining the variation in interest rates in the euro area relative to that in other economies. Over 1970-2024, as shown in the first row of the chart, global shocks explained around one-fifth of the total interest rate variation in the United States, the United Kingdom, Canada, and Japan. In the euro area, however, global shocks accounted for only 62 percent of the variation, overshadowing the role of domestic shocks (at 38 percent). This pattern is not driven by outsized shocks during one specific period, but consistent across each of the sub-periods. Over 2020-24, when the role of global shocks increased to explain over 50 percent of interest rate fluctuations in all G-5 economies, the role of global shocks was even more dominant in the euro area (at 89 percent). These findings likely reflect the euro area's stronger global trade and financial linkages, and its deeper integration with global supply chains. This dominant role of global shocks in the euro area's interest rate cycle is consistent with other studies in global business cycle literature.

Second, there are also noteworthy differences in the role of supply versus demand (not differentiating by their global versus domestic nature) between the euro area and the United States (and other G-5 economies). Specifically, over 1970-2024, 45 percent of the variation in U.S. interest rates is explained by demand shocks, and only 16 percent by supply shocks. In the euro area, supply shocks played a more significant role (29 percent), while demand shocks contributed a smaller share (39 percent). The decompositions in the other economies are closer to that of the United States, with demand estimated to play a much larger role than supply. Focusing on the post-pandemic period, the comparison between the euro area and other economies is more striking. In the United States, 48 percent of the variation in policy interest rates is explained by demand shocks, and only 25 percent by supply shocks, while in the euro area, the roles are nearly reversed, with only 26 percent explained by demand and 43 percent by supply. The decompositions in the other G-5 economies remain closer to that for the U.S., with demand playing a significantly larger role than supply.

The more substantial role of supply shocks in the euro area, compared to other economies, is also apparent in the decompositions of the shocks explaining inflation and output. For example, and building on the results in Section IV, supply shocks play a greater role than demand (excluding monetary policy shocks) in explaining the variation in inflation in each economy, but they play the largest role in the euro area (although only slightly more than in Japan and the United Kingdom). For example, in the euro area, supply shocks drive a majority of the variation in inflation over 2020-24 (51 percent), while demand shocks contributed only 24 percent. In contrast, in the United States, supply shocks explain only slightly more of the variation in inflation than demand shocks (40 percent versus 38 percent).

These differences are intuitive. The euro area was more reliant on oil, natural gas, and food imports from Russia and Ukraine, while the United States is a net exporter of both food and energy, and benefited from a greater demand boost due to multiple large fiscal packages during this period. The inflation decompositions in the other G-5 economies fall between those of the euro area and the U.S., with supply shocks playing a greater role (around 46 percent) compared

to demand shocks (28-33 percent), albeit with substantial heterogeneity across countries (such as a much larger role of domestic supply shocks in Japan and the United Kingdom).

These findings shed light on an important issue often overlooked in the debate on demand versus supply and rarely decomposed in earlier literature: the role of global versus domestic contributions to each type of shock. Global shocks explain a majority of the variation in both interest rates and inflation over 2020-24, on average and in most individual economies, and particularly in the euro area. The only exception is Japan, where domestic shocks explain a majority of the variation in inflation.

Next, we shift to examining these results for other advanced economies in our sample that are not in the G-5, with a subset of results reported in Appendix **Figure A4**. In most (but not all) cases, the main results are similar to those for the larger advanced economies. For example, the contribution of the global shocks increased over time in all economies in this sample, albeit with differences across individual economies. Over 1970-2024, the global shocks played a more significant role in explaining the variation in interest rates in Switzerland, Portugal, and Germany than in other advanced economies.[1] Moreover, the relative difference in the importance of global versus shocks across countries is fairly consistent across time; in other words, even as the role of global shocks increases across all economies over time, countries more sensitive to global shocks continue to be more sensitive in the different subperiods.[2] This suggests that structural factors—such as the monetary policy framework, share of commodity imports, or financial and economic openness—play a role in explaining these differences.

It is also worth noting that contributions of different types of shocks to the variation in interest rates is usually consistent for the comparable shares explaining the variation in inflation and output growth. This is not surprising; economies for which inflation or output is more sensitive to global shocks are more likely to adjust interest rates in response to these global shocks. Monetary policy reaction functions typically depend on both future and past inflation and output growth. There are, however, some notable exceptions for which the role of different shocks varies across economic variables. For example, in Switzerland, the role of global shocks is substantially larger in explaining the variation in interest rates than inflation or output growth—likely reflecting the important role of Switzerland in the global financial system.

Understanding the structural factors that explain these cross-country differences is an important area for future research. A full analysis is beyond the scope of this paper, but the remainder of this section reports some comparisons suggesting that the role of variables highlighted in the business cycle literature on the role of global shocks to fluctuations in output and inflation also likely apply to our analysis of the role in interest rates cycles. More specifically, the recent literature on business cycles and inflation cycles points to trade openness and participation in global value chains as key factors that may explain cross-country differences in the contributions of global shocks.[3]

The correlations shown in **Figure A5** support this hypothesis. Estimates based on the variance decompositions reported above shows that economies with above-median trade openness—such as

[1] Variance decompositions of euro area member countries are not reported but are available upon request.
[2] This is supported by scatter plots of the relative share of global shocks in the variation in interest rates for each country across different sub-samples. The correlation of these shares across samples is 80 percent.
[3] For instance, Ha et al. (2023) document that based on 55 economies, the share of global shocks in inflation variations was systematically more sizeable in the economies wither greater trade openness and with greater intensity of commodity exports.

Belgium, France, Germany, Ireland, the Netherlands, Portugal, Spain, and Switzerland—tend to have systematically greater contributions of global shocks to interest rates. This pattern is broadly consistent across different sample periods and is statistically significant at the 5 percent (or 10 percent) level, depending on the sub-sample.[4]

Regression analysis examining how domestic interest rates respond to various shocks yields a similar conclusion. Table A5 presents the estimated regression coefficients of cumulative impulse response coefficients, projected onto proxy variables for country characteristics, with their 16–84 percent intervals serving as the lower and upper bounds of the estimates. To ensure robust empirical results, the regressions are conducted on impulse response functions across the entire forecasting horizon (ranging from 0 to 40 months) while accounting for other potential control variables. To enhance the dataset for estimation, we consolidate empirical results from two earlier sample periods—1970–84 and 1985–98—to analyze the pre-globalization period, and from three more recent periods—1999–2007, 2008–19, and 2020–24—to represent the post-globalization period.

The findings suggest that the economies with greater trade openness—measured by the trade-to-GDP ratio—experienced significantly greater interest rate sensitivity to global demand and monetary policy shocks. In contrast, countries with lower trade openness exhibited were more sensitive to domestic demand and monetary policy shocks, even after accounting for other country characteristics. This pattern remains largely consistent across sub-periods but was more pronounced in the latter half of the sample (1999–2024) compared to the earlier, pre-globalization period (1970–98). The results also hold when using non-cumulative impulse response functions, or other forecasting horizons in the impulse responses.

Other country-specific variables, including financial market openness, monetary policy and exchange rate regimes, central bank independence, and the scale of commodity imports or exports may also play a role in the sensitivity of interest rates and the macroeconomic variables to the various shocks identified above. Additional preliminary results, consistent with the findings for trade openness, suggest that greater financial openness amplifies the impact of global shocks—particularly global demand shocks, as illustrated in Panel B of Table A5. Furthermore, economies with inflation-targeting regimes were more sensitive to domestic shocks, and less so to global shocks. The influence of other country characteristics yields mixed results, albeit it is difficult to identify the impact of individual structural variables as many are highly correlated.[5]

[4] Over 2020-23, the difference across two groups is not statistically, significant, partly due to the broad-based increase in the contribution of global shocks to interest rates across the economies.

[5] Other structural characteristics that could be important—such as monetary and exchange rate regimes and the role of commodity exports—are highly correlated among advanced economies, especially within the euro area.

## Appendix B Additional tables and figures

Table A1 Data Appendix

| Variable | Variable Description (unit) | Source |
|---|---|---|
| **Policy rate** | Nominal monetary policy interest rates by central banks (in percent). In some specifications, euro area policy rates before 1997 are GDP-weighted averages of policy rates in member countries. | BIS, Haver Analytics, OECD |
| **Shadow rate** | Shadow policy rate point estimates (in percent) as explained in Krippner (2013). Data are available for seven economies (Australia, Canada, euro area, Japan, New Zealand, United Kingdom, United States) over 1995-2024. | LJK Limited; Krippner (2013) |
| **Headline CPI** | Headline Consumer Price Index. Inflation rates are calculated on a month-over-month basis or relative to 12 months earlier based on the analysis. | OECD, Haver Analytics, Ha, Kose, Ohnsorge (2023) |
| **Industrial Production** | The industrial production index covers the volume of production in sectors such as mining, manufacturing, electricity, gas, steam, and air conditioning. The reference year is 2015 (OECD) unless specified otherwise. Growth rates of production are calculated on a month-over-month basis or relative to the past 12 months based on the analysis. | OECD, Haver Analytics |
| **Oil price** | Nominal oil prices (average of Dubai, WTI, and Brent oil prices). Oil price growth rates are calculated on a month-over-month basis. | World Bank (Pink sheet database) |

Notes: Sample period is from January 1970 to September 2024. Economies included are: Australia, Austria, Belgium, Canada, Switzerland, Germany, Denmark, Spain, Finland, France, the United Kingdom, Greece, Ireland, Israel, Italy, Japan, Korea, Netherlands, Norway, New Zealand, Portugal, Sweden, the United States, and the euro area.

**Table A2 Correlates of global interest rate factor**

(Correlation coefficients)

**Correlations coefficients of global interest rate factor**

| Shocks | Measures | Correlation | Source |
|---|---|---|---|
| Global demand | Economic condition index | 0.29 | Baumeister (2020) |
| | Economic policy uncertainty | -0.17 | Baker, Bloom, and Davis (2016) |
| | - Monetary policy | -0.24 | |
| | - Fiscal policy | -0.21 | |
| Supply and oil | Global supply index | 0.36 | Federal Reserve Bank of New York |
| | GPR index | -0.09 | Caladara and Iacoviello (2022) |
| | Oil production | 0.13 | Killian (2009) |
| Monetary policy | Monetary policy surprise | 0.23 | Gurkaynak, Sack, Swansson (2005) |
| | Central Bank information shock | 0.29 | Jarocinsky and Karadi (2020) |

Note: Long-term correlations over the period from 1970, or the earliest available, to 2024.

**Table A3 Variance Contributions of Global Factors**

(Percent of total variation, averages across countries)

| Global factors | 70-24 | 70-98 | 99-24 | | 70-84 | 85-98 | 99-07 | 08-19 | 20-24 |
|---|---|---|---|---|---|---|---|---|---|
| **Interest Rates** | 13.4 | 11.4 | 38.1 | | 9.6 | 10.7 | 30.8 | 29.3 | 37.7 |
| **Inflation** | 26.1 | 9.6 | 30.9 | | 13.1 | 11.2 | 22.0 | 23.7 | 29.6 |
| **Output growth** | 23.5 | 6.5 | 37.1 | | 7.1 | 10.7 | 15.7 | 13.2 | 48.4 |

Notes: The table presents the average contributions of the global rate factor, the global output factor, and the global inflation factor to the variance of country-specific policy rates, inflation, and output growth, respectively, over the periods as noted in the second row. See Appendix Table A1 for variable definitions.

Table A4 Contributions of Shocks to Interest Rate Variation: Country groups

(Percent of total variance, average across economies)

A. G-5 economies

| Shocks | 70-24 | 70-84 | 85-98 | 99-07 | 08-19 | 20-24 |
|---|---|---|---|---|---|---|
| Total Global Shocks | 26.9 | 23.9 | 24.8 | 49.9 | 44.3 | 62.1 |
| Oil Price | 4.5 | 5.0 | 4.7 | 8.8 | 7.4 | 11.8 |
| Global Supply | 5.6 | 4.7 | 5.2 | 10.2 | 7.8 | 12.6 |
| Global Demand | 10.7 | 9.3 | 7.9 | 15.7 | 19.8 | 24.7 |
| Global Monetary Policy | 6.1 | 5.0 | 6.9 | 15.3 | 9.3 | 13.1 |
| Total Domestic Shocks | 73.1 | 76.1 | 75.2 | 50.1 | 55.7 | 37.9 |
| Domestic Supply | 9.5 | 10.7 | 11.2 | 6.8 | 8.2 | 5.8 |
| Domestic Demand | 32.9 | 35.0 | 32.8 | 21.9 | 24.9 | 17.3 |
| Domestic Monetary Policy | 30.8 | 30.4 | 31.1 | 21.4 | 22.6 | 14.8 |

C. Other economies

| Shocks | 70-24 | 70-84 | 85-98 | 99-07 | 08-19 | 20-24 |
|---|---|---|---|---|---|---|
| Total Global Shocks | 9.8 | | 8.5 | 29.0 | 34.1 | 41.1 |
| Oil Price | 1.8 | | 2.7 | 5.4 | 5.9 | 7.5 |
| Global Supply | 2.1 | | 1.6 | 5.9 | 5.7 | 9.5 |
| Global Demand | 3.3 | | 2.3 | 9.9 | 15.6 | 12.8 |
| Global Monetary Policy | 2.7 | #N/A | 1.9 | 7.7 | 7.0 | 11.3 |
| Total Domestic Shocks | 90.2 | | 91.5 | 71.0 | 65.9 | 58.9 |
| Domestic Supply | 13.8 | | 11.6 | 11.2 | 9.2 | 10.9 |
| Domestic Demand | 38.5 | | 39.9 | 31.1 | 33.3 | 26.9 |
| Domestic Monetary Policy | 37.8 | | 40.0 | 28.8 | 23.4 | 21.1 |

Note: Forecast error variance decompositions of interest rates over the 40-month forecasting horizon, based on country-specific FAVAR models that consist of four global variables (inflation, output growth, policy rates, and oil prices) and three domestic variables (inflation, output growth, and policy rates).

Table A5 Relationship between trade openness and monetary policy rate responses

A. Trade openness

| Sample period | 1970-98 | | | 1999-2024 | | |
|---|---|---|---|---|---|---|
| Shock | Median | 16% | 84% | Median | 16% | 84% |
| Oil price | 0.002 | 0.05 | -0.04 | 0.001 | -0.002 | 0.004 |
| Global supply | 0.003 | 0.05 | -0.04 | 0.000 | -0.004 | 0.004 |
| Global demand | -0.03 | 0.03 | -0.06 | **0.009** | **0.006** | **0.010** |
| Global monetary policy | **0.006** | **0.05** | **-0.05** | **0.002** | **0.001** | **0.005** |
| Domestic supply | **-0.12** | **-0.03** | **-0.18** | **-0.001** | **0.000** | **-0.004** |
| Domestic demand | -0.01 | 0.077 | -0.10 | **-0.004** | **-0.003** | **-0.007** |
| Domestic monetary policy | **-0.13** | **-0.04** | **-0.19** | **-0.003** | **-0.001** | **-0.004** |

B. Financial openness

| Sample period | 1970-98 | | | 1999-2024 | | |
|---|---|---|---|---|---|---|
| Shock | Median | 16% | 84% | Median | 16% | 84% |
| Oil price | 0.48 | -0.14 | -0.74 | -0.02 | -0.08 | 0.04 |
| Global supply | 0.64 | 0.23 | -0.24 | 0.01 | -0.07 | 0.09 |
| Global demand | 1.05 | 0.30 | -0.39 | **0.14** | **0.09** | **0.17** |
| Global monetary policy | 1.17 | 0.58 | -0.05 | **0.06** | **0.03** | **0.11** |
| Domestic supply | 0.92 | -0.44 | -1.77 | **-0.04** | **-0.03** | **-0.05** |
| Domestic demand | **-0.13** | **-1.52** | **-2.62** | 0.02 | 0.03 | 0.00 |
| Domestic monetary policy | **-0.56** | **-1.79** | **-2.89** | **-0.04** | **-0.03** | **-0.05** |

Note: The tables present the point estimates from the OLS regression of response of monetary policy rates on country characteristics. IRF (R, c, h) = $\alpha^{h} + \beta_{h}^{1}$ Openness + $\sum\beta_{h}^{j}$ Other controls$_{c,j}$ + $\beta_{h}^{3}$ Time dummy + $\varepsilon_{c,h}$, h = 0, . . . , H. The results for "1970-98" are based on the impulse response functions of three sub-samples periods of 1970-84 and 1985-99 while "1999-2024" results are based on three sub-samples: 1999-2007, 2008-19, and 2020-23. The dependent variable is the median or 68% upper/lower bound of the domestic interest rate response to the corresponding shocks. Trade openness is based on the trade-to-GDP ratios while financial openness is based on the de-Jure measures of Chinn-ITO index. Other country factors include monetary policy and exchange rate regimes, the intensity of commodity exports.

Table A6. Contributions of global shocks to global inflation factor variation: robustness exercises

**A. Full-sample period (1970-2024)**

| Sensitivity | | Proxy variables | Structural Shocks | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Global | Oil Price | Supply | Demand | Monetary policy | Domestic | Supply | Demand | Monetary policy |
| Baseline | | | **16.4** | 2.8 | 3.5 | 6.1 | 4.0 | **83.6** | 12.1 | 36.4 | 35.1 |
| Global variables | Commodity Prices | Real oil price | **16.4** | 2.7 | 4.1 | 5.7 | 3.8 | **83.6** | 10.8 | 36.1 | 36.8 |
| | Global Output | Global economic activities index | **15.9** | 2.4 | 3.4 | 6.1 | 4.0 | **84.1** | 11.5 | 37.1 | 35.5 |
| | Global Interest Rates | Weighted average of interest rates | **15.2** | 3.1 | 2.9 | 5.8 | 3.5 | **84.8** | 12.3 | 37.9 | 34.6 |
| | Global Factor Measures | Weighted average of output, inflation, interest rates | **15.0** | 3.3 | 3.3 | 4.8 | 3.6 | **85.0** | 12.4 | 38.2 | 34.3 |
| Global & Domestic variables | Domestic inflation | Core CPI | **16.2** | 3.1 | 2.8 | 5.3 | 5.0 | **83.8** | 11.3 | 38.8 | 33.7 |
| | Domestic interest rates | Policy rates | **14.5** | 2.5 | 2.4 | 5.3 | 4.3 | **85.5** | 11.1 | 37.3 | 37.0 |
| Model | Alternative identification scheme | Sign restriction | **16.8** | 2.5 | 3.7 | 6.7 | 4.0 | **83.2** | 11.2 | 36.8 | 35.1 |
| | Alternative specifications | Time-varying coefficients | **17.8** | 3.4 | 3.9 | 6.3 | 4.2 | **82.2** | 11.7 | 35.0 | 35.5 |

Note: This table reports variance decompositions of domestic interest rates (in percent) based on various types of robustness exercises as explained in the paper. Variance decompositions are based on median from 500 successful Bayesian draws. Global economic activity index is monthly indicators estimated by Killian (2009) and Killian and Zhou (2018). "Baseline" indicates the variance decompositions of domestic interest rates based on FAVAR model that consists of oil price growth, global factors of inflation, output growth, and global interest rates and domestic output, inflation, and interest rates based on 13 economies. Real oil prices are nominal oil price deflated by US CPI index. "Alternative sign restriction" indicates that sign restrictions are imposed two months over impulse responses of interest rates following the global shocks. All the other restrictions are same as the baseline sign restriction.

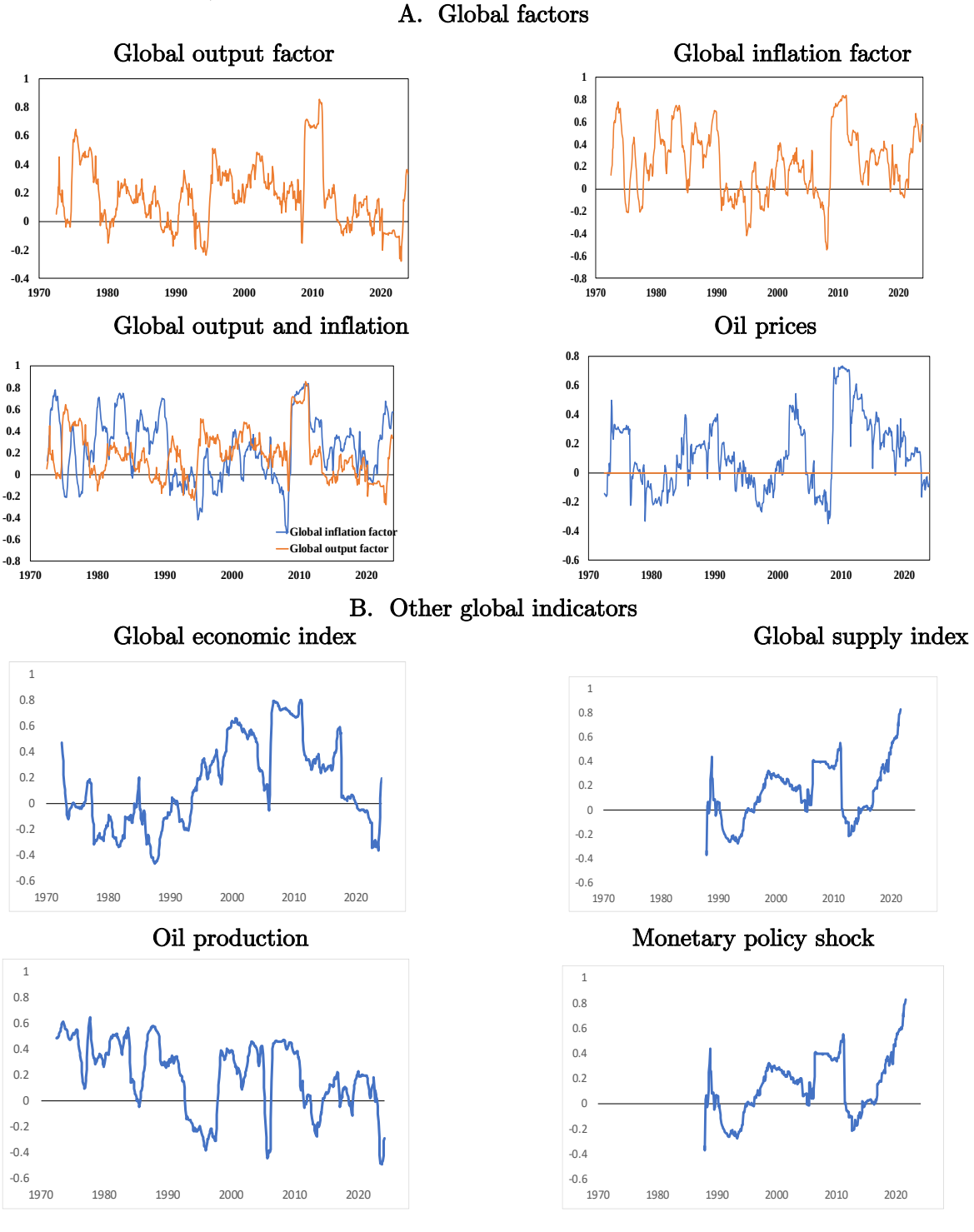
## B. Post-pandemic period (2020-24)

| Sensitivity | | Proxy variables | Structural Shocks | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Global | Oil Price | Supply | Demand | Monetary policy | Domestic | Supply | Demand | Monetary policy |
| Baseline | | | **49.2** | 9.2 | 10.7 | 17.3 | 12.0 | **50.8** | 8.9 | 23.2 | 18.7 |
| Global variables | Commodity Prices | Real oil price | **51.0** | 9.6 | 10.3 | 17.8 | 13.4 | **49.0** | 8.7 | 23.2 | 17.1 |
| | Global Output | Global economic activities index | **48.8** | 9.1 | 10.9 | 18.1 | 10.7 | **51.2** | 7.6 | 24.4 | 19.2 |
| | Global Interest Rates | Weighted average of interest rates | **52.4** | 9.1 | 11.1 | 19.7 | 12.6 | **47.6** | 8.1 | 22.2 | 17.4 |
| | Global Factor Measures | Weighted average of output, inflation, interest rates | **52.7** | 10.3 | 9.8 | 19.9 | 12.7 | **47.3** | 8.5 | 21.7 | 17.2 |
| Global & Domestic variables | Domestic inflation | Core CPI | **47.6** | 8.4 | 8.9 | 14.2 | 16.0 | **52.4** | 9.1 | 24.8 | 18.5 |
| | Domestic interest rates | Policy rates | **38.4** | 7.8 | 7.2 | 15.7 | 7.7 | **61.6** | 8.3 | 28.5 | 24.8 |
| Model | Alternative identification scheme | Sign restriction | **52.4** | 8.9 | 10.2 | 20.7 | 12.7 | **47.6** | 8.6 | 21.8 | 17.2 |
| | Alternative specifications | Time-varying coefficients | **50.7** | 9.2 | 9.8 | 20.3 | 11.3 | **49.3** | 9.3 | 21.8 | 18.2 |

Note: This table reports variance decompositions of domestic interest rates (in percent) based on various types of robustness exercises as explained in the paper. Variance decompositions are based on median from 500 successful Bayesian draws. Global economic activity index is monthly indicators estimated by Killian (2009) and Killian and Zhou (2018). "Baseline" indicates the variance decompositions of domestic interest rates based on FAVAR model that consists of oil price growth, global factors of inflation, output growth, and global interest rates and domestic output, inflation, and interest rates based on 13 economies. Real oil prices are nominal oil price deflated by US CPI index. "Alternative sign restriction" indicates that sign restrictions are imposed two months over impulse responses of interest rates following the global shocks. All the other restrictions are same as the baseline sign restriction.

Figure A1 Time-varying correlates of global interest rate factor

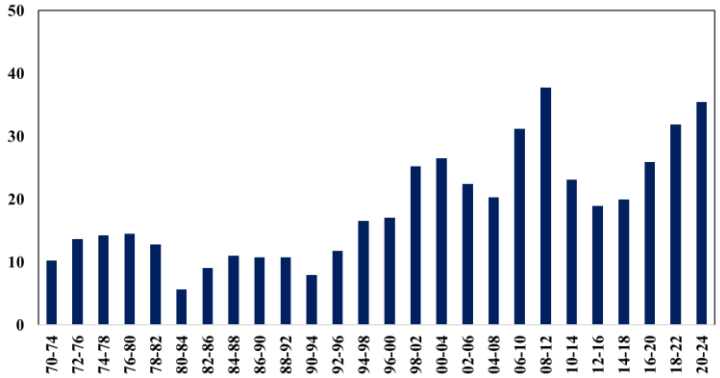
(Correlation coefficients)




Notes: The panels present the correlations of the global interest rate factor with the global output, inflation, oil prices, and other global indicators. The correlations refer to 5-year (centered) moving averages.

**Figure A2 Variance Contribution of the Global Interest Rate Factor: 5-year Rolling Windows**

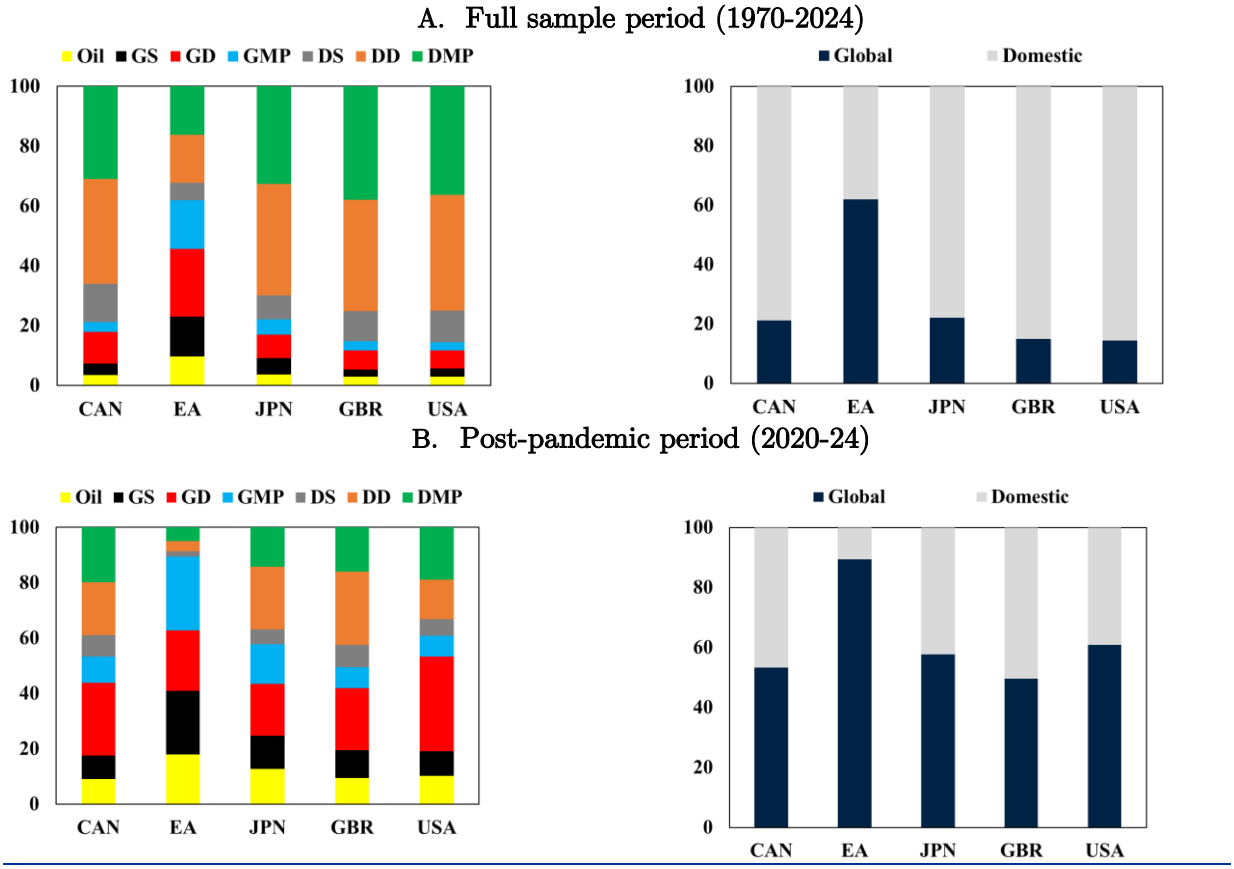
(Percent of total variation)




Notes: The chart presents the average variance contribution of the global policy rate factor to the variations in country-specific policy rates over five-year windows in seven advanced economies (Australia, Canada, the euro area, Japan, New Zealand, Switzerland, the United Kingdom and the United States), considering the data availability.

Figure A3 Contributions of Shocks to Interest Rates: G-5 economies

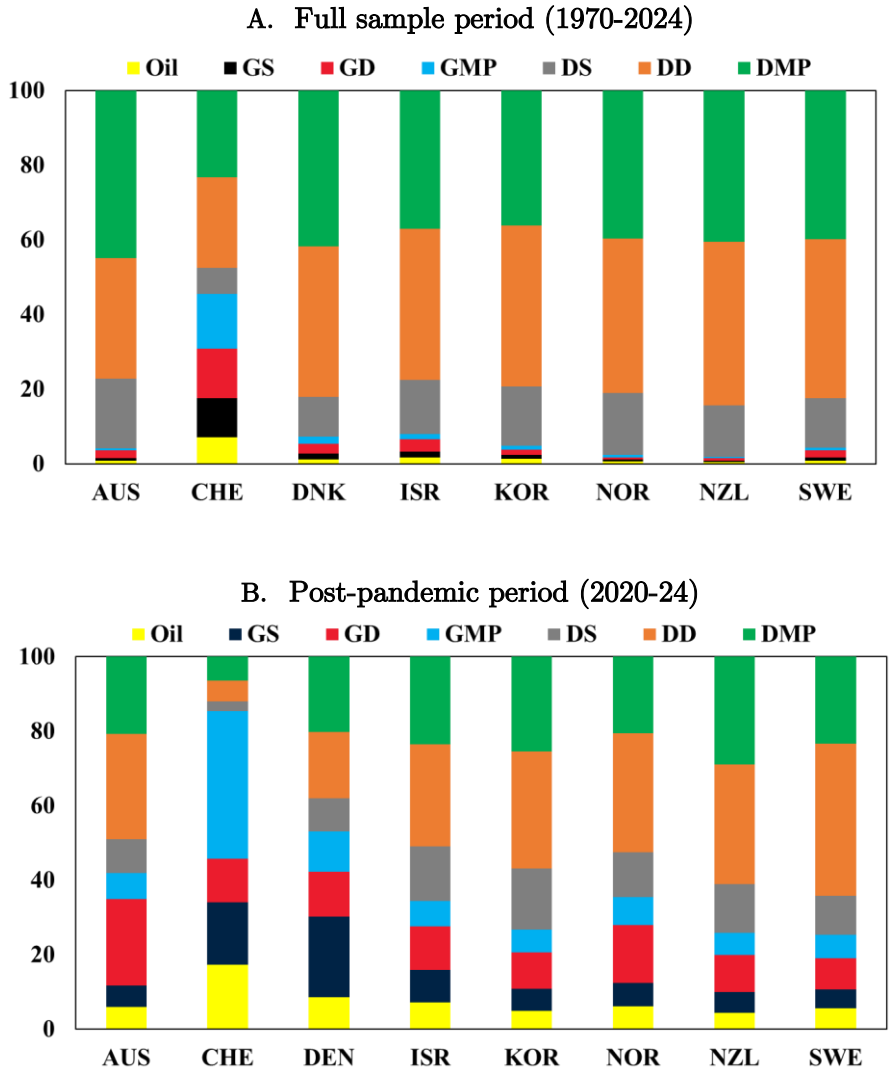
(Percent of total variations)




Notes: Forecast error variance decompositions of interest rates in G-5 economies based on the FAVAR model that consists of four global variables (global output growth, inflation, interest rates, and oil prices) and three domestic variables (domestic output growth, inflation, and interest rates). "Oil" = oil price, "GS" = global supply, "GD" = global demand, "GMP" = global monetary policy, "DS" = domestic supply, "DD" = domestic demand, "DMP" =domestic monetary policy.

Figure A4 Contributions of shocks to policy rates: Other advanced economies

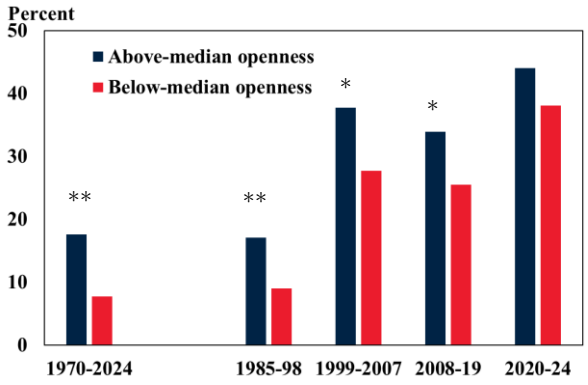
(Percent of total variation)




Notes: Forecast error variance decompositions of domestic monetary policy rates based on the FAVAR model that consists of four global variables (global output growth, inflation, monetary and oil prices) and three domestic variables (domestic output growth, inflation, and monetary policy rates). "Oil"= oil price shock, "GS" = global supply shock, "GD" = global demand shock, "GMP" = global monetary policy shock, "DS" = domestic supply shock, "DD" = domestic demand shock, "MP" =domestic monetary policy shock.

Figure A5 Contributions of Global Shocks Across Different Levels of Trade Openness

(Percent)




Notes: The results are based on the estimated contributions of global shocks (sum of oil, global supply, global demand, and global monetary policy shocks) to domestic variables in 23 economies across countries with different trade-to-GDP ratios (in percent. ** * indicate statistically significant at the 5% and 10% level, respectively.