Rate Cycles

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

August 2024

Rate Cycles

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

August 2024

Abstract: This paper analyzes cycles in policy interest rates in 24 advanced economies over 1970–2024, combining a new application of business cycle methodology with rich time-series decompositions of the shocks driving rate movements. "Rate cycles" have gradually evolved over time, with less frequent cyclical turning points, more moderate tightening phases, and a larger role for global shocks. Against this backdrop, the 2020–24 rate cycle has been unprecedented in many dimensions: it features the fastest pivot from active easing to a tightening phase, followed by the most globally synchronized tightening, and an unusually long period of holding rates constant. It also exhibits the largest role for global shocks—with global demand shocks still dominant, but an increased role for global supply shocks in explaining interest rate movements. Inflation and the growth in output and employment have, on average, largely returned to historical norms for this stage in a tightening phase. Any recalibration of interest rates going forward should be gradual, however, and account for the interactions between increasingly important global factors and domestic circumstances, combined with uncertainty as to whether rate cycles have reverted to pre-2008 patterns.

Keywords: Monetary policy; Oil prices; demand shocks; supply shocks; ECB; Federal Reserve
JEL Classification: E52, E31, E32, Q43

* Forbes (Corresponding author): MIT, Sloan School of Management; NBER; CEPR; kjforbes@mit.edu. Ha: World Bank, Prospects Group; jongrimha@worldbank.org. Kose: World Bank, Prospects Group; Brookings Institution; CEPR; akose@worldbank.org. This paper is prepared for the ECB Forum on Central Banking on "Monetary Policy in an Era of Transformation" in Sintra, Portugal on July 1-3, 2024. We would like to thank Carlos Arteta, Francisco Arroyo Marioli, Mirco Balatti Mozzanica, Bill English, Graham Hacche, Philipp Hartmann, Dohan Kim, Philip George Kenworthy, Jirka Slacalek, Paolo Surico, Guillermo Verduzco-Bustos and participants at the ECB Forum in Sintra for helpful comments and feedback. We are grateful to Chris Collins, Graeme Littler, Maria Hazel Macadangdang, Shijie Shi, and Kaltrina Temaj for excellent research assistance. The findings, interpretations, and conclusions expressed in this paper are those of the authors and should not be attributed to the institutions they are affiliated with.

I. Introduction

Monetary policy has undergone a remarkable transformation since the ECB's Sintra conference just four years ago. Most central banks have quickly pivoted from aggressively easing monetary policy in 2020 to aggressively tightening. Amid a series of global shocks, including the COVID-19 pandemic, disruptions in global supply chains, and the Russian invasion of Ukraine, concerns about inflation being too low were quickly replaced by worries about inflation being too high. Discussion of the impact of quantitative easing has been replaced by debates about the impact of quantitative tightening.

This paper provides the first systematic, cross-country analysis of "rate cycles" over about 55 years to put today's monetary policy challenges into context. We analyze the characteristics of easing and tightening phases; how they have changed over time; how economic growth, employment, and inflation have evolved over these cycles; the extent to which rate cycles have been synchronized globally; and the causes of these cycles. This historical analysis, and particularly the examination of how countries have exited similar highly synchronized rate cycles, can improve our understanding of the trade-offs faced by central banks today.

Rate cycles have gradually evolved in many dimensions since the 1970s: less frequent turning points (particularly since 2010), shorter and more moderate tightening phases, and longer easing phases. These trends were broken during the 2020-24 cycle, however, with a more aggressive tightening phase and larger increases in interest rates than was typical of earlier cycles, and the most internationally synchronized increases in interest rates since the start of our sample period. Macroeconomic variables also evolved differently during the ongoing cycle, with unprecedented swings around the pandemic. Economic growth, unemployment, and inflation, however, have recently returned to historical norms on average (albeit with important differences across countries), despite a slower start to tightening than has historically occurred relative to the evolution of macroeconomic variables. This normalization took place in the aftermath of an unusually rapid pivot from actively easing to tightening, and then a more aggressive tightening path, followed by a longer period of central banks holding rates constant than at the end of past such tightening phases.

What has not changed during the 2020-24 cycle, however, is the increased role of global factors in explaining movements in interest rates over time. Interest rate fluctuations have become increasingly synchronized (by some measures even more so than business and inflation cycles), such that global shocks explained 64 percent of the variation in interest rates over 2020-24; this is the first time in the sample that global shocks on average played a greater role than domestic shocks. Although global supply and oil price shocks have played a large role since 2000, and particularly during the post-pandemic tightening phase, the growing importance of global shocks over time primarily reflects the increasing role of global demand shocks. Correctly identifying this demand component of global shocks in interest rates has, therefore, become more important for setting monetary policy.[1]

An extensive literature studies how central banks adjust monetary policy, including historical narratives of monetary policy decisions (e.g., the comprehensive history of the ECB's monetary policy in Hartmann and Smets (2018) and the history of US monetary policy in Romer and Romer

[1] Conventional wisdom suggests that monetary policy should respond to demand-driven shocks, but can often look through supply shocks. Recent studies, however, provide a more nuanced approach. For example, Bandera et al. (2023) and Tenreyro (2023) argue that depending on the characteristics of the supply shock and the nature and state of the affected economy, a supply shock may or may not require a monetary policy response.

(2023)). A separate literature uses different methods to identify cycles in real and financial variables to help understand the current economic situation, how the macroeconomy is likely to evolve, and how policy can best respond. These studies focus on various types of cycles and their turning points, including business cycles (Burns and Mitchell 1946; Harding and Pagan 2002), business and credit cycles (Claessens, Kose, and Terrones 2009, 2011), capital flow cycles or "waves" (Forbes and Warnock 2012, 2021), and the global financial cycle (Rey 2015).[2]

Surprisingly, this classical approach for identifying turning points has not been systematically applied to interest rate cycles.[3] This paper attempts to fill this gap. We identify the monthly turning points of cycles in policy interest rates (supplemented with information on central banks' asset purchases and sales) for 24 advanced economies over 1970-2024. To simplify terminology, we will refer to the resulting cycles as "rate cycles". Our approach is novel not only in the application of business cycle methodology to identify and analyze turning points in rate cycles, but also in its combination with time-series techniques employing a factor-augmented vector autoregressive (FAVAR) model to analyze a rich set of global and domestic shocks behind these cycles.

Although rate cycles often mirror business and financial cycles, even within a given cyclical phase (such as a recession or a financial downturn), there are different ways that central banks can adjust monetary policy—with different effects on activity and inflation. We focus mainly on changes in policy interest rates, as this is the primary tool employed by central banks to shape the monetary policy stance, although we supplement this with information on asset purchase programs. Policy interest rates are straightforward to observe, with data widely available across countries over long periods. This makes it possible to find comparable historical precedents and perform the empirical analysis decomposing the shocks driving these cycles.

Section II identifies the turning points of the rate cycles that inform the analysis in the remainder of the paper. Each rate cycle consists of an easing and tightening phase, comparable to the expansion and contraction phases that together constitute a business cycle. Using monthly data on nominal policy rates and new asset purchase programs, we modify the dating algorithm from Bry and Boschan (1971) and Harding and Pagan (2002) to identify 212 distinct rate phases (111 of tightening and 101 of easing) from January 1970 through May 2024. There are substantially less frequent turning points after 2010, with many economies in extended easing phases until after the pandemic, highlighting the importance of using a longer time series to understand today's tightening phase. This rich database of the turning points in rate cycles should provide a useful reference for future work on a wide range of topics related to monetary policy.

Section III describes the key characteristics of the resulting rate cycles, including their relationships with macroeconomic variables and how these characteristics and relationships have

---

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

[3] Other research uses different approaches to identify easing and tightening phases. For example, de Soyres and Saijid (2024) defines an easing phase as when the policy rate decreases compared to the previous quarter and had not decreased already in the year prior. Caldara et.al. (2024) focuses on "global tightening windows" which last two years and begin when: (i) global interest rates are higher by more than 25 basis points than four quarters before; (ii) global interest rates are higher than six quarters later. Adrian and Estrella (2008) defines monetary policy cycles in the United States using fixed thresholds over fairly short windows to locate peaks in the federal funds rate. Some financial institutions use historical narratives or thresholds to identify turning points of easing and tightening phases. None of these studies, however, apply a systematic framework to identify and analyze easing and tightening phases for interest rates across a large set of countries over a long period.

changed over time. Over the full period (1970-2024), tightening phases are much shorter than easing phases on average (47 vs 79 months), with fewer rate changes, and a slower initial velocity of rate adjustments than in easing phases. Rates tend to be adjusted by smaller increments (on average) during easing phases, however, partly reflecting the constraint of lower bounds.

Macroeconomic variables mostly evolve as expected in relation to rate cycles. Economic activity (measured by the growth in GDP or industrial production) accelerates and the labor market (measured by the growth in employment or change in the unemployment rate) strengthens before the start of tightening phases, and each measure begins to soften roughly six months after the start of a tightening phase as higher interest rates take effect with a lag. The opposite occurs during easing phases. The relationship between rate cycles and inflation (measured by headline or core CPI inflation) is more muted, consistent with evidence of a flat Phillips curve for much of the sample.

More interesting is how these relationships have changed over time—particularly during and after the pandemic. We repeat this analysis over five sub-periods: 1970-84, 1985-98, 1999-2007, 2008-19, and 2020-24. Each window includes some type of recession/crisis and recovery, with the divisions between the sub-periods often marking major global events that could have changed the nature of rate cycles. Tightening phases have moderated over time—whether in terms of duration, number of rate increases, and both the initial and the average pace of rate increases—all contributing to a substantial decline of nearly 80 percent in the average amplitude of tightening phases (i.e., the total increase in policy rates) between 1970-84 and 2008-19. This pattern is broken, however, in the post-pandemic tightening phase—when interest rate increases were more aggressive than in the 1999-2007 and 2008-19 cycles, and more akin to tightening episodes before 1999. As a result, interest rates are closer to the levels typical of this stage in pre-2008 cycles in most economies.

This sharp break in the post-pandemic rate cycle is even more prominent in the corresponding relationships with macroeconomic variables. Economic activity and labor markets collapsed and then bounced back much more sharply around the pandemic than in any earlier periods in our sample. The rebound after the 2020 global recession was so sharp that activity and labor markets were much stronger before the start of the subsequent, post-pandemic tightening phase than at the same point in earlier cycles. After interest rates were increased and the post-lockdown rebound subsided, however, activity and labor markets softened more quickly on average than in past episodes, consistent with the post-pandemic tightening phase starting later, but then followed by an unusually aggressive path of rate hikes by historical standards.

The movements in inflation were also unusual. Both headline and core CPI inflation began to increase in mid-2021, about 18 months into the pandemic easing phase (a stage in cycles when inflation is typically muted) and continued to pick up after the start of the post-pandemic tightening much faster than during earlier such episodes. On average across our sample, inflation has since declined to around levels typical of this point in previous tightening phases (albeit with some variation across economies). While a number of factors contributed to these sharp swings in inflation, central banks have responded with unusually aggressive interest rate hikes and an unusually long period during which rates have been held at their peaks.

To better understand the evolution and drivers of national rate cycles, Section IV examines their synchronization across economies. It documents sharp "waves" in the synchronization of rate cycles over time—whether measured by the share of the sample adjusting policy interest rates in the same direction (or conducting asset purchases or sales), or the share of economies simultaneously in an easing or tightening phase. The post-pandemic period stands out as the period of most synchronized rate increases since 1970, with all economies except Japan in a tightening phase. There are four other "*Highly Synchronized Tightening*" periods when over 60 percent of the economies in our sample are in a tightening phase and actively raising interest rates: 1979-80, 1988-89, 2000, and 2005-07. These periods are used throughout the remainder of the analysis to better understand today's global tightening phase—and what comes next.

Section IV also employs a dynamic factor model to estimate the global common factor in interest rates, output growth, and inflation, allowing us to better understand the extent of synchronization in rate adjustments and how this compares with the synchronization in business and inflation cycles. The importance of the global rate factor in explaining fluctuations in national interest rates has increased significantly over time. It explained only about 10 percent of the variation in interest rates over 1970-84, jumping to about 30 percent over 2008-19, and almost 40 percent over 2020-23. The importance of the global factors in business and inflation cycles has also increased over time, but the "globalization" of interest rates has been more marked, including before the pandemic.

Section V presents a detailed analysis of the importance of different types of shocks in driving these interest rate cycles over time. We estimate a factor-augmented VAR (FAVAR) model with four global (monetary policy, demand, supply, and oil price) shocks and three domestic (monetary policy, demand, and supply) shocks explaining the variation in interest rates over different periods and rate phases in five major advanced economies (Canada, the euro area, Japan, the United Kingdom, and the United States). Across the full period, global shocks accounted for only about one-quarter of the variation in interest rates on average in these five economies, and domestic shocks (primarily domestic demand and monetary policy shocks) about three-quarters. This decomposition has changed meaningfully over time, however, with global shocks steadily gaining importance—consistent with the growing synchronization of rate cycles documented in Section IV. Specifically, since January 2020 global shocks explained 64 percent of the variation in interest rates—much more than the contribution of domestic shocks for the first time.

Among the four global shocks, demand shocks make the single largest contribution to the variation in interest rates in each sub-period, followed by global monetary policy shocks, and a growing role for global supply and oil price shocks. The global shocks are even more important during tightening phases, while monetary policy shocks—and particularly domestic monetary policy shocks—play a relatively greater role during easing phases. During the most recent tightening phase, the contributions of the global supply and oil price shocks were together larger than during any historical precedent—including the tightening phases of the 1970s and 1980s coinciding with the first and second oil crises. This large role of global shocks likely contributed to the unusually high degree of synchronization in the post-pandemic tightening phase (documented in Section IV), while the continuing large role of demand shocks (including global demand shocks) likely contributed to the more aggressive tightening in this phase compared to historical precedents (documented in Section III).

Central banks face the perennial challenge of deciding when to stop adjusting rates during an easing or tightening phase, and when to begin adjusting rates to transition to the next phase. Timing an "exit" is complicated by the long and variable lags with which monetary policy affects the economy, as well as by challenges in assessing the shocks driving the cycle, forecasting the outlook, and evaluating the restrictiveness of policy in real time. To help inform the policy choices confronting central banks today, Section VI examines the historical experience with ending easing and tightening phases—particularly after periods of highly synchronized tightening similar to the current episode. It examines holding periods (when policy rates are held unchanged and asset purchase programs are completed), and "premature adjustments" (when a decision to end a tightening or easing phase is subsequently reversed).

The results suggest that central banks have been holding rates constant for longer periods before shifting to a new phase of the rate cycle, including during the current tightening phase (when rates have been on hold for longer than any historical tightening phases). The one exception in this shift to longer holding periods was after the pandemic easing, when countries pivoted from actively providing stimulus to raising interest rates faster than in any other transition between phases. Since 1999, central banks have frequently raised interest rates prematurely during an easing phase, mainly during periods of relatively weaker growth and below-target inflation in the 2010s. In contrast, central banks less frequently lowered interest rates prematurely during a tightening phase (and rarely since the turn of the century), with the few occasions when they did so generally having been driven by adverse global shocks that temporarily filtered through to domestic economic conditions.

A closer look at how countries exited from highly synchronized tightening phases in the past suggests that the current situation, in which several countries have begun to lower policy interest rates before the United States, is not unprecedented. It is not unusual to have substantial divergence in when economies shift from tightening to easing monetary policy, with the timing reflecting different domestic circumstances. After the 1979-80 synchronized global tightening phase (also driven by a relatively large contribution from global supply and oil price shocks), five advanced economies lowered interest rates before the United States. There was substantial divergence in the timing of exits during this episode—with initial rate cuts spread over almost three years. Countries that transitioned to an easing phase before the United States were characterized by meaningfully lower inflation rates, but not relatively weaker activity.

The final section of the paper brings together the key results from throughout the analysis on how the current tightening phase compares to historical experience. It highlights the many ways in which the post-pandemic tightening in monetary policy has been unprecedented. It also emphasizes, however, how in some ways this tightening phase represents a reversion to historical patterns from before the 2008 crisis (such as in the more aggressive path of rate increases and resulting higher level of interest rates) against a longer-term backdrop of increased global synchronization of interest rates.

These comparisons have several implications for policy today. First, activity, labor markets, and inflation have, on average, largely normalized relative to past cycles (even though central banks were slower to start tightening than in past episodes). Second, any recalibration of interest rates going forward should be gradual (barring any unexpected shocks), taking into account the interactions between global factors and domestic circumstances, combined with uncertainty if rate cycles have returned to pre-2008 patterns. Third, while central banks will continue to focus on domestic inflation objectives (per their mandates) and the timing of adjustments will diverge across economies, monetary policy decisions are increasingly influenced by global shocks; this is a longer-term trend and not just the configuration of the 2020-24 cycle. Finally, central banks need to prioritize accurately differentiating between global supply and demand shocks; these two types of global shocks can merit different monetary policy responses, and the risks from an inaccurate identification will only grow as these international factors play a greater role.[4]

This paper covers a lot of ground. But it is also important to highlight what this paper does not do. Our analysis of rate cycles focuses on changes in policy interest rates, supplemented by information on asset purchase programs and shadow interest rates, but does not evaluate broader measures of the monetary policy stance. This would involve estimating the nebulous neutral interest rate, and taking into account other policy tools that played a different role in different

[4] For a recent analysis of the appropriate response to global demand and supply shocks in the euro area and United States, see Giannone and Primiceri (2024).

countries at different points in time (such as the money supply or exchange rate). Closely related, we do not take into account changes in monetary policy tools or frameworks over time. Finally, we focus on a sample of 24 advanced economies (including the euro area), but do not consider emerging and developing economies, many of which would likely have very different rate cycles.

II. Rate Cycles: Methodology, Data, and Dates

This section adapts the methodology used in the extensive literature on business cycles to identify cycles in policy interest rates. We also incorporate information on central banks' balance sheet programs—large-scale asset purchases (QE, quantitative easing) when short-term policy rates had reached the lower bound, and subsequent asset sales (QT, quantitative tightening). This section begins by introducing the methodology and then describes the data on policy interest rates and asset purchase programs used to identify the rate cycles. It concludes with the resulting dates for easing and tightening phases used in the remainder of the paper.

II.1. Dating Methodology

Our goal is to identify the turning points of rate cycles using a methodology that links to the long-standing literature on business cycles and can be applied consistently over a long period and across countries. Because of the substantial volatility in interest rates early in our sample period and differences in monetary policy frameworks across countries and time, we cannot use an off-the-shelf approach, rely on country-specific analyses, or employ simple rules of thumb as is sometimes done for business cycles (such as the two quarters of negative GDP growth popularly used as a shorthand to identify recessions).

Instead, we modify the BBQ algorithm proposed by Bry and Boschan (1971) and then developed in Harding and Pagan (2002).[5] This algorithm evaluates increases and decreases in a series to locate local maxima and minima over specified windows. If an adjacent local peak and trough of policy interest rates meets the censoring criteria set in the algorithm, they define the start of the two phases (easing and tightening) that together constitute a cycle. More specifically, the algorithm identifies a local maxima in the monthly series for interest rates i_t at time t if the interest rate increases and does not immediately fall back per the following criteria:

$$\{[(i_t - i_{t-2}) > 0, (i_t - i_{t-1}) > 0] \; and \; [(i_{t+2} - i_t) < 0, (i_{t+1} - i_t) < 0]\}.$$

Similarly, a local minima occurs in month t if:

$$\{[(i_t - i_{t-2}) < 0, (i_t - i_{t-1}) < 0] \; and \; [(i_{t+2} - i_t) > 0, (i_{t+1} - i_t) > 0]\}.$$

A local maxima is the peak of the interest rate series and can be the start of an easing phase (if it meets the requirements above), while a local minima is the trough of the interest rate series and can be the start of a tightening phase. A full "rate cycle" comprises an easing and a tightening phase, just as a business cycle comprises an expansion and contraction phase. For these local maxima and minima to qualify as the start of an easing or tightening phase, respectively, we set three parameters: (i) a window of at least 18 months on each side of a local maxima and minima; (ii) a window of at least 36 months for a full cycle (including both tightening and easing phases); and (iii) a window of at least 7 months for any individual phase of a cycle (either a tightening or easing phase).

[5] The BBQ algorithm was first proposed by Bry and Boschan (1971), building on the work of Burns and Mitchell (1946) that lays the foundation for identifying US business cycles. See Claessens, Kose, and Terrones (2009, 2012) for details and applications to identifying business and financial cycles.

The first two criteria require relatively long windows on each side of a turning point and for the full cycle in order to capture changes in interest rates that are not reversed soon afterward; this allows us to identify and study periods of "premature adjustment", i.e., when a central bank shifts from raising to lowering interest rates (or vice versa) and then needs to reverse course. These longer windows also avoid classifying changes in interest rates that largely reflect market-driven movements as turning points, an issue earlier in the sample when interest rate data is more volatile and policy rates may not be directly set by central banks. In contrast, the third criterion allows for individual phases in a cycle to be short-lived; brief periods of rate hikes or cuts can potentially qualify as an easing or tightening phase—albeit within the longer parameters for a full cycle. This is useful in several cases when a central bank adjusts rates quickly by a large amount, and then does not adjust rates again (such as lowering rates to zero in one meeting in response to a negative shock).

After applying the algorithm, we make several adjustments to the dates identified in order for a month t to qualify as a turning point. These adjustments are mainly to address issues when interest rates are constant for an extended period around the lower bound. First, a month can qualify as the start of an easing (tightening) phase if there is no change in the policy rate but the central bank starts a new QE (QT) program (defined below). Second, if there is not a new balance sheet program, there must be an increase (decrease) in the policy interest rate to qualify as the start of a tightening (easing) phase. Finally, any such increase (decrease) in the policy rate must be meaningful and lasting, defined as $|\Delta i_t| \geq 0.50$ percentage point over one month, or at least two rate changes (of any size) occurring over a year, such that the policy rate is at least 30 basis points higher/lower one year after the first rate change.

Appendix 1 provides more information on the details of the criteria used to identify the cycle dates, the application of each of the additional criteria, and the specific countries and dates affected by each of these criteria.

II.2. Database: Policy Rates and Balance Sheet Programs

To define rate cycles, we focus on the policy interest rate for several reasons. First, policy interest rates are currently the primary tool used by central banks to affect the monetary policy stance. Since our goal is to inform central bank decisions today, this is an obvious measure on which to focus. Employing market-determined measures of interest rates would incorporate fluctuations in rates that are not directly under the control of central banks. Second, data for policy interest rates are widely available over a long period, allowing us to analyze their evolution over the past 55 years (1970-2024) for 24 advanced economies. A long panel is particularly important for our empirical decomposition of the factors driving rate cycles and for the identification of precedents comparable to the ongoing rate cycle.

Finally, we focus on nominal policy rates, instead of attempting to estimate more complex measures of the overall stance of monetary policy.[6] Measuring the overall policy stance would require finding a comparable way to measure the impact of adjusting other policy tools (such as the money supply in certain periods) and modelling variables such as the neutral interest rate (which could be subject to substantial measurement error). Both of these tasks are extremely challenging for an individual country, and even more so for a cross-section of diverse economies

[6] A series of papers have used alternative approaches to measure the overall stance of monetary policy. For example, Bernanke and Mihov (1998) uses a nested VAR of a range of macroeconomic and financial variables. Woodford (2003) uses deviations from an estimated natural interest rate, and others have considered deviations from certain monetary policy rules, including Taylor (1993) and Orphanides (2003). More recently, Estrella (2022) measures the stance of US monetary policy as movements in a long-term Treasury forward rate relative to that of the federal funds (or shadow) rate.

over a long period when economic and financial structures have shifted and the relationships between variables have changed meaningfully. Measuring variables such as the neutral interest rate is also particularly difficult in real-time—especially today—which would limit our ability to analyze the current situation and compare it to historical precedents.[7]

While there are multiple reasons to focus on policy interest rates as our main guide to identify cycles in monetary policy, they have several limitations. Although policy interest rates are currently the key tool for adjusting monetary policy, there are periods when other instruments have also been important (including for different goals)—such as adjusting reserve requirements, the money supply, credit controls, and the size and composition of the central bank's balance sheet. Given our focus on monetary policy today, we incorporate information on QE and QT programs in our measure of rate cycles. For parts of the analysis, we also use the shadow interest rate to incorporate changes in balance sheet policy, but this measure is not available broadly for our sample and is less directly controlled by central banks. Finally, we do not take into account changes in monetary policy goals, frameworks and targets that occurred over the sample period (such as whether a central bank targets inflation, employment, the money supply, or the exchange rate), although we discuss the likely impact of some of these changes on rate cycles over time.[8]

Our sample includes 24 advanced economies (including the euro area as a single entity for some parts of the analysis). We select these economies based on several 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.[9] Depending on the analysis, we include individual countries that are currently in the euro area, or consider the euro area as an economic entity.

We collect monthly data on the nominal interest rate defined as the policy rate by the central bank from January 1970 through May 2024. Our main source is the BIS, but when data are unavailable or there are gaps, we augment it with information from Haver Analytics, FRED and the OECD. For members of the euro area, we use the policy rate for individual member countries through the end of 1998, and then use the European Central Bank (ECB) policy rate starting in January 1999. It is worth noting that interest rate that the central bank identifies as the policy rate has changed over time in most countries.[10] 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

[7] See Forbes (2019a) and Kiley (2020) for discussions of the challenges associated with using the neutral interest rate to measure the monetary policy stance, as proposed in Jordà and Taylor (2019). Estimating the neutral rate relies on estimates of the output gap in real time, which is itself subject to significant difficulties (Orphanides and Norden 2002 and Garrat et al. 2008). For a discussion of the determinants of the long-run neutral rate, see Ferreira and Shousha (2023).

[8] Countries have adjusted their frameworks and targets meaningfully during the sample, but classifying different regimes is not straightforward, especially as some economies had multiple targets, and others had substantial discretion in how they adjusted policy. Ball (2011), Bernanke and Mishkin (1992) and Federal Reserve Bank of San Francisco (2003) document these changes in frameworks and targets over time. Section 3.2.1 discusses how these differences in targets and frameworks can explain some of the differences in rate cycles over time.

[9] We include countries in the ERM in the earlier half of our sample, as well as Switzerland when it had a one-sided band on its exchange rate from 2011-2015.

[10] For details of the main policy interest rates and changes over time, see the database "Long Series on Central Bank Policy Rates" compiled by the BIS and available at: https://www.bis.org/statistics/cbpol/cbpol_doc.pdf.

as they aimed to meet operating targets for the money supply). This volatility is an important consideration in choosing the appropriate criterion for the identification of the turning points in rate cycles.

Next, we augment this monthly data on policy interest rates with dummy variables for major QE or QT programs. Incorporating these programs is important to capture changes in the evolution of monetary policy in several parts of the subsequent analysis, particularly when policy rates in several economies were at the lower bound and central banks relied on asset purchase programs to adjust policy. These dummy variables equal one on the announcement date of a new program (even if the program is not implemented until later) and revert to zero when the program ends.[11] These QE and QT dummies only include programs related to monetary policy (including balance sheet run-off through passive QT), but do not include programs primarily aimed at providing liquidity or addressing market dysfunction. The data used to compile these balance sheet variables are: CGFS (2019) and BIS (2019) for programs before the pandemic, English et al. (2021) and Fratto et al. (2021) for QE programs in response to the pandemic, and Du, Forbes, and Luzzetti (2024) and English et al. (2024) for QT programs since the pandemic.

II.3. The Dates of the Rate Cycles

Application of our algorithm to the data on nominal policy rates and balance sheet programs yields 212 distinct rate phases (111 of tightening and 101 of easing) from January 1970 through May 2024 for our sample of 24 advanced economies. This includes the phase that each economy is in as of May 2024—even if that phase is not completed.[12] Appendix Table 1 lists the identified turning points at the start of tightening and easing phases. The near symmetry of the blocks for each country—with each tightening phase followed by an easing phase (and vice versa) and a roughly equal number of tightening and easing phases for each country—reflects the way in which these cycles are defined.

The 24 economies in our sample averaged 5 tightening and 4 easing phases, but some countries have had substantially more rate cycles than others. For example, the United States has had 17 distinct easing and tightening phases, and Canada and Sweden 15, while Ireland and Portugal had only 3 and 4, respectively. The smaller number of cycles for the individual euro area countries, however, reflects their shorter time series—as any cycles after 1998 are included as the euro area and not for the individual countries. Of the countries with data on nominal policy rates from 1970 through the end of the sample, Japan has the fewest turning points, with only 4 tightening and 4 easing phases—about half those of several non-euro area economies.

More interesting than this list of turning points, however, is seeing these cycles in the context of the evolution of the policy rate and any QE or QT announcements for each economy. Chart 1 shows these graphs of policy rates for three major economies: the euro area, Japan, and United States. (Appendix Charts 1 and 2 show the resulting cycles for other economies with the individual euro area countries broken out separately on one page). In each graph, the start of tightening phases is denoted by dashed purple lines and easing phases by dashed red lines. The start of QT and QE programs are in dashed blue and orange lines, respectively.

---

[11] We only include programs involving government bonds (the vast majority of asset purchases programs), and do not incorporate adjustments to the speed, size or scope of the programs after announcement.

[12] For an economy that has recently adjusted its policy rate, and this could become a turning point with more time, the economy is still classified as being in the phase as of May 2024. For example, even though Sweden decreased its policy interest rate on May 8, 2024, it is still classified as being in a tightening phase at end-May 2024 as its rate cut does not yet qualify as a turning point.

A closer look at the turning points for these three major economies in Chart 1 is useful to better understand how these rate cycles are defined—and what can be learned from them. For example, consider the patterns for the euro area after the ECB started setting policy rates in January 1999. The methodology described above identifies: a tightening phase starting in November 1999; followed by an easing phase from May 2001; then another tightening phase starting in December 2005; and an easing phase starting in October 2008 (during the Global Financial Crisis), which subsequently involved several rounds of asset purchases. This final easing phase ended in July 2022, when policy rates began to be raised sharply. The period in 2011 when the ECB raised interest rates twice by 25bps does not count as the start of a tightening phase, as the ECB unwound these rate hikes within a year, followed by further rate cuts and asset purchase programs.[13] In the analysis below, this 2011 rate hike qualifies as a "premature adjustment"—a category that is useful to better understand why some attempts to transition from easing to tightening phases (or vice versa) can be premature and quickly unwound.[14] In March 2020 when the ECB announced a new asset purchase program, but did not reduce interest rates, this would have qualified as the start of an easing phase if the ECB was not already in an easing phase.[15]

A useful contrast to these patterns for the ECB is the turning points for Japan (middle of Chart 1). Japan has very few rate cycles (only four of them), with policy interest rates hugging zero from the mid-1990s and extended periods when there is no change in the policy rate, but asset purchase programs are the primary tool for monetary policy. These periods will be evaluated in Section VI in the discussion on how phases end, including how some phases include a long "holding" period at the end, while others involve a quick transition from adjusting policy in one direction to shifting to a different phase. Also, in contrast to the above example for the ECB in 2011, Japan's increase in interest rates in July 2006 is identified as the start of a tightening phase—even though (as with the ECB) the Bank of Japan (BoJ) raised rates only twice in 25 bps increments and these hikes were later reversed. This qualifies as a turning point for Japan because the interest rate increases were sustained for over a year; the subsequent easing phase did not begin until the first rate cut in October 2008—over two years after the initial rate hike.

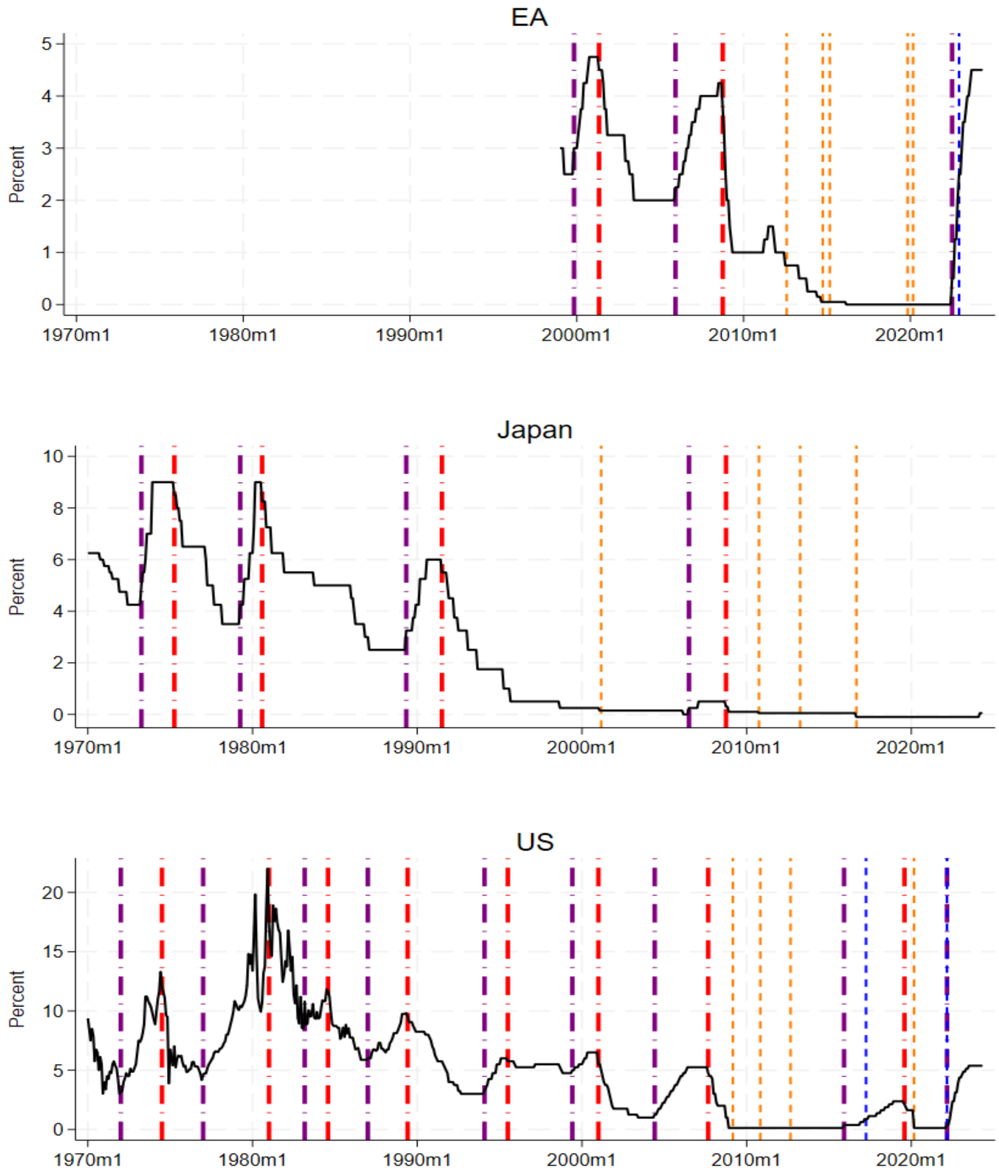
[13] Specifically, the ECB increased rates by 25bps in April 2011 and July 2011, and then lowered them by the same amount in November and December 2011, such that the policy rate in January 2012 was the same as in March 2011.

[14] Similarly, in some economies an increase in interest rates before 2020 may not be identified as the start of a tightening phase if those increases were reversed during the pandemic and followed by a more aggressive tightening phase afterwards (e.g., Norway).

[15] The Swedish Riksbank also did not lower its policy interest and started a new asset purchase program after the pandemic, but this is considered as the start of an easing phase as monetary policy was previously defined as being in a tightening phase.

Chart 1 Rate Cycles in the Euro Area, Japan and the United States

(Policy Interest Rates, Easing and Tightening Phases and New QE and QT Programs)



Sources: Authors' calculations based on the data and methodology identifying rate cycles described in Section II, with data from January 1970 through May 2024.
Notes: The solid black line is the policy interest rate. Dashed purple and red lines indicate the start of tightening and easing phases, respectively. Dashed blue and orange lines represent the announcement of new QT and QE programs, respectively, and only include the announcement of major new programs involving government bonds and aimed at providing monetary stimulus; we do not include announcements of changes to an ongoing QE/QT program or balance sheet programs aimed primarily at providing liquidity. These QE/QT dates are not turning points that denote the start of an easing or tightening phase unless there is also a red or purple line.

The cycle dates for the US are also a useful contrast to those for the euro area and Japan. The US has had two periods of QT. The first QT program began in 2017, 15 months after the first rate hike in December 2015, which marked the start of the corresponding tightening phase. The second QT program began around the same time as the March 2022 rate hike, which marked the start of the most recent tightening phase. This accelerated start to QT after the pandemic—either at the same time as the first rate hike or soon after—occurred in most countries, although the United States is the only country to have made meaningful progress in reducing the size of its balance sheet before the pandemic.[16]

The more frequent turning points in the United States, and corresponding larger number of easing and tightening phases relative to Japan and the euro area, are more typical of other countries in the sample. The dates of the turning points for the US correspond to well-known shifts in monetary policy, as well as to the obvious peaks and troughs in the policy rate data. This is noteworthy given the greater volatility of policy rates earlier in the sample when the Federal Reserve and some other central banks relied on different tools and monetary frameworks (e.g., sometimes focused on the control of monetary aggregates). Despite these changes in how monetary policy is conducted, the dating algorithm, together with the additional criteria discussed above (and in Appendix 1), appears to have been successful in identifying the major turning points in policy interest rates that generally correspond to shifts in monetary policy.

While these differences in rate cycles across the euro area, Japan, and the United States are useful to understand the dating algorithm, there are also several fairly consistent patterns across most economies. Policy interest rates tended to be higher and substantially more volatile in the first half of the sample—reflecting higher neutral rates and inflation combined with monetary policy regimes that generally focused less on the level of the policy rate and more on other variables (such as the money supply). In the latter half of the sample, interest rates tend to be lower and much more stable (often flat around the lower bound in the 2010s), with a corresponding shift to more frequent use of balance sheet policy. There are also substantially fewer turning points after 2010, with several countries in a single, lengthy easing phase from 2008 through 2021/2022. As explained in Section IV, these differences in the level of policy rates and the frequency of changes in them may have contributed to the increased international synchronization of rate cycles by some measures.[17] When most countries shifted to a tightening phase after the pandemic, many combined sharp increases in interest rates with the start of QT.

III. Characteristics of the Rate Cycles

This section analyzes key characteristics of rate cycles across countries. It begins by calculating descriptive statistics for tightening and easing phases and then evaluates how rate cycles relate to the evolution of key macroeconomic variables (capturing activity, the labor market, and inflation). The second half of the section evaluates how these characteristics of rate cycles have changed over time, including how the tightening episode that began after the COVID-19 pandemic and the corresponding evolution of macroeconomic variables compare to previous episodes.

[16] The only other country to announce a formal QT program before the pandemic was Sweden (in April 2019), but there was little progress in reducing asset holdings before the onset of the pandemic. Other countries had brief periods during which their balance sheet shrank as various programs expired or rolled off, but these are generally not included as formal QT programs. See Du Forbes and Luzzetti (2024) for details and a cross-country analysis of QT and central bank balance sheets.

[17] This aligns with Ciccarelli and Mojon (2010) and Chatterjee (2016), which argue that lower inflation is associated with greater inflation and interest rate synchronization across countries.

III.1 Rate Cycles over the Full Period: January 1970 – May 2024

We compute a rich set of descriptive statistics that are frequently used to analyze business cycles. More specifically, we calculate the following statistics for the tightening and easing phases of each rate cycle:

- *Duration*: The length of the phase (in months), defined from the turning point marking the start of one phase to the turning point marking the start of the subsequent phase, and including any periods when rates are constant at the end of the phase.
- *Amplitude*: The total change in the policy interest rate (in percentage points) over the entire phase.
- *Number of in-sync rate changes*: The number of times the policy rate is adjusted by more than 0.1 percentage point in-sync with the phase (i.e., the number of rate increases >0.1 percentage point during a tightening phase and the number of rate decreases <-0.1 percentage point during an easing phase).[18]
- *Pace*: The average size of policy rate adjustments in-sync with the phase (as described above); this does not include months with no change in rates.
- *Initial Velocity*: The total change in the policy rate (in percentage points) over the first six months of the phase.

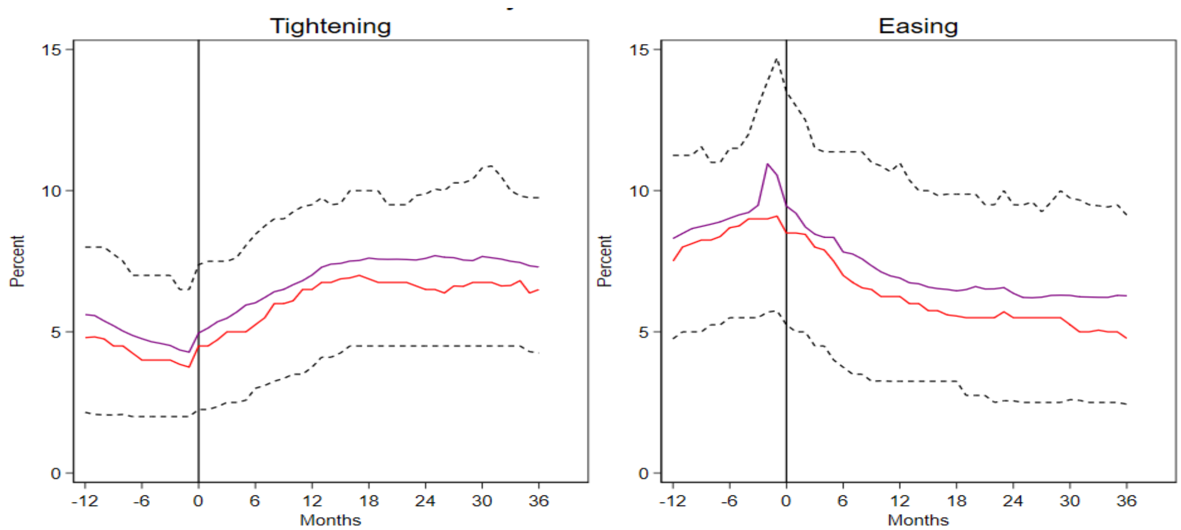
We calculate these statistics for each economy across all of the tightening and easing phases identified in Section II before examining the evolution of key macroeconomic variables in the different phases. We also calculate statistics for when policy rates are on "hold" (i.e., held constant at the end of a phase) or adjusted in the opposite direction of the phase (i.e., when rates are increased during easing phases and vice versa), but discuss these statistics in Section VI on exiting a cycle.

III.1.1 Key Characteristics of Easing and Tightening Phases

Chart 2 shows the monthly means, medians, and upper and lower quartiles of policy interest rates during easing and tightening phases from January 1970 through May 2024. In tightening phases, the median policy interest rate increases from 4.5 percent to a peak of 7 percent after about 18 months, and then is roughly stable before declining very gradually toward the end of the three-year window. In easing phases, the median policy rate declines from 8.5 percent to a low of 5 percent after about 2″ years, before gradually declining further toward the end of the window.

[18] We use the threshold of 0.1 percentage point so that minor movements in market-determined rates are not counted as rate increases or decreases.

Chart 2 Policy Interest Rates over Tightening and Easing Phases: January 1970–May 2024



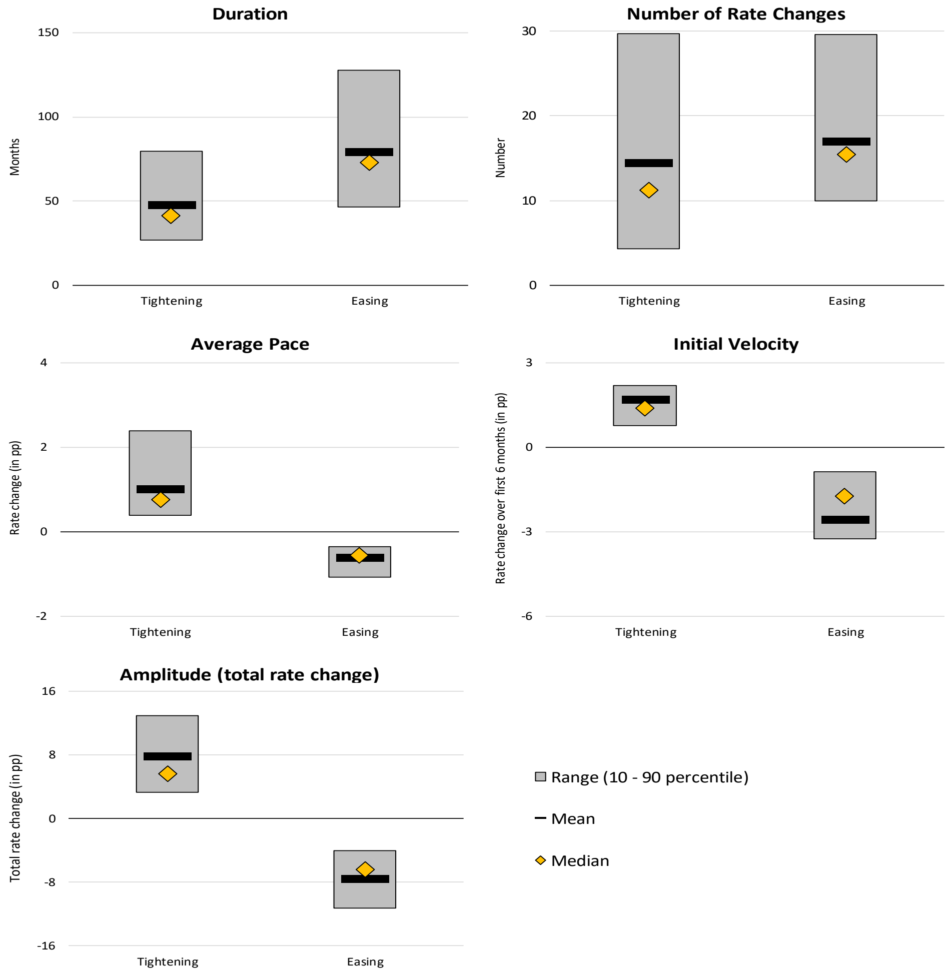
Sources: Authors' calculations using the turning points for rate cycles listed in Appendix Table 1. Notes: The t=0 is the start of the tightening or easing phase. Median and means are in solid red and purple lines, respectively, and the upper and lower quartiles of the distribution are in dashed black lines. All statistics calculated across all easing or tightening phases for which the corresponding macroeconomic variable is available for at least 6 months prior to t=0. Members of the euro area are included as individual countries through 1998, and then the euro area is included from 1999.

Chart 3 summarizes the key statistics behind the corresponding rate cycles, including means (black lines), medians (yellow diamonds), and range (grey bars) over the full period from January 1970-May 2024. [19] As with Chart 2, this shows large ranges for many of the variables—and the summary statistics show substantial skews. Despite this asymmetry, however, the means are fairly similar to the medians for each statistic (although the means are usually slightly greater in absolute value than the medians for the summary statistics), suggesting that the skew represents a few outliers and thin tails.

For a better understanding of the differences across easing and tightening phases across economies, especially given the large variation in each variable, Table 1 reports the corresponding statistics for the full sample as well as for individual economies. Several patterns are noteworthy. Tightening phases last an average of 47 months, much shorter than the average 79-month duration of easing phases. During tightening phases policy rates are also adjusted less often and initially more gradually (i.e., lower velocity), but are changed by larger increments on average (i.e., pace). Also noteworthy, despite these differences in the duration, initial velocity, number and pace of rate changes over the phases, the mean amplitude of rate changes is identical (with the sign reversed) across the two phases.

[19] Summary statistics are calculated by first averaging across all relevant phases for each economy, and then calculating the sample statistic (e.g., median) across all the economies with data in the relevant period. This approach gives equal weight to each country—instead of each easing or tightening phase. This implies that a country (such as Japan) with a smaller number of long cycles receives more weight than if simply calculating sample statistics across all phases.

Chart 3 Characteristics of Rate Cycles: January 1970–May 2024



Sources: Calculated based on the rate cycles defined in the text, with data from January 1970 through May 2024. Notes: The number and pace of rate adjustments only include "in-sync" rate adjustments, i.e., the rate increases for tightening phases and decreases for easing phases. Initial velocity and amplitude are the total changes in rates (in any direction) over the first six months of the phase or the entire phase, respectively. Members of the euro area are included as individual countries through 1998, and then the euro area is included from 1999.

A closer look at the statistics other than the means and medians, as well as individual economy information in Table 1, provide additional insights on these patterns. Although the durations of the shortest tightening and easing phase are similar (around 25 months), the longest easing phase (at 156 months for Japan) is much longer than the longest tightening phase (at 98 months for Spain). The fastest initial velocity for easing phases (rate declines of 25 percentage points in Ireland) is four times larger than that for tightening phases (6 percentage points in Greece)—and both are substantially faster than for other economies, partly reflecting higher inflation and nominal policy rates in these countries at the start of the sample. Tightening phases have a higher maximum amplitude, number of rate adjustments, and average pace than easing phases.

Table 1 Characteristics of Rate Cycles: January 1970-May 2024

(Mean values across economies)

	Duration (in months)		Amplitude (total change, pp)		Velocity (pp/first 6 months)		Rates "In Sync" with Phase: # Changes		Rates "In Sync" with Phase: Pace (pp)	
	Tightening	Easing	Tightening	Easing	Tightening	Easing	Tightening	Easing	Tightening	Easing
Australia	71	81	9.0	-6.6	1.3	-2.0	30	15	0.6	-0.6
Austria	43	69	4.5	-4.3	1.8	-1.2	12	16	0.5	-0.3
Belgium	79	49	8.6	-7.0	1.2	-3.0	17	18	0.9	-0.5
Canada	41	55	4.6	-7.6	1.4	-2.5	11	25	0.4	-0.6
Denmark	31	114	4.7	-6.6	1.7	-3.1	8	19	0.9	-0.6
Euro area	27	138	2.9	-3.9	1.3	-2.3	9	12	0.3	-0.3
Finland	51	90	9.2	-8.2	1.4	-1.2	16	23	0.9	-0.5
France	51	88	9.0	-8.5	1.4	-0.7	15	30	0.9	-0.3
Germany	32	49	4.4	-4.7	1.3	-1.3	11	13	0.5	-0.5
Greece	60	26	12.9	-14.3	6.2	-6.5	28	19	3.4	-1.6
Ireland	54	61	32.7	-29.2	0.8	-25.1	28	30	1.5	-1.3
Israel	25	87	4.9	-6.3	1.7	-1.4	10	20	0.6	-0.4
Italy	36	47	6.6	-6.4	2.2	-1.5	4	10	1.7	-0.9
Japan	24	156	3.3	-4.1	1.4	-1.2	4	8	0.7	-0.4
Korea, Rep.	34	77	2.5	-2.7	0.6	-0.9	9	10	0.3	-0.3
New Zealand	71	128	8.3	-10.9	1.6	8.4	31	30	0.8	-1.1
Netherlands	34	42	4.5	-5.6	1.1	-1.4	7	13	0.7	-0.6
Norway	29	100	3.5	-6.5	0.6	-1.3	10	17	0.4	-0.6
Portugal	84	58	12.7	-11.3	4.7	-3.2	4	11	2.4	-1.1
Spain	98	50	15.3	-9.7	1.4	-2.9	34	21	2.4	-0.8
Sweden	42	63	3.4	-4.6	1.1	-1.7	11	13	1.0	-0.4
Switzerland	39	106	3.3	-4.2	1.3	-1.7	6	8	0.6	-0.5
United Kingdom	42	102	6.2	-6.5	2.0	-1.8	10	14	1.0	-0.6
United States	34	56	6.8	-5.7	1.1	-2.6	16	12	0.5	-0.6
Full Sample										
Mean	**47**	**79**	**7.7**	**-7.7**	**1.7**	**-2.6**	**14**	**17**	**1.0**	**-0.6**
Median	**41**	**73**	**5.6**	**-6.5**	**1.4**	**-1.7**	**11**	**15**	**0.7**	**-0.6**
St. Dev.	**20**	**33**	**6.4**	**5.3**	**1.2**	**5.4**	**9**	**7**	**0.8**	**0.3**
Min	**24**	**26**	**2.5**	**-2.7**	**0.6**	**8.4**	**4**	**8**	**0.3**	**-0.3**
Max	**98**	**156**	**32.7**	**-29.2**	**6.2**	**-25.1**	**34**	**30**	**3.4**	**-1.6**

Sources: Authors' calculations based on the rate cycles described in Section II.

Notes: Duration is the length of the phase in months (including any period at the end of the phase when rates are on hold). Amplitude is the sum of rate changes in percentage points (pp) over the entire phase (including any rate changes in either direction). Velocity is the total change in the policy rate in percentage points (pp) over the first six months of the phase. Rates in-sync with phase is the mean number or mean size in pp of rate changes in "in-sync" with the phase, i.e., rate increases for a tightening phase and rate decreases for an easing phase. Means are calculated as the average for each economy across all easing or tightening phases. EA is the euro area, with policy rate data starting in January 1999. Individual members of the euro area only include policy rate data through December 1998. Otherwise, policy rate data covers a period from January 1970 through May 2024, with a later start for some economies due to data limitations.

The statistics for individual economies in Table 1 also show substantial heterogeneity across the sample by some measures. For example, in some countries, the average duration of tightening phases is much shorter than that of easing phases—such as 24 and 27 months for tightening phases in Japan and the euro area, respectively, compared to 156 and 138 months for the corresponding easing phases. In other economies different phases have more similar durations—and in Spain and Belgium the average duration of tightening phases is even longer than that of easing phases (albeit this only includes the pre-1999 period). In some countries, the pace of rate adjustments is substantially greater—whether measured by amplitude, velocity, or the average size of rate changes—although this often reflects a larger share of the respective sample occurring during periods when inflation (and corresponding nominal policy interest rates) were higher.

Some of these differences across easing and tightening phases, as well as across economies, could be explained by different shocks triggering the start of each type of phase, as well as constraints around the lower bound. Specifically, some easing phases (such as around the 2008 Global Financial Crisis and 2020 COVID-19 pandemic) were triggered by severe shocks that quickly affected many economies, causing central banks to lower interest rates aggressively and contributing to the higher initial velocity of rate adjustments during easing phases. These aggressive rate adjustments during easing phases, however, may not necessarily correspond to similar velocity and pace for tightening phases, as recoveries tend to occur more gradually over time. The longer average duration of easing phases, however, particularly for some countries with rates around zero, may also partly reflect a limited ability to provide monetary stimulus due to the lower bound.

III.1.2 Economic Activity and Inflation during Rate Cycles

In order to assess how the economy evolves in response to changes in policy rates, we follow the standard approach in the business cycle literature of evaluating the evolution of key macroeconomic variables around the cycle's turning points. In this case, we focus on the turning points indicating the start of easing and tightening phases as defined in Section II.3 and listed in Appendix Table 1.

We focus on the evolution of six macroeconomic variables that are central to the analysis of monetary policy and which have decent country coverage for the long period on which we focus: GDP growth, growth of industrial production (IP), growth of employment, the unemployment rate, headline CPI inflation, and core CPI inflation. The first two variables focus on real economic activity, the middle two on the labor market, and the final two on inflation. Each variable is measured relative to a year earlier (to eliminate seasonality).[20] Details on sources and definitions are in Appendix Table 2.[21] We focus on the evolution of each of these variables from 1-year before the turning point of the rate cycle through 3-years after, with the start of each easing or tightening phase denoted as t=0. For countries in the euro area, we include each member country individually for any phases beginning before 1999 when the euro area came into existence, but only include data for the euro area as a whole for phases beginning from 1999.

Charts 4 and 5 show the evolution of these macroeconomic variables during the rate cycles (with tightening and easing phases in Charts 4 and 5, respectively). The graphs include the mean (purple) and median (red) for the entire sample of country-phases identified over the full period from January 1970-March 2024 (the latest available for most countries), as well as the upper and lower quartiles of the distribution (dashed black lines). The patterns for economic activity and the labor market closely mirror results from the business cycle literature. Activity is accelerating and the labor market tightening (based on unemployment falling or employment increasing) before the start of tightening phases, with the opposite before easing phases. After interest rates begin rising (at the start of tightening phases), activity and the labor market continue to have positive momentum for roughly 6 months, but then activity begins to slow and the labor market softens, presumably reflecting in part the lagged effects of tightening monetary policy.

Similarly, after interest rates are decreased (i.e., the start of easing phases), activity and the labor market continue to soften for roughly 6 months, and then gradually recover as the easing takes effect with a lag. By three years after the start of the phase, the mean and median measures of activity and the labor market generally settle back around where they began one year before t=0, except that GDP and IP growth settle slightly below their starting points after a tightening phase. These results are broadly consistent with the forward-looking and counter-cyclical nature of monetary policy, as well as with estimates of the length of transmission lags.[22] The means and medians follow very similar patterns—suggesting any skews in the distribution are roughly balanced between positive and negative outcomes.

The evolution of inflation (both headline and core) displays notably different patterns. The pickup in inflation before the start of tightening phases, and deceleration before the start of easing phases, is more muted than occurs for the other macroeconomic variables. After interest rates are increased (at the start of tightening phases), mean inflation continues to pick up for longer than 6 months and only declines very gradually; median inflation barely moves. After interest rates are cut, mean and median inflation continue to fall for an extended period, but only very slowly.

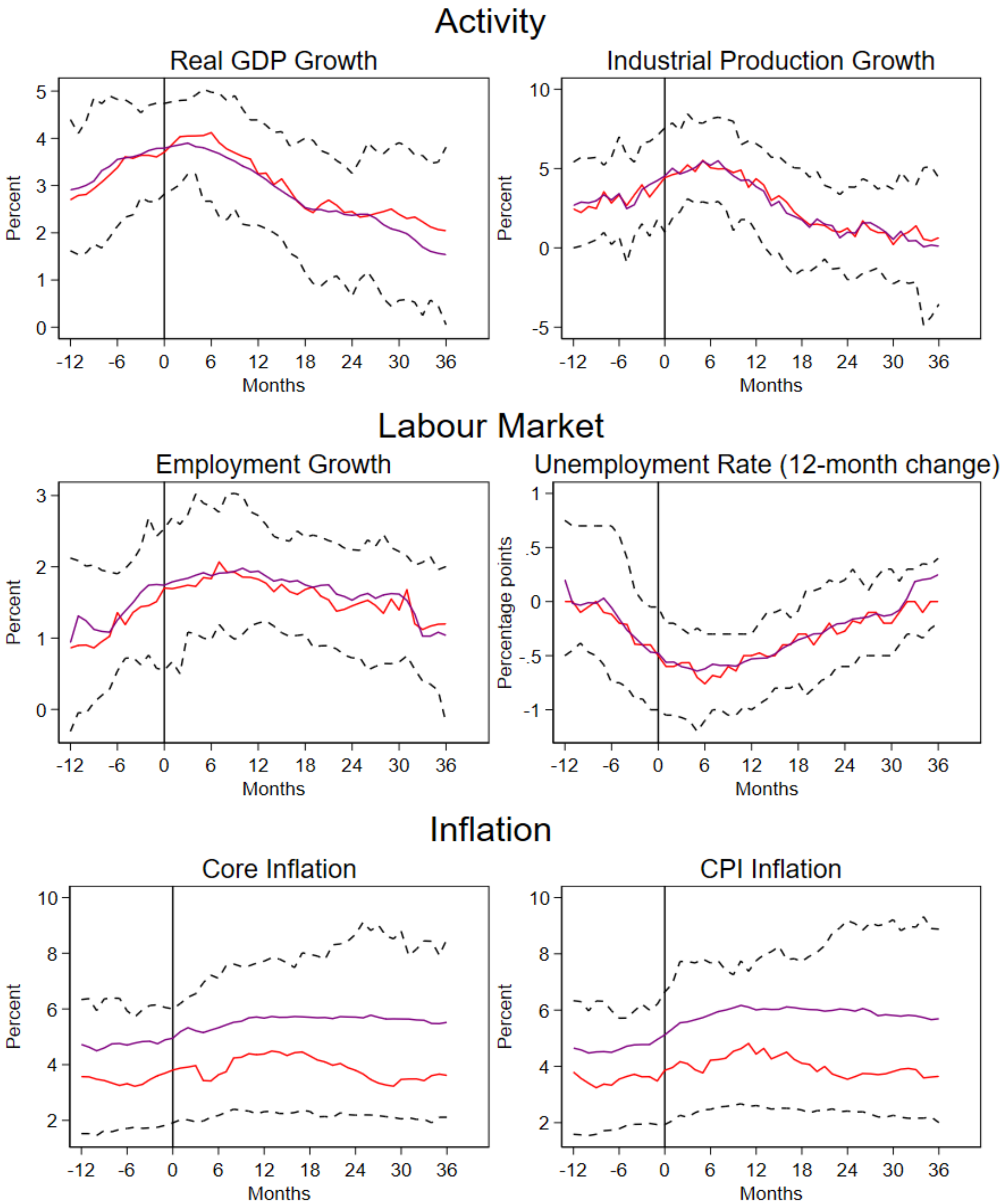
---

[20] Macroeconomic data was collected on 31 May 2024 and covers the period from January 1970 through March 2024 for most countries.

[21] All variables are measured relative to a year earlier, with the unemployment rate measured as the change (instead of percent change). Data for some variables is limited early in the sample. We only include economies in the calculation of the sample statistics if the relevant data is available for at least 6-months before t=0.

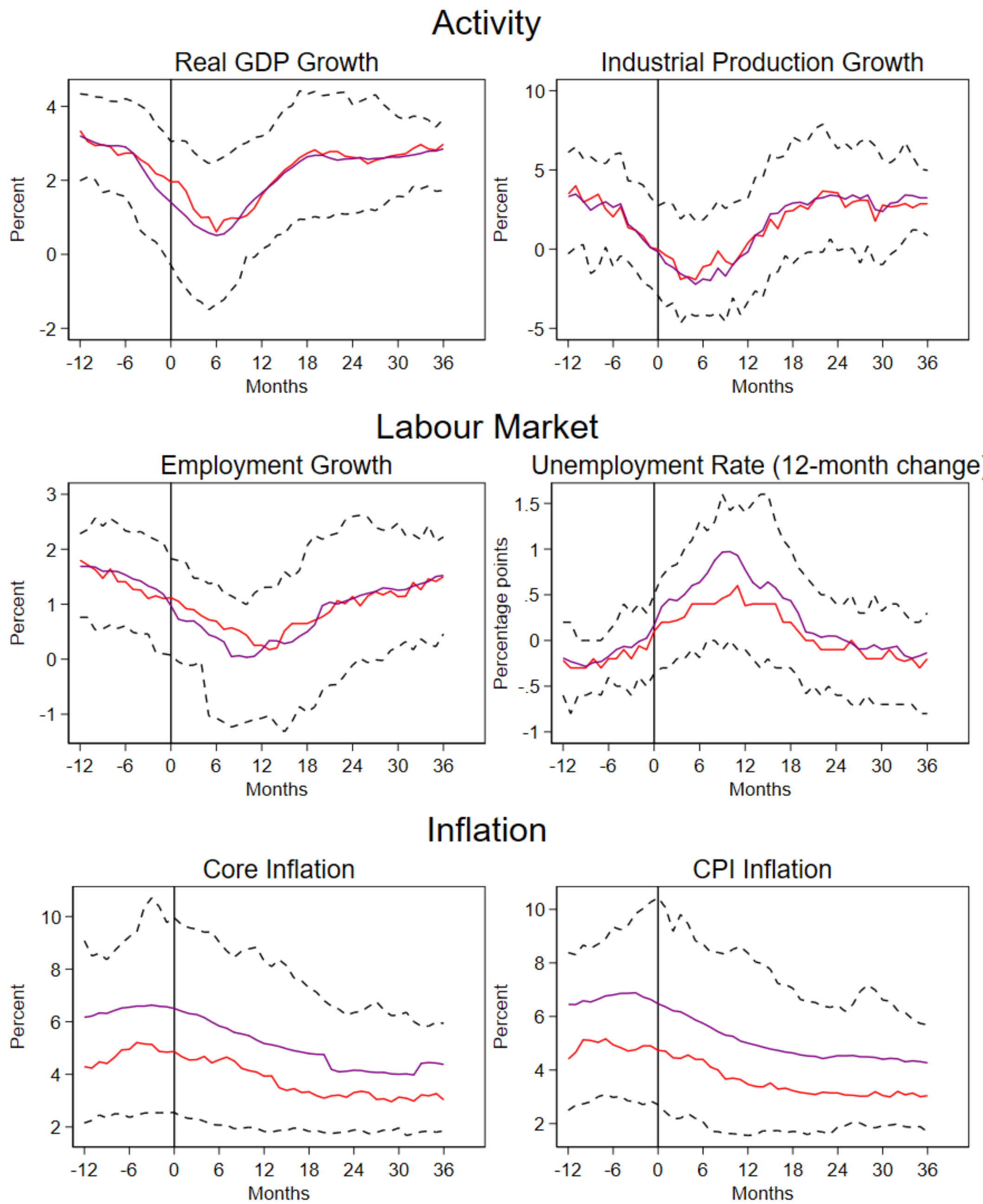
[22] See Clarida, Gali, and Gertler (1998), Woodford (2003), and Lane (2022), among many others, for a discussion of these topics. Havranek and Rusnak (2013), using a meta-analysis based on 67 studies, reports that the average transmission lag of monetary policy to inflation is 29 months (ranging from 18 to 49 months).

Chart 4 Macroeconomic Variables over *Tightening* Phases



Sources: Authors' calculations using the turning points for rate cycles listed in Appendix Table 1. Notes: Chart shows changes in economic variables around the turning points of interest rate cycles, with *t*=0 the start of the tightening phase. Medians and means are in solid red and purple lines, respectively, and the upper and lower quartiles of the distribution are in dashed black lines. All variables are calculated as percent change relative to 12 months earlier, except for the unemployment rate, which is the change relative to 12 months earlier. All statistics calculated across all tightening phases for which the corresponding macroeconomic variable is available for at least 6 months prior to *t*=0. Phases are defined based on individual euro area countries through 1998, and then for the ECB cycle starting in 1999, with the corresponding macroeconomic variables for ECB phases based on the euro area (and not individual countries).

Chart 5 Macroeconomic Variables over *Easing* Phases



Sources: Authors' calculations using the turning points for rate cycles listed in Appendix Table 1. Notes: The t=0 is the start of easing phases, with all statistics calculated across all easing phases for which the corresponding macroeconomic variable is available for at least 6 months prior to *t*=0. See notes to Chart 5 for other definitions.

This weak relationship between the start of a phase and inflation is not surprising, even accounting for the lags from adjustments in policy rates on prices, as changes in monetary policy could reflect changes in expected inflation that the policy action prevents, as well as because inflation is influenced by factors other than monetary policy.[23] These findings are also consistent with a flat Phillips curve, or a non-linear Phillips curve with the median cycle on the flat section of the curve. For example, when activity is weak and interest rates are low, changes in activity and interest rates may have minimal impact on inflation, but when there is less slack in the economy, changes in activity and interest rates would have a greater impact on inflation.[24]

Moreover, for each inflation measure the mean is substantially higher than the median, indicating an asymmetric skew in the distribution. The dashed lines showing the distribution of inflation outcomes also reflect this skew—with much higher inflation in a small number of economies. As discussed below, these phases with higher inflation largely occur early in the sample when inflation was much higher in most economies than today. This highlights the importance of understanding how the rate cycles, and their relationship to economic variables, have evolved over time.

III.2 Cycles over Time

To analyze how rate cycles have changed over time, we calculate the same statistics as those used in Section III.1.1 for five sub-periods:

- *1970-84*: the first half of the "pre-ECB" period, including the global recessions of 1975 and 1982, and the first and second oil price shocks of the 1970s.
- *1985-98*: the latter half of the "pre-ECB" period, including 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 start of the ECB setting rates for the euro area, the bursting of the tech bubble, the 2001 global downturn, and the lead up to the 2008 Global Financial Crisis.
- *2008-19*: the Global Financial Crisis and the 2009 global recession, the 2012 global downturn associated with the euro area debt crisis, but ending before the COVID-19 pandemic.

---

[23] More specifically, this muted correlation between the turning points in rate cycles and inflation may reflect forward-looking monetary policy (i.e., that reacts to, and prevents, future expected inflation, based partly on central banks' internal information on future inflation developments (Castelnuovo and Surico 2010; Jarocinsky and Karadi 2020). For example, if inflation is expected to increase, this could shift monetary policy to a tightening phase, leading to a positive correlation between increases in interest rates and actual inflation. In order to assess the direct effects of monetary policy, it would be necessary to use a more rigorous analytic approach that controls for the reaction functions of central banks.

[24] See Furlanetto and Lepetit (2024), Benigno and Eggertsson (2023), and Forbes, Gagnon, and Collins (2022), which provide evidence of this nonlinearity in the Phillips curve. Specifically, they document a very weak relationship between inflation and the labor market when there is slack in the economy (a phase which has characterized many advanced economies over the 2010s) and a stronger relationship when there is a positive output gap. Hoijn et al. (2023) argues that the Phillips curve has become steeper in many advanced economies since the start of recovery from the COVID-19 recession.

- *2020-24*: the 2020 global recession associated with the COVID-19 pandemic, the post-pandemic spike in inflation, and the Russian invasion of Ukraine in 2022.

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 monetary policy cycles. The first two periods (from 1970-1998) also include individual cycles for countries that are currently members of the euro area, but then the later periods (from 1999) include one euro area cycle as the ECB began setting monetary policy for the group.[25] The periods before 1999 are 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).

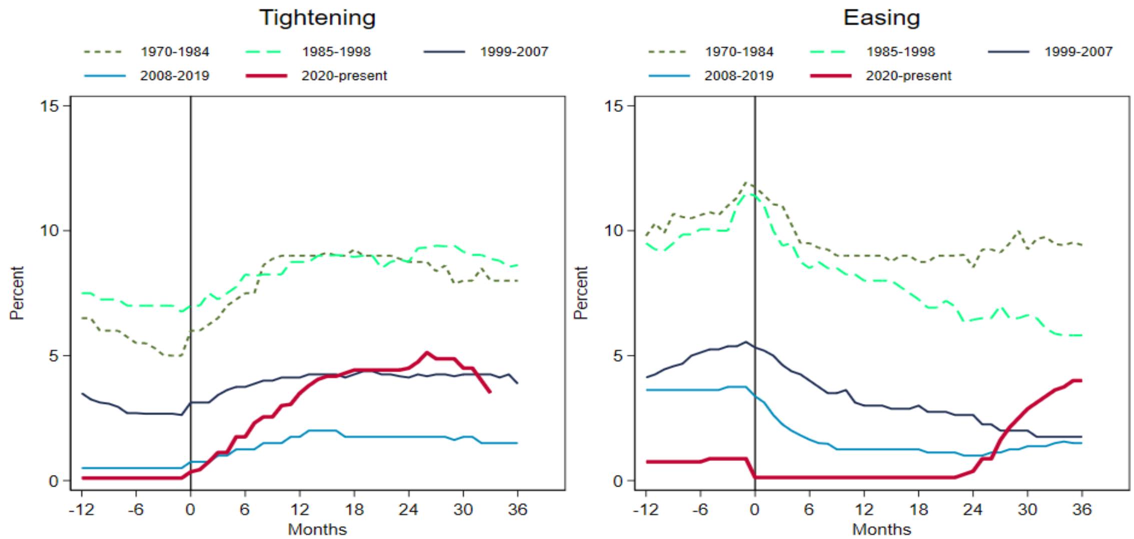
III.2.1 Characteristics of Easing and Tightening Phases over Time

Chart 6 shows median policy interest rates for each of the five periods listed above. It highlights the higher level of policy rates during the pre-1998 cycles, and unusually low level of rates during the 2008-19 cycles. What is most striking, however, are the unusual patterns around the 2020 cycles. Rates started the post-2020 tightening phase at the low levels of the 2008-19 period, but were raised aggressively to reach levels typical of the 1999-2007 tightening phases in about a year. The increases in interest rates during the 2020 easing phase were equally unusual—with rates increasing quickly from two years after the start of the easing phase, a much faster shift to tightening than occurred during any of the other windows.

Chart 7 provides more details by presenting the key statistics characterizing these rate cycles for the five periods, with the corresponding data in Appendix Table 3. In tightening phases, there is a striking pattern from the earlier period starting in 1970 up until the last period (the pandemic tightening in red): each of the statistics suggests a steady "dampening" of tightening phases from the 1970s through the pandemic. Tightening phases have become shorter (shrinking from 55 months in 1970-84 to 36 months from 2008-19). They also involve fewer rate increases (declining by over half from 17 to 8), a slower pace of rate increases (declining by 80 percent from 1.3 percentage points to 0.3 percentage point), and slower initial velocity at the start of the phases (with mean hikes over the first six months declining by 70 percent from 2.2 to 0.6 percentage point).

[25] Sensitivity tests also treat the countries in the euro area as one economy pre-1998.

Chart 6 Policy Interest Rates during Rate Cycles over Different Sub-periods

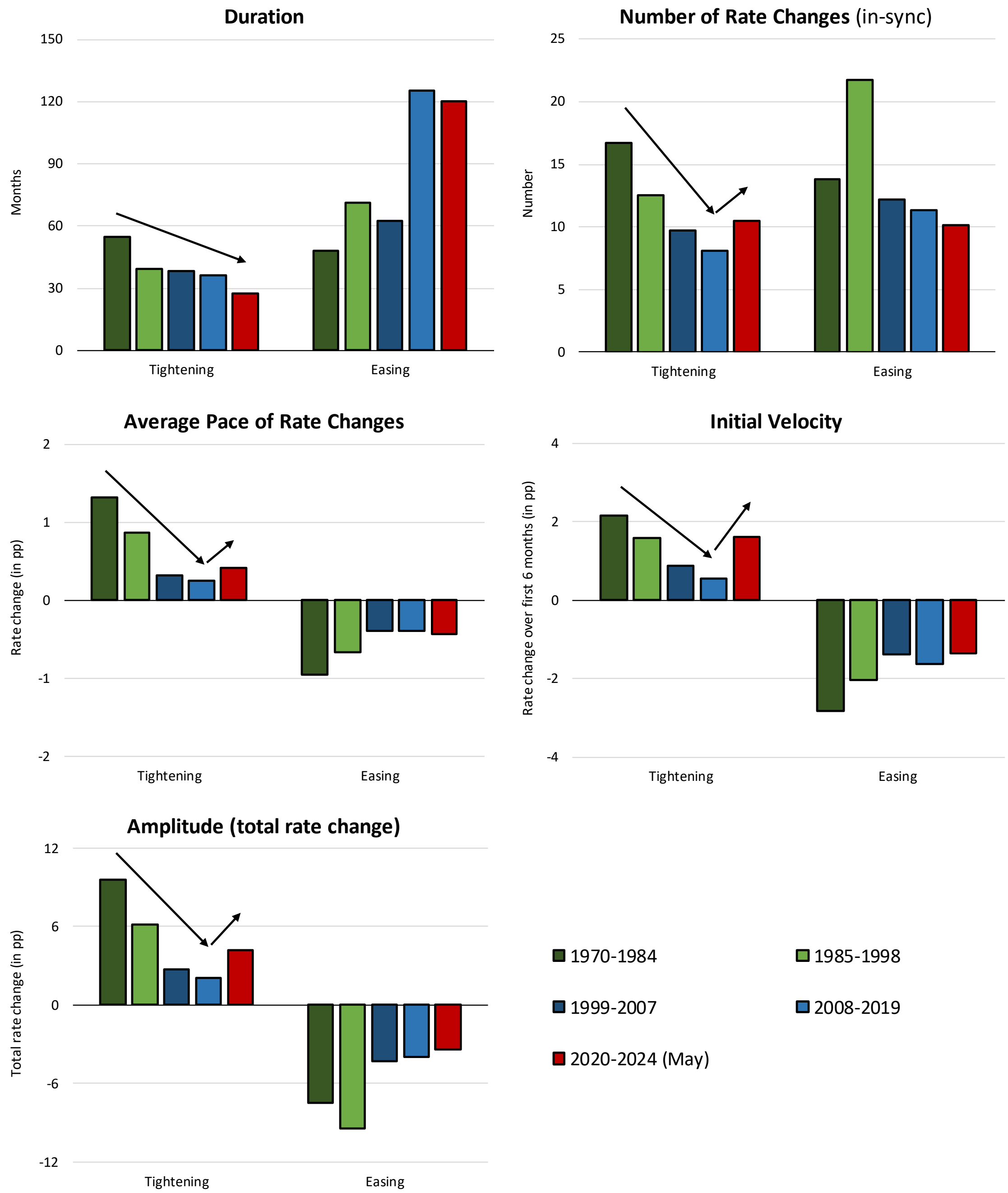


Sources: Authors' calculations using the turning points for rate cycles listed in Appendix Table 1. Data from January 1970 – May 2024. Notes: The t=0 is the start of each tightening or easing phase within the periods listed above. Lines are the medians for all phases in the period listed at the top and for which data on the policy rate is available for at least 6 months prior to t=0. Phases are defined based on individual euro area countries through 1998, and then for the ECB cycle starting in 1999.

Not surprisingly, all of this contributes to a sharp fall in the overall amplitude of tightening phases over time—with the total change in rates falling by 80 percent from 9.6 percentage points in the tightening phases over 1970-84 to 2.1 percentage points over 2008-19. Granted, some of this "dampening" reflects lower levels of inflation that reduce the nominal statistics above, but these patterns also hold for measures that are not nominal (such as the duration of the phases and the number of rate changes). What is particularly striking is that this moderation of tightening phases does not happen in any one window or one period, but instead happens for every statistic over each subsequent period. These results are consistent with arguments that more strongly anchored inflation expectations have allowed central banks to stabilize inflation with smaller increases in policy rates (Forbes 2019b; Ha, Kose, and Ohnsorge 2019; 2022).

Equally striking, the post-pandemic tightening is more intense by almost all measures than the preceding one; it appears to have broken this trend of moderation in tightening phases over time. In the most recent tightening phase that started after 2020, there have been more rate hikes, larger rate hikes on average, a much faster velocity of rate hikes over the first six months of tightening, and a larger amplitude in terms of the total increase in interest rates (all relative to the preceding tightening phases during 2008-19). In each case, the most recent tightening phase is more like the 1999-2007 tightening phases than the more recent 2008-19 phases, and in some cases closer to those of the 1985-1998 window (such as in the initial velocity of rate hikes). The only statistic that does not suggest the post-2021 tightening was more aggressive is the duration of the phase—but this will increase as this phase is still continuing for most of the sample (as of the May 2024 end of the data).

Chart 7 Characteristics of Rate Cycles over Different Sub-periods



Sources: Authors' calculations using the turning points for rate cycles listed in Appendix Table 1. Data from January 1970 – May 2024. Notes: Chart shows means across all tightening or easing phases within the given time period, with data ending on May 31, 2024. The number and pace of rate adjustments only include "in-sync" rate adjustments, i.e., the rate increases for tightening phases and decreases for easing phases. Velocity and amplitude are the total change in rates (in any direction) over the first six months of the phase or the entire phase, respectively. Means are calculated for each economy (weighted by the length of each phase within the relevant period) and then over the sample as a whole. Members of the euro area are included as individual countries through 1998, and then the euro area is included from 1999.

In contrast to these striking patterns for tightening phases, easing phases show less consistent evidence of moderating over time, and no clear change in characteristics for the recent pandemic cycle. More specifically, and focusing on the earliest easing phases (1970-84) compared to the last phases before the pandemic (2008-19), they involve a slower pace (with the average size of rate cuts falling from 1.0 to 0.4 percentage point), a lower initial velocity over the first six months of the cycle (from 2.8 to 1.6 percentage points), a smaller overall amplitude of the cycle (with the total reduction in rates falling from 7.5 to 4.0 percentage points), and modest fall in the number of rate reductions (from 14 to 11). But the duration of easing phases has more than doubled—from 48 months (over 1970-84) to 125 months (over 2008-19).

Some of these patterns may reflect constraints in central banks' ability to lower rates further due to the lower bound—which would limit the number of rate reductions, pace, and amplitude, potentially leading to longer easing phases as the ability to provide stimulus is more limited (especially before the active use of balance sheet policies). Overall, however, there are less consistent patterns for easing phases over time than for tightening phases, with more forceful easing by many measures during the 1984-98 window than during the periods just before or after—none of which should be meaningfully affected by constraints around the lower bound.

These patterns on how rate cycles have changed over time are consistent with some results in the business cycle literature. For example, the business cycle literature has documented longer expansions and shorter recessions—including less frequent recessions—since the 1970s (European Central Bank 2019, Deutsche Bundesbank 2020). In addition, fewer rate increases, the smaller pace of rate increases, and slower velocity at the start of the tightening phases appear to be associated with the weaker recovery in the subsequent expansion following the 2009 and 2020 global recessions, a period when many economies struggled to overcome the legacies of the crises associated with these episodes (Kose, Sugawara, and Terrones, 2020).

The patterns of changes in rate cycles are also similar to those in inflation cycles over the past five decades. The literature has documented shorter and fewer episodes of rising inflation since the mid-1970s, and longer periods of declining inflation (e.g., the Great Disinflation or Great Moderation since the mid-1980s) (Ha, Kose, and Ohnsorge 2019; 2021). The exceptionally aggressive and lengthy monetary policy tightening after the pandemic follows the highest rate of inflation in many economies since the early 1980s.

To summarize, the easing and tightening phases of rate cycles have evolved in different ways since the 1970s. Tightening phases became less aggressive in every dimension (duration, number of rate increases, pace, initial velocity, and overall amplitude) in each successive sub-period—until the post-pandemic tightening. The most recent tightening that began in 2021-22, however, has been more aggressive than since 2008 by each cycle characteristic, and closer to the patterns from tightening phases over 1984-2007. This has also corresponded to a sharp increase in interest rates in most economies, from the lows of the 2008-2019 period to levels typical of 1999-2007. In contrast, easing phases have shown less consistent patterns over time; they have moderated by many measures (such as pace and amplitude), but become more aggressive by others (most notably in duration).

III.2.2 Economic Activity and Inflation during Rate Cycles over Time

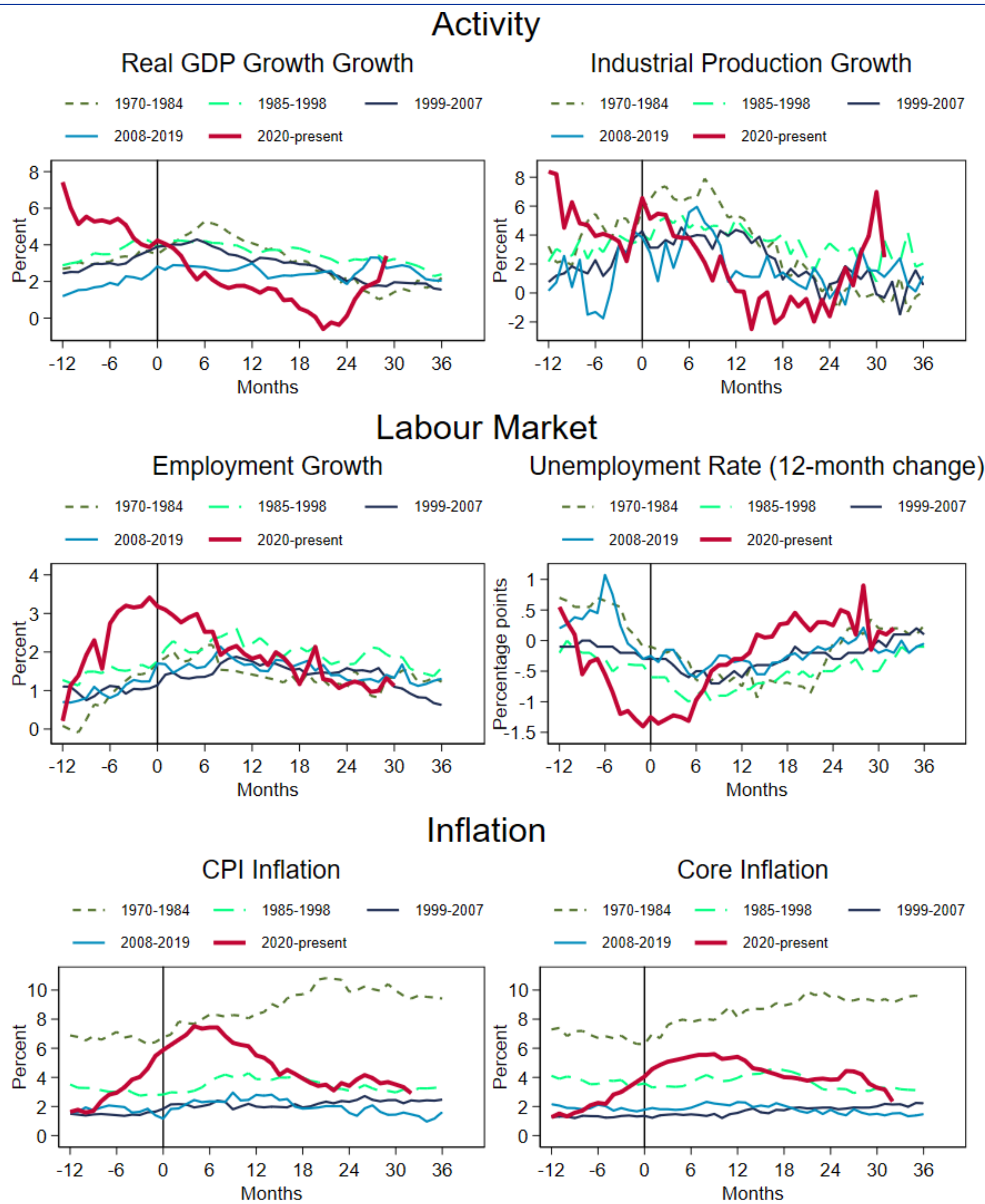
Do these changes in rate cycles over time, and particularly tightening phases, correspond to changes in the relationships between rate cycles and macroeconomic variables? To answer this question, we repeat the analysis in Section III.1.2 (which explored the relationships between rate cycles and economic activity, labor markets, and inflation over 1970-2024), except now examine if those relationships have changed over the five sub-periods used above. Chart 8 and Chart 9 show the results. We have also repeated the analysis below to adjust for countries at the effective lower bound for policy interest rates, with no meaningful impact on the results.[26]

Beginning with measures of activity, and the labor market during tightening phases (Chart 8), the series of graphs shows a fairly similar evolution of GDP, industrial production, employment and unemployment during most tightening phases until 2020. More specifically, the median of each measure of activity was stronger before the start of the tightening phase (whether measured by GDP growth, IP growth, employment growth or unemployment declines) and, as expected, each measure deteriorated after interest rates were increased (albeit with more lagged effects on the labor market).

The strength in activity before rate increases, as well as the deterioration in activity after rate increases, however, was more pronounced during the post-pandemic tightening phase than earlier phases. These patterns are consistent with the post-pandemic tightening starting later in the expansion than has historically occurred based on the six macroeconomic variables considered here, but then becoming more aggressive in terms of rate hikes than earlier periods—a pattern consistent with the statistics on how cycle characteristics have changed over time (in Chart 7). As of March 2024, the median changes in most measures of activity and labor markets were comparable to this stage during historical cycles (with GDP and IP growth on the stronger end, and the employment measures on the softer end—but all comparable to at least one previous cycle). Granted, these graphs only show the medians for the sample and there are important differences in the situations for individual economies. Overall, however, this implies that even if central banks were slower to tighten monetary policy after the pandemic given macroeconomic developments than in past cycles (albeit with the benefit of hindsight and still faster than during historical easing phases), the subsequent aggressive response (including an unusually long period holding rates constant at higher levels, as discussed in Section VI.1) seems to have caught them up, on average, for this point in a tightening phase.

[26] More specifically, we define an economy as being at the effective lower bound (ELB) if the policy interest rate was <=25basis points or they are doing QE (as defined above) at any point in the 3-year window after the start of the easing phase or the 1-year window before the start of the tightening phase. Then we examine the evolution of the 6 macroeconomic variables for economies at the ELB and not at the ELB. There are some differences, such as economies at the ELB having weaker activity early in easing phases. There are no meaningful differences in the patterns for inflation, however, for the two sets of economies.

Chart 8 Macroeconomic Variables over *Tightening Phases* during Different Sub-Periods



Sources: Authors' calculations using the turning points for rate cycles listed in Appendix Table 1. Notes: The t=0 is the start of the tightening phase. Lines are the medians for all tightening phases in the period listed at the top and for which the corresponding macroeconomic variable is available for at least 6 months prior to t=0. All variables are calculated as percent change relative to 12 months earlier, except for the unemployment rate, which is the change. Phases are defined based on individual euro area countries through 1998, and then for the ECB cycle starting in 1999, with the corresponding macroeconomic variables for ECB phases based on the euro area (and not individual countries).

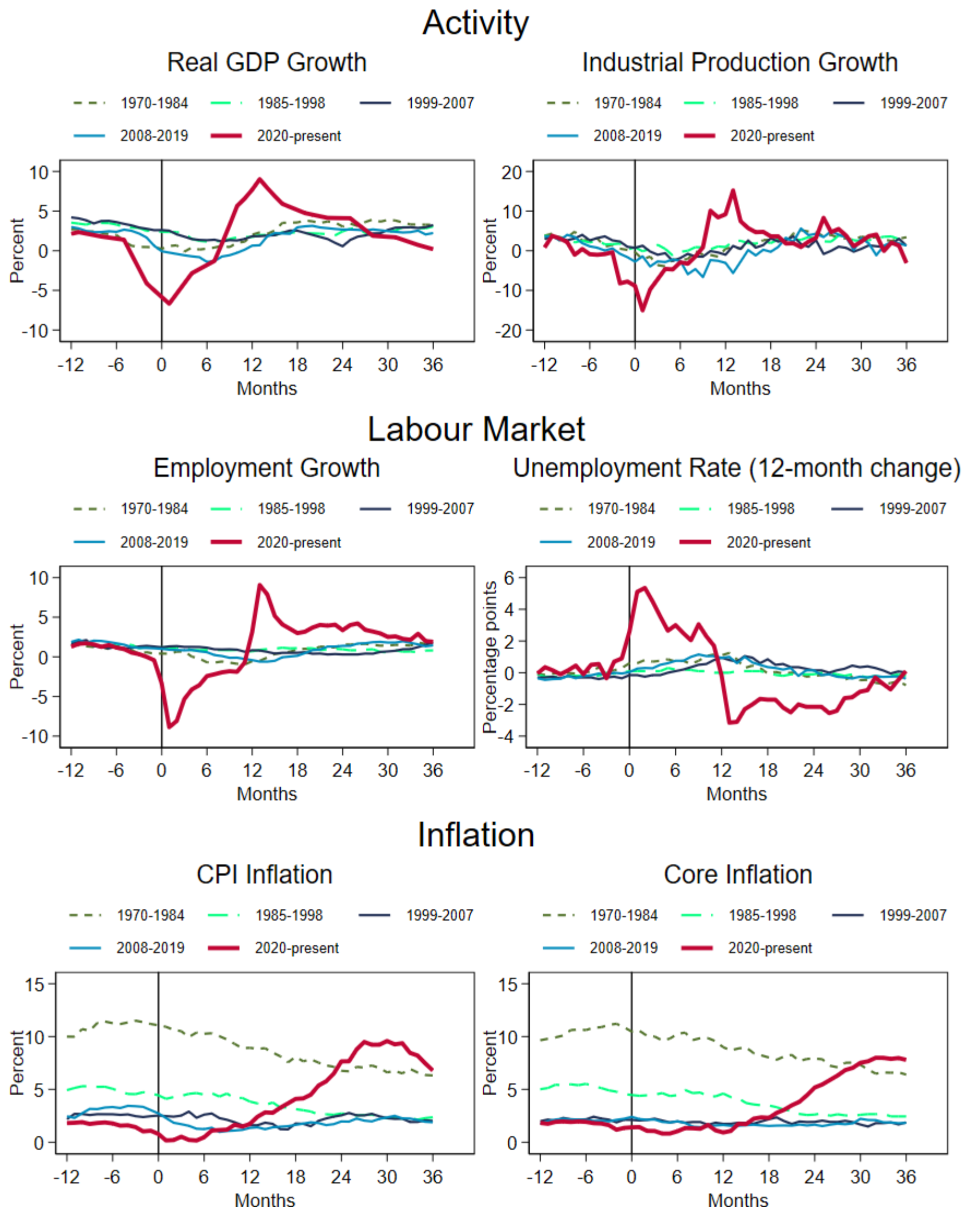
The comparable graphs for headline and core CPI inflation during tightening phases (bottom of Chart 8) also suggest that this cycle involved larger movements than have historically occurred, and an unusually slow start to tightening monetary policy, but a recent normalization relative to a comparable stage in historical cycles. Inflation during the post-pandemic period started around the lows typical of historical episodes one year before the start of the tightening phase (excluding the earliest phases when inflation was meaningfully higher), but then picked up much faster than the medians of all earlier tightening phases—such that headline inflation reached the much higher levels typical of the earliest 1970-1984 period before central banks began increasing interest rates. Both measures of inflation have fallen since, such that at the end of the sample (with most data ending in March 2024) inflation is around levels typical at this point in the 1985-98 and 1999-2007 tightening phases. Both headline and core CPI inflation follow similar patterns, although headline inflation peaks at higher levels (as would be expected given the large shocks to food and oil prices), but core inflation is slower to decline (as would be expected given the greater persistence in core inflation). The steep increase and subsequent decline in inflation is a sharp contrast to the flatter inflation paths during earlier episodes.

The swing in each of these macroeconomic variables is even more extreme—and unique compared to historical patterns—during the easing phases (Chart 9). Each variable measuring economic activity and the labor market shows a modest softening in the economy before the start of easing phases, and then a very modest recovery over time. The pattern for the 2020 easing phase begins almost identically, but then at t=0 each measure abruptly collapses (and unemployment abruptly increases). For most economies, t=0 is March 2020, the month when economies were locked down, financial markets froze up, and central banks adopted a range of policies to support the economy and financial markets. Each measure of activity and the labor market also shows a uniquely steep rebound about a year later as vaccines began to be rolled out and economies reopened. In fact, by most measures the rebound from the pandemic recession was unusually strong compared to earlier easing phases—such as in the strength in GDP growth, employment growth, and fall in the unemployment rate starting from about 1 year into the easing phase.

About three years after the start of the pandemic easing phases, the average recovery in most macroeconomic variables was comparable to that during historical periods—with the median measures of activity and the labor market not only roughly equal to before t=0, but also comparable to the levels at the same point of historical easing phases. The noteworthy exception, however, is the evolution of inflation; both headline and core CPI inflation started to pick up about 1″ years after the start of the 2020 easing phase—and continued to accelerate through most of the subsequent year. While CPI inflation began to decline at the end of the 3 years, core inflation remained persistently high and above the median during any historical periods 3 years after the start of the easing phase. This is a very different pattern than the previous easing phases—during which inflation generally falls (during pre-1998 phases) or is fairly flat (during 1999-2019 easing phases).[27] Inflation during the 2020 easing phase is not only unique relative to median inflation rates during historical easing episodes, but even more striking, is how inflation evolved in a very different pattern than that for real activity and the labor market—before finally appearing to normalize (on average across economies) in early 2024.

[27] The diverse and time-varying relationship between the policy rate and inflation rates likely reflects the endogenous nature of both variables. On the one hand, inflation declines after monetary policy tightening, as the conventional monetary policy literature suggests. On the other hand, monetary policy reacts to future expected inflation (Jarocinsky and Karadi 2020). Depending on future expected inflation, inflation can increase or decline following monetary tightening.

Chart 9 Macroeconomic Variables over *Easing Phases* during Different Sub-Periods



Sources: Authors' calculations using the turning points for rate cycles listed in Appendix Table 1. Notes: The $t=0$ is the start of the easing phase, with lines the medians for all easing phases in the period listed at the top and for which the corresponding macroeconomic variable is available for at least 6 months prior to $t=0$. See notes to Chart 8.

To conclude, the evolution of macroeconomic variables over the 2020-2024 rate cycle has been unprecedented in many ways—from the sharp collapse and equally sharp recovery in measures of activity and the labor market, to the acceleration in inflation early in the easing phase that continued much longer during the tightening phase (particularly for core inflation). Although the shift from easing to tightening monetary policy occurred later relative to the evolution of macroeconomic variables during historical tightening phases (albeit relatively quickly compared to historical easing phases), the subsequent aggressive tightening has allowed economies to largely catch up. Most macroeconomic variables are, on average, currently close to historical averages for this point in a tightening phase. Noteworthy, however, is that this "normalization" has occurred with policy rates much higher than since the Global Financial Crisis, and closer to levels typical of pre-2008 tightening cycles. Granted, these averages mask substantial variation across economies, as well as across tightening periods, but these patterns suggest that as central banks begin to think about recalibrating interest rates, any adjustments should be gradual due to uncertainty on the extent to which rate cycles have returned to pre-2008 patterns.

IV. Synchronization of the Rate Cycles

Could the differences in rate cycles documented in the last section, particularly the differences in the most recent period, reflect changes in the global forces driving these cycles? A recent literature finds that global factors play increasingly more important roles in driving inflation and activity over time (Forbes, 2019b and Ha, Kose and Ohnsorge, 2019). This builds on an extensive literature documenting the increased comovement of financial variables—including government bond yields and equity indices—although with mixed evidence on whether the comovement of financial variables has declined since 2008.[28]

To better understand these global forces driving interest rate cycles, this section begins by analyzing the degree to which adjustments in policy interest rates and the rate cycles identified in Section II are synchronized across economies. The second part of the section uses a dynamic factor model to estimate the global common factor in rates across countries and assesses how the importance of this factor has changed over time. This includes a comparison of this global factor for interest rates with that for inflation and output growth.

IV.1 Synchronization of Rate Changes and Rate Phases

In order to analyze the co-movement in rate cycles, we first compute two measures of synchronization: the share of economies adjusting policy rates in each direction (or doing asset purchases) and the share in each type of phase. For each statistic, we use the same sample, data, and turning points for the rate cycles from Section II.

Our first measure is the share of economies where rates increased or decreased by more than 0.1 percentage point in each quarter.[29] If an economy is easing monetary policy through an ongoing asset purchase program (defined in Section II) when the policy rate is at the lower bound, we include this as a rate decrease.[30] We focus on quarters—instead of individual months—as many central banks do not meet each month, such that monthly fluctuations could reflect the timing of meetings rather than underlying rate decisions. We continue to include rate changes for each member of the euro area separately through 1998, and then include rate changes by the ECB (as one economy) from 1999 through the end of the sample. The resulting statistics are shown in Chart 10, with blue indicating the share of the sample where rates increased, and red the share where rates decreased.[31]

---

[28] For evidence of a reduced global factor in some financial variables since 2008, see Avdjiev et al. (2020), Forbes and Warnock (2021), Goldberg and Krogstrup (2019), Ha et al. (2020), and Miranda-Agrippino and Rey (2020).

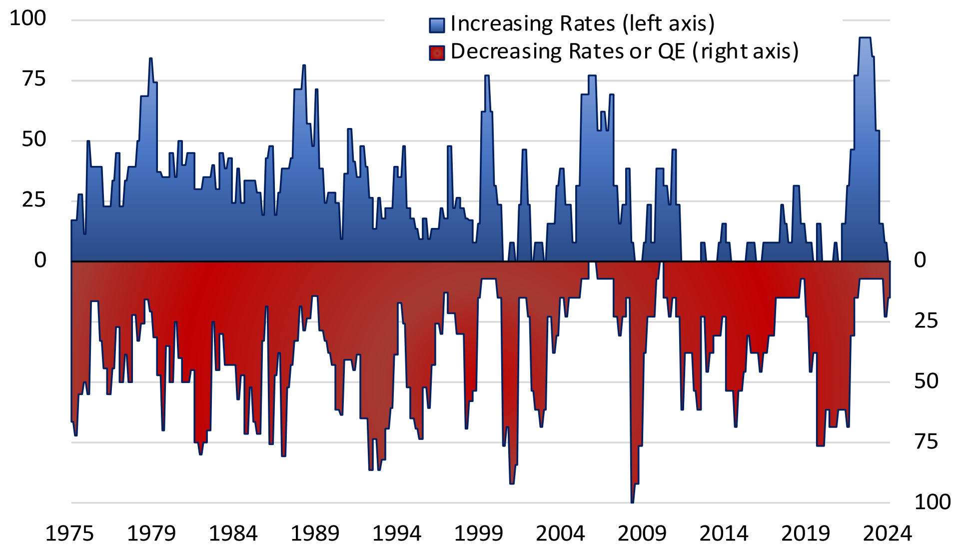
[29] We use the threshold of 0.1 percentage point so that we do not include any minor fluctuations in market-determined rates. We start the graphs in 1975 as data is more limited in the early 1970's and several years are needed in some cases to define a turning point that starts a rate cycle.

[30] We do not include quantitative tightening programs as rate increases, as central banks have stated that these programs are not the primary tool for adjusting monetary policy.

[31] The combined share of economies raising and lowering rates in any quarter can be greater than 100 percent as some economies could both raise and lower rates within a quarter.

Chart 10 Share of Economies with Changes in the Policy Interest Rate or QE

(Percent of sample per quarter)



Sources: Authors' calculations, based on data on changes in policy interest rate and QE programs described in Section II and ending in May 2024.
Notes: Reports share of sample with an increase in the policy interest rate >0.1 percentage point in any quarter in blue and share with decreases in the policy interest rate or an ongoing QE program in red. Includes changes in policy rates for individual euro area countries through 1998, and then changes in the ECB policy rate.

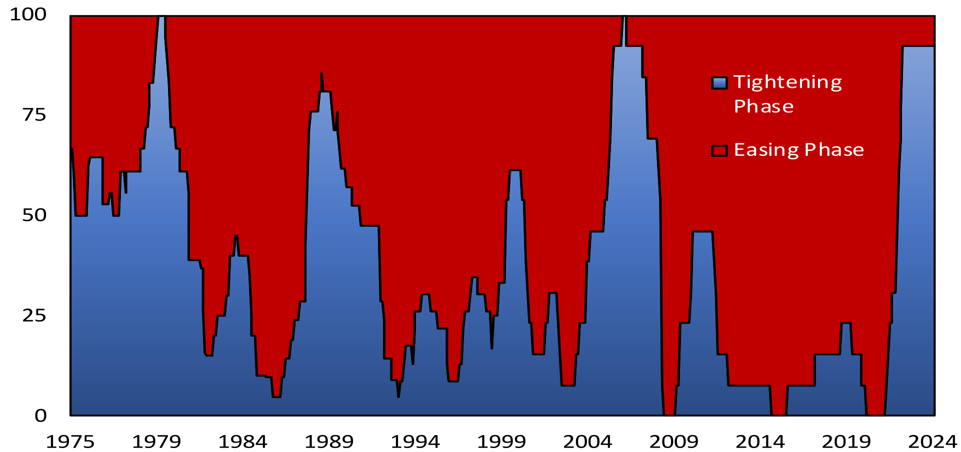
Several patterns are immediately apparent in Chart 10. The share of economies adjusting rates in either direction is not steady. These "waves" suggest that movements in policy interest rates are correlated across countries during certain windows. For example, 92 percent of the sample increased interest rates from 2022q3 through 2023q1 during the post-pandemic tightening (with Japan the exception), while every economy lowered rates in 2008q4 in response to the Global Financial Crisis. There are also periods, however, when there is little correlation in rate changes across economies—such as in 1992q1 when rates increased in 41 percent of the sample, declined in 45 percent, and remained constant in the rest. This was a period after the 1991 global recession, oil shocks around the first Gulf War (1990-91), and collapse of the Soviet Union. It was also just before the ERM crisis, which partly resulted from this divergence in policy rates. These waves in the share of the sample with rates moving in the same direction suggest that the impact of global factors on interest rate movements may change over time.

Another pattern in Chart 10 is the larger share of red (countries cutting rates or doing QE) than blue (countries increasing rates), particularly after 2010. This is consistent with more countries easing policy in the later part of the sample. There is one prominent exception to this trend of fewer rate hikes over time, however: the giant "tsunami" of synchronized rate hikes in the post-pandemic period. The most recent tightening phase is the most synchronized period of rate increases since the sample began in 1975. This "tsunami" appears to be a return to the synchronized tightening phases from before 2008—and corresponds to the array of statistics in Section III.1 that suggest the characteristics of the most recent tightening phase are more similar to those in earlier periods rather than the 2008-19 window.

A second measure capturing the synchronization in policy rates is the share of economies in the same rate phase (i.e., easing or tightening), instead of the share that is increasing or decreasing rates (or doing QE). Although increases and decreases in interest rates will be correlated with whether an economy is in a tightening or easing phase, this second measure of synchronization will better capture more sustained shifts in the overall policy rate—rather than isolated changes in any quarter.[32] Chart 11 shows this comparison by splitting the same sample into the share in a tightening phase (in blue) and easing phase (in red) each month.

Chart 11 Share of Economies in an Easing or Tightening Phase

(Percent of sample per month)



Sources: Authors' calculations based on the rate cycles identified in Section II, with data ending in May 2024. Notes: Shows share of sample in a tightening phase or easing phase in each month. Includes phases for individual euro area countries through 1998, and then phases for the ECB from 1999 through the end of the sample.

Some of the patterns noted in Chart 10 are even more apparent in Chart 11 when focusing on phases instead of individual rate changes. For example, the red (easing phases) continues to be more dominant than the blue (tightening phases), with an average of 62 percent of the economies in an easing phase over the full sample. The share of red (relative to blue) is even larger for easing phases than for rate decreases and QE, as rates are held constant for longer at the end of easing phases (as documented in Section VI.1), and these "holding periods" are included in the calculation of rate phases (Chart 11) but not as active policy adjustment (Chart 10).

What stands out even more distinctly in Chart 11, however, is the blue waves—which now look more like steep mountains—indicating periods of highly synchronized tightening phases. These rapid and highly synchronized shifts for a large share of the sample from an easing to a tightening phase are likely caused by global factors, and the blue "mountains" before 2020 could provide useful comparisons to the current, post-pandemic tightening phase.

[32] More specifically, an economy can be in an easing phase if it: (a) lowers the policy interest rate or has a QE program in the quarter; (b) keeps the policy rate on hold; or (c) raises the policy rate but this does not qualify as shifting to a tightening phase (as defined in Section II). Only the first set of economies are included as decreasing rates in Chart 10, while all three sets are in an easing phase in Chart 11.

IV.1.1 Highly Synchronized Tightening Periods

In order to provide a more detailed analysis of episodes when a large number of countries are simultaneously increasing interest rates during a tightening phase (the blue "mountains" in Charts 10 and 11), we define periods of "*Highly Synchronized Tightening*" based on the two synchronization measures reported above. More specifically, we define a *Highly Synchronized Tightening* period if it meets two criteria: (i) at least 60% of the sample is in a tightening phase in the month; and (ii) at least 60% of the sample increased rates at least once (by at least 0.1 percentage point) in the quarter. In other words, a majority of the economies must be actively raising rates and these rate increases must reflect a persistent change in the policy stance (enough to qualify as a tightening phase per the criteria in Section II).[33]

Based on these criteria, there are five *Highly Synchronized Tightening* periods:

1. 1979m4 – 1980m3 (18 economies)

2. 1988m8—1989m12 (18 economies)

3. 2000m1—2000m6 (8 economies)

4. 2005m10—2007m9 (13 economies)

5. 2022m4-2023m6 (12 economies)

These periods are used throughout the remainder of the paper in order to place monetary policy today in the context of not just historical rate cycles and other tightening phases, but also tightening phases that are highly synchronized globally. These periods may have different characteristics than tightening phases that occur idiosyncratically, and there may be differences in how countries "exit" from tightening phases when monetary policy is more synchronized (as explored in Section VI).

Appendix Chart 3 shows means, medians, and ranges for the same characteristics used in Chart 3 in three groups: (1) the first four *Highly Synchronized Tightening* periods (not including the post-pandemic tightening); (2) the post-pandemic *Highly Synchronized Tightening* that begins in 2022; and (3) other tightening phases, i.e., ones that are not highly synchronized.[34] Focusing on the median values, *Highly Synchronized Tightening* periods before 2022 tend to involve more rate hikes (10.0 vs. 6.0 percentage points for non-synchronized periods) and last longer (38 months vs 24 months for non-synchronized phases), contributing to a larger overall amplitude of rate changes (4.3 vs. 3.0 percentage points for non-synchronized phases).[35]

[33] We only include dates starting in 1975 in order to allow time for an economy to qualify as being in a tightening phase (per the criteria in Section II). Also, if an economy is in a *Highly Synchronized Tightening* period, followed by another within 12 months, we merge the two periods as one long highly synchronized period. For example, the period ending in 2006m9 qualifies, and then another highly synchronized tightening period starts in 2007m1, and we combined these into one period.

[34] In each economy, we include the tightening phase that overlapped with the five periods listed above—even if the tightening phase began before or after the dates above.

[35] A graph of policy interest rates during these highly synchronized tightening phases is similar to that for the five sub-periods shown in Chart 6 for the corresponding dates.

The most recent 2022 tightening period is very similar to other *Highly Synchronized Tightening* periods by several measures—such as the number of rate hikes, pace, and amplitude, and even more aggressive when measured by the initial velocity of rate hikes (with a median velocity of rate hikes over the first six months of the hiking phase about 50 percent greater during the most recent episode than earlier *Highly Synchronized Tightening* periods). This suggests that the more aggressive characteristics of the most recent tightening phase may be a return to historical averages of highly synchronized episodes, rather than simply reflecting the unusual nature of the pandemic and subsequent shocks.

There are a number of reasons why *Highly Synchronized Tightening* periods may be more aggressive than other tightening phases. For example, if the exchange rate channel is a key channel for the transmission of monetary policy, then a simultaneous tightening in monetary policy could dampen this channel and require a larger domestic adjustment in interest rates.[36] Or, if *Highly Synchronized Tightening* periods are driven by a different confluence of shocks, these different shocks could merit a different monetary policy response (explored in Section V)

IV.2 The Global Factor in Policy Rates

To better understand these patterns in the synchronization of rate cycles, we shift from analyzing common patterns in the turning points of cycles to directly estimating the global common factor in rates across economies. This allows us to assess the behavior of the global interest rate factor over time, as well as to calculate the share of the variance of national interest rates explained by this global rate factor. We also estimate the global factors in inflation and output growth. Since the global rate factor could be considered a rough measure of the commonality in responses of national central banks to movements in inflation and output, this allows us to analyze the relative importance of each of the three global factors in driving their respective national variables and how they have each evolved over time.

We estimate the global common factors for interest rates, inflation, and output growth using a simple dynamic factor framework (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, π_t^i, and Y_t^i refer to interest rates, inflation, and output growth in country *i* in month *t*, respectively. $f_t^{R,global}$, $f_t^{\pi,global}$ and $f_t^{Y,global}$ are the global common factors for interest rates, inflation, and output growth in month *t*, respectively.[37] 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).

The sample and most data used to estimate the model are the same as in Section III (with details in Appendix Table 2). Our main modification is to supplement the data on the interest rate

[36] There are also mechanisms, however, that could mitigate this effect. For example, during a *Highly Synchronized Tightening* period, the impact from the aggregate tightening on global financial conditions on global growth could reduce the need to tighten as aggressively in individual economies.
[37] As is standard in this literature, the factors and error terms follow independent autoregressive processes.

(measured as the nominal policy rate above) with the shadow interest rate starting in 1995 for Australia, Canada, the euro area, Japan, New Zealand, Switzerland, the United Kingdom, and the United States.[38] The shadow rate better captures these countries "true" policy rates, since their central banks have employed various types of unconventional monetary policy in recent decades.[39]

Inflation is measured as headline CPI inflation, and output growth as the growth rate of industrial production (which is more widely available than GDP growth at a monthly frequency). All variables are month-on-month from January 1970 through March 2024 (or the latest available as of May 31, 2024), demeaned and stationary. For the estimation of 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).

IV.2.1 Behaviour of the Global Rate Factor

Chart 12 shows the resulting estimates of the global factors for interest rates, inflation, and output growth. These three factors display movements broadly consistent with well-known fluctuations in the respective variables. For example, the global interest rate factor captures the highly synchronized tightening and easing episodes since 1970. The factor often declined sharply around the global recessions and downturns shown in grey (in 1975, 1982, 1991, 1998, 2000-01, 2009, and 2020), as many countries cut policy rates (and as documented in the previous section).[40]

Conversely, the global rate factor rose substantially during certain periods (in 1973-74, 1979-80, 1988-90, and 2021-23), primarily because of disturbances in oil markets, disruptions in cross-border supply chains, and demand pressures associated with accelerating output growth. For example, the global interest rate factor jumped over 2021-22 to its highest level 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 jumped during these two peaks in the global interest rate factor.

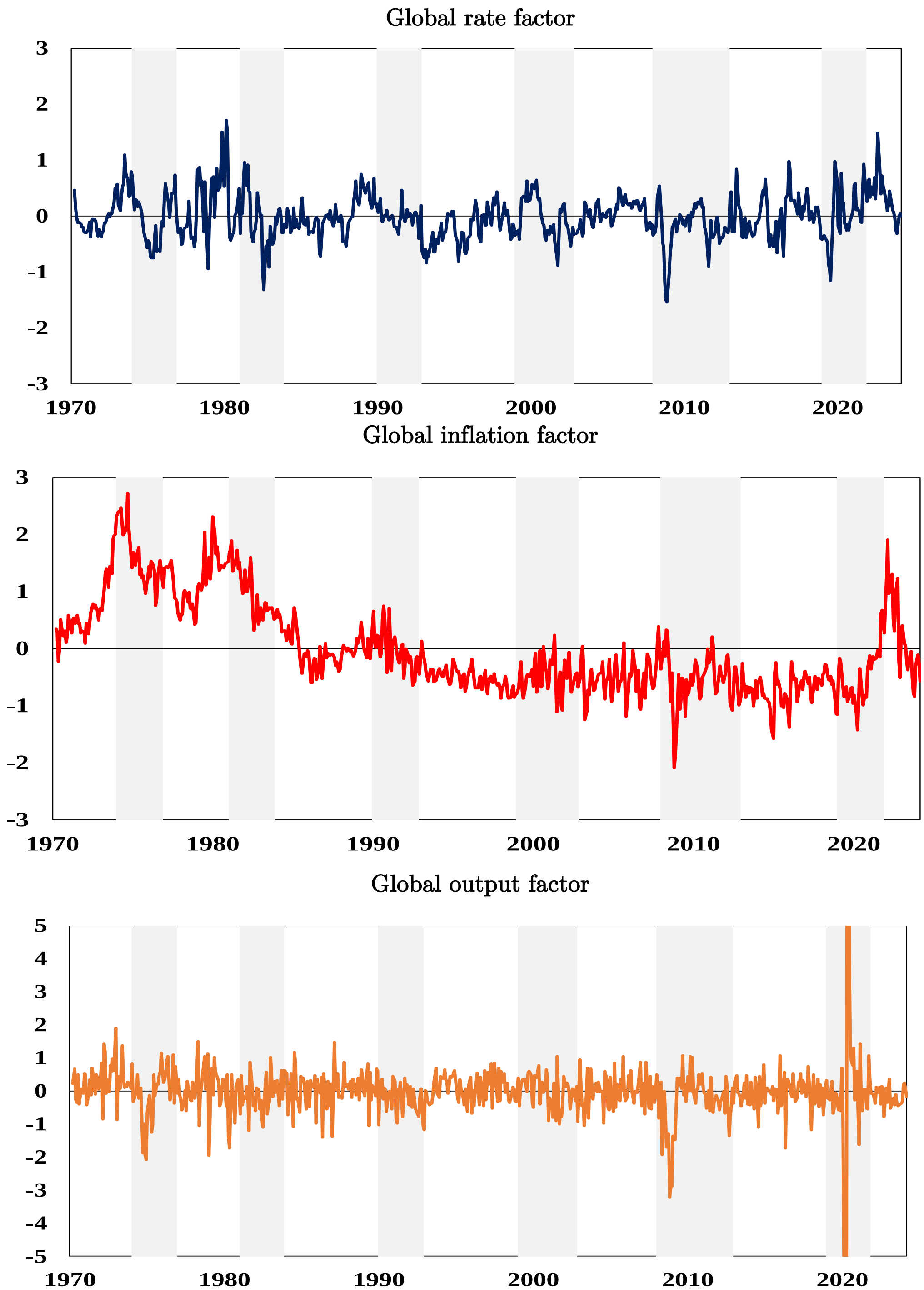
[38] The shadow interest rate is estimated as the shortest maturity rate based on the shadow yield curve (Krippner 2013). Specifically, the rate is estimated using a dynamic factor model with variables closely associated with different types of monetary policy operations. The resulting shadow rate is 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.

[39] Utilizing the dummy variables denoting the start of major asset purchase programs, as done above, is not sufficient for the estimation of the global factor, which requires a continuous measure.

[40] 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).

Chart 12 Global Factors

(Percent)



Sources: Authors' calculations based on the data described in Appendix Table 2. Notes: Global factors for policy rates, inflation, and output growth are estimated using a one-factor dynamic factor model for cross-country data for policy rates (or shadow rates), inflation rates, and growth rates of industrial production. Shaded areas in Panel A indicate global recessions and downturns (Kose and Terrones 2015; Kose, Terrones, and Sugawara 2020).

The global interest rate factor displayed particularly large swings until the mid-1980s, partly due to sharp fluctuations in national interest rates (Cook and Hahn 1989). During this period, some countries focused on money supply targets (Brimmer 1983; Friedman 1982), such that high rate volatility reflected the impact of financial markets on interest rates rather than central banks' decisions to adjust policy rates. The global rate factor was relatively stable in the 1990s and early 2000s before becoming more volatile again around the 2009 global recession. After a protracted period of stability in the 2010s, it has again displayed significant volatility since the beginning of the COVID-19 pandemic.

The behavior of the global inflation and output factors (in the bottom two panels of the Chart 12) is also consistent with some well-known global events. For example, the global inflation factor fell sharply just before or during 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 fell during periods of sharp declines in oil prices (in 1986, 1990-91, 1997-98, 2001, 2008, 2014-16, and 2020).[41] The global output factor (measured by the highly volatile monthly IP series) shows even more short-term volatility, but also plunged during global recessions and rebounded in subsequent recoveries. The collapse and subsequent spike in output around the pandemic is particularly noteworthy and much more extreme than any other period in the sample—consistent with the evidence in Section III showing the unusual behavior of output and employment during the most recent rate cycle.

Although movements in the interest rate factor are mirrored by those for the global inflation and output factors during specific periods (such as the collapse in the global factor in all three variables during the 2008 recession), the correlations across the three global factors are fairly low at 0.11-0.26 for the full period. To better understand the evolutions of these variables over time, it is useful to decompose the role of these global factors in driving movements in individual economy's interest rates, inflation, and output growth.

IV.2.2 Importance of the Global Rate Factor over Time

Next, we examine the importance of global factors in explaining variations in national interest rates, inflation, and output. We estimate the contributions of the global factors to the variances of these variables, with results in Chart 13. Four results are worth highlighting. First, the global interest rate factor plays a significant role in driving fluctuations in national interest rates; it accounted for nearly 15 percent of the interest rate variation, on average over the full period.[42] 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.[43]

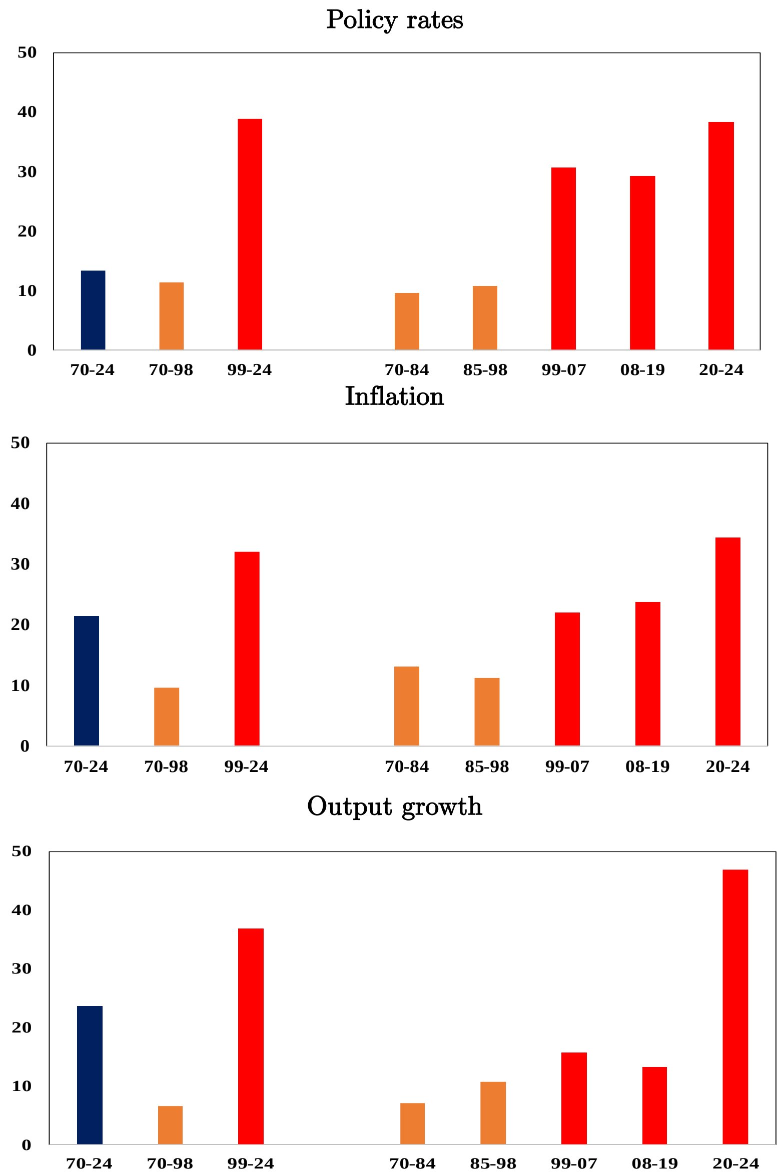
[41] Baffes et al. (2015) presents an analysis of the periods of sharp declines in oil prices. Ha et al. (2023) examines the role of oil prices in driving national inflation.

[42] 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 (18 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 (61 percent), the euro area (58 percent), Canada (55 percent), and Australia (49 percent), but much smaller in Japan (18 percent).

[43] 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).

Chart 13 Variance Contributions of the Global Factors

(Percent of total variation)



Sources: Authors' calculations based on data from January 1970 through March 2024.
Notes: The chart 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. See Section IV.2 for estimation details.

Second, the importance of the global interest rate factor has increased significantly since the end of the 1990s.[44] On average, this global factor explained about 40 percent of the interest rate

[44] As a robustness check, we calculated the variance contribution of the global rate factor using other sub-sample periods (which are not based on the start of ECB) 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.

variation over 1999-2024, almost four times larger than the share in the 1970-98 period. Since the variance share due to the global interest rate factor measures the degree of common interest rate movements, this finding 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 used in Section III (1970-84, 1985-98, 1999-2007, 2008-19, and 2020-24), the increased importance of the global interest rate factor over time, and particularly starting in 1999, is even more pronounced. This suggests that rate cycles have become much more synchronized during the past quarter century.

Third, to better assess the extent of interest rate synchronization over time, we also examine the evolution of the variance shares due to the global interest factor over shorter, 5-year windows (Appendix Chart 4). The results again show the increased importance of the global interest rate factor beginning in the late 1990s, but also that the role of this factor has fluctuated over the more recent period. More interestingly, the share of variance due to the global factor rose further around specific sub-periods—e.g., 1976-80, 2000-04, 2008-12, and 2020-24.[45] These periods of heightened importance of the global interest rate factor coincided with the episodes when a large share of economies eased or tightened interest rates simultaneously, as documented in Section IV.1 The variance contribution of the global policy rate factor to domestic rate fluctuations also increases during the *Highly Synchronized Tightening* periods (identified in the previous subsection) as expected.

Finally, this increased global synchronization in interest rates coincides with increased global synchronization in inflation and output growth, with even more comovement in interest rates by some measures. Appendix Table 4 and Chart 13 show that 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 (1999-2023). In the latter period, the extent of interest rate synchronization was even larger than that of output growth and inflation. In each of the later three sub-periods (1999-2007, 2008-19, and 2020-24) the degree of interest rate synchronization easily exceeded that of inflation and output (except for output growth over 2020-24, for which global synchronization spiked due to the simultaneous growth swings around the pandemic lockdowns and recoveries). In fact, the estimates from the last window before the pandemic (2008-19) suggest that the global factor in interest rates now explains a greater share of interest rate movements than the corresponding role of the global factor in inflation (in explaining domestic inflation) and output growth (in explaining domestic growth).

What is driving this trend of increased global synchronization in growth, inflation, and particularly interest rates? Both structural and cyclical factors have likely played important roles.[46] Policy frameworks have become more similar over time as a larger share of economies in our sample have introduced inflation targeting. There has been a convergence of inflation targets, as many countries have lowered their targets over the past three decades to levels at or around 2 percent. Global integration in trade and financial markets also grew rapidly over the past three decades, especially

---

[45] 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.

[46] 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.

during the pre-pandemic period. Stronger trade linkages combined with the expansion of global supply chains have made domestic inflation more sensitive to global price movements and translated into more synchronized changes in national policy interest rates.[47] 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.[48]

These results on the increased synchronization of movements in global output, inflation, and especially interest rates, complement the results on the synchronization of rate changes and rate phases documented in Section IV.1 In order to understand why changes in interest rates have become more synchronized over time, the next section shifts to a systematic analysis of the importance of different types of shocks in explaining interest rate cycles.

V. What Drives the Rate Cycles?

Previous sections of this paper have identified the turning points of rate cycles, periods when these rate cycles were highly synchronized, and the importance of the global factors in explaining interest rate movements. This section attempts to understand the sources of these rate movements and cycles using a factor-augmented VAR (FAVAR) model.[49] Our model includes three domestic variables (output, inflation, and interest rates), the same variables used in the previous section and similar to those used in earlier studies of monetary policy (e.g., Uhlig 2005 and 2017, Dees et al. 2010, and Madeira, Madeira, and Monteiro 2023).[50] In addition to these domestic variables, our model 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 that global factors have become increasingly important drivers of macroeconomic and financial variables, and including the results above showing the greater role of the global interest rate factor in driving national interest rate movements.[51]

This section begins by describing the empirical methodology and data in more detail, including the identification of the shocks using sign and zero restrictions motivated by theory. Then it reports the variance decompositions based on the FAVAR model quantifying the importance of the four global and three domestic shocks in driving national interest rates, including how the roles of these different shocks have changed over time. The section ends by assessing how the roles played by these shocks differ across the easing and tightening phases of rate cycles defined in

[47] 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 a literature review on the policy changes and structural factors driving inflation synchronization, see Ha, Kose, and Ohnsorge (2019).
[48] 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.
[49] See Bernanke, Bolvin, and Eliasz (2005), Mumtaz and Surico (2009), and Ha et al. (2023) for applications of the FAVAR model.
[50] The models in these studies generally include: output, inflation, and short-term interest rates and are often motivated by the standard New Keynesian approach, e.g., Clarida et al. 1999, Woodford 2003, Smets and Wouters 2007. For a review of the literature on the linkages between interest rates and macroeconomic outcomes, see Claessens and Kose (2018).
[51] An extensive literature documents the global synchronization of domestic business cycles (e.g., Kose, Otrok, Whiteman, 2003 and 2008, among many others). Building on Rogoff (2003, 2007), some studies have also shown the global comovement in inflation rates (Ciccarelli and Mojon 2010; Forbes 2019b; Auer, Levchenko, and Sauré 2019; Ha et al. 2024).

Section II as well as how these have also evolved over time and differ during *Highly Synchronized Tightening* periods (defined in Section IV.1.1)

V.1. Methodology and Data

In order to estimate the role of our seven global and domestic shocks, we employ the following FAVAR model:

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

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

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 (Δop), domestic interest rates ($R^{domestic}$), domestic inflation ($\pi^{domestic}$), and domestic output growth ($y^{domestic}$).

The ε_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").[52] The model assumes stochastic volatility of the structural shocks—the residuals represented by the time-varying residual covariance matrix Σ_t. These shocks are independently (but not identically) distributed across time.[53]

This FAVAR model is estimated 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.

[52] 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) develops 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 analysing an even wider range of shocks behind U.S. macroeconomic and financial variables.

[53] 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 Σ_t is allowed to be period-specific, hence rendering stochastic volatility and introducing heteroskedasticity (Carriero, Corsello, and Marcellino, 2019). ε_t is serially independent with zero mean and variance Σ_t. We assume that $\Sigma_t = F\Lambda_t F'$, where F is a lower triangular matrix with ones on its main diagonal, while Λ_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).

We identify the seven shocks using sign and zero restrictions, following previous studies on the drivers of inflation and monetary policy.[54] Postulating that B_0^{-1} in our model has a recursive 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.[55] A positive global monetary policy shock increases global policy rates while decreasing global output growth and inflation. 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. A contractionary (positive) domestic monetary policy shock lowers domestic output growth and inflation, with an indeterminate effect on oil prices. 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.

We estimate this FAVAR model from January 1970 through December 2023 for each of the following five economies: Canada, the euro area, Japan, the United Kingdom, and the United States (referred to as the G5).[56] We focus on these economies primarily because of their size and

---

[54] For some examples of these studies, see Uhlig (2005, 2017), Antolín-Díaz and Rubio-Ramírez (2018), Forbes, Hjortsoe, and Nenova (2018, 2020), and Ha et al. (2024).

[55] For example, the sign restrictions for monetary policy shocks are standard and align with those employed by Uhlig (2005, 2017), Madeira, Madeira, and Monteiro (2023), Dees et al. (2010), and Gerlach and Smets (1995). Our identifying assumptions with respect to supply and demand shocks are consistent with those used by Charnavoki and Dolado (2014) and Ha et al. (2024) that (a) a negative non-commodity supply shock raises input costs and inflation, while reducing output and commodity prices--through declines in productivity and demand/consumption for commodity products; and (b) a demand shock raises output, inflation, and commodity prices. For similar approaches to the identification of supply and demand shocks, see Gambetti, Pappa, and Canova (2008) and Melolinna (2015). 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.

[56] The United States, which is the largest economy, is included in estimating the global factors, following many previous studies on business and financial cycles (e.g., Kose, Otrok, and Whiteman 2008) and inflation synchronization (e.g., Ciccarelli and Mojon 2010). That said, the exclusion of the United States did not

availability of data on the policy interest rate, output, and inflation for the full sample period. We use the same data for each of the domestic variables as used in the analysis in earlier sections and as described in Appendix Table 2. The data for the global variables is also the same as that used in the previous section, with the addition of oil price growth, which is measured 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.

V.2. Drivers of Rate Cycles

This section estimates the model described above in order to examine the importance of the seven different global and domestic shocks in driving rate cycles using standard forecast error variance decompositions. We use simple averages across countries in order to focus on the aggregated results of these decompositions and learn from the broader cross-country experience. We analyze the results over the full sample from 1970-2023, the five shorter sub-periods used in earlier sections, during the economy-specific easing and tightening phases identified in Section II and then for these two phases over shorter windows (the five sub-periods and for *Highly Synchronized Tightening* periods).

V.2.1. Drivers of Rate Cycles over the Full Sample (1970-2023)

The left side of Table 2 and Chart 14 present the contributions of the seven global and domestic shocks to the variance of national policy interest rates over the full sample period from 1970-2023, including the combined contributions of all the global shocks and all the domestic shocks. On average, the global shocks together accounted for nearly 26 percent of the variation in interest rates in the five economies, ranging from 14 percent (in the United States) to 55 percent (in the euro area).[57] Among the global shocks, global demand shocks played the largest role in driving policy rates, accounting for 10 percent of the average variance in interest rates. The other global shocks (to monetary policy, supply, and oil prices) explained, on average, from 4 to 6 percent of the variation in rates.

In contrast, domestic shocks explained the lion s share of the variance of domestic policy rates, accounting for almost three-quarters of rate fluctuations on average over the full period. Among the domestic shocks, demand shocks were the main drivers of the variation in interest rates, with an average contribution of about 34 percent, followed by domestic monetary policy shocks (accounting for nearly 31 percent). Domestic supply shocks played a much smaller role, with an average contribution of nearly 10 percent.

change the global factor estimates. In addition, given the potential feedback effects, our FAVAR model with monthly data does not impose any restrictions between the global and domestic variables other than contemporaneous sign and zero restrictions. We also estimate the results excluding the US from the G5 sample, however, and the headline results for the averages across countries are robust.

[57] Global shocks account for a smaller share of the variation in policy rates than domestic shocks in all five economies except the euro area. This finding likely reflects the euro area's stronger global 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.

Table 2 Contributions of Shocks to Interest Rate Variation

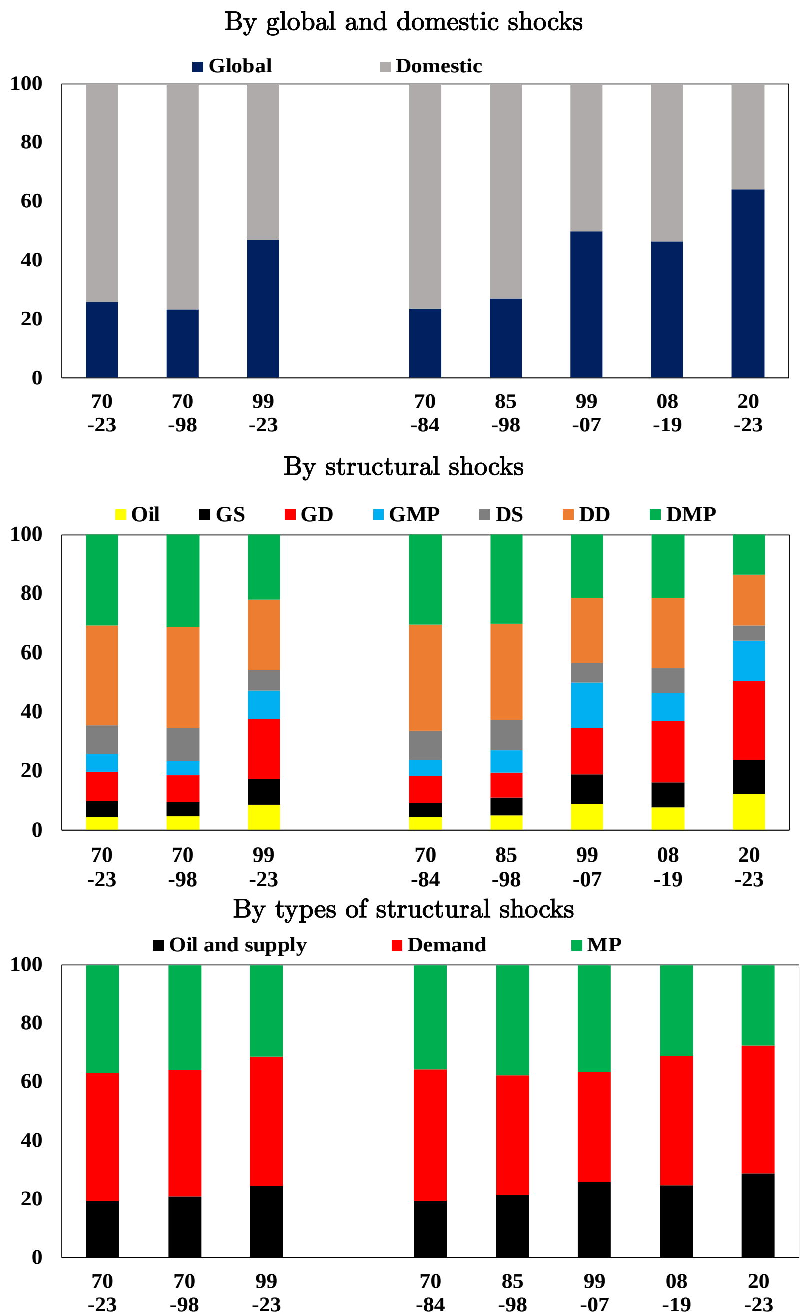
(Percent of total variance)

Shocks	70-23	70-98	99-23		70-84	85-98	99-07	08-19	20-23
Total Global Shocks	25.9	23.3	47.1		23.6	26.8	49.9	46.4	64.3
Oil Price	4.4	4.7	8.5		4.5	5.0	8.8	7.6	12.0
Global Supply	5.5	5.0	8.8		4.8	6.1	10.2	8.6	11.5
Global Demand	9.9	8.9	20.4		9.0	8.2	15.7	20.7	26.8
Global Monetary Policy	6.0	4.8	9.4		5.3	7.5	15.3	9.5	13.8
Total Domestic Shocks	74.1	76.7	52.9		76.4	73.2	50.1	53.6	35.7
Domestic Supply	9.6	11.3	7.1		10.0	10.5	6.8	8.4	5.1
Domestic Demand	33.6	34.2	23.9		35.9	32.5	21.9	23.7	16.9
Domestic Monetary Policy	30.9	31.2	22.0		30.5	30.2	21.4	21.5	13.7

Sources: Authors' calculations based on G5 economies (Canada, the euro area, Japan, the United Kingdom, and the United States). Notes: Forecast error variance decompositions of policy 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).

Chart 14 Contributions of Shocks to Interest Rate Variation

(Average across G5 economics, percent of total variation)



Sources: Authors' calculations, based on the G5 economies (Canada, the euro area, Japan, the United Kingdom, and the United States). 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). "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.

V.2.2 Drivers of Rate Cycles over Time

Next, we examine how the importance of global and domestic shocks in explaining the variance of policy rates has changed over time. We begin by focusing on two long sub-periods—1970-98 and 1999-2023—with the later period when the ECB began setting rates for countries in the euro area. Table 2 (and the corresponding sections of Chart 14) suggest that the total contribution of global shocks to the variance of interest rates doubled in the later period (from an average of 23 percent over 1970-98 to 47 percent over 1999-2023). This increase was broad-based, as not only did the contribution of each individual global shock rise in the later period, but the combined role of the global shocks became more important in each of the five economies in the sample. Most noteworthy is the increased role of global demand shocks, which on average contributed to 20 percent of the variance in interest rates over 1999-2003 (more than doubling from 9 percent over 1970-98).

In order to better understand these changes over time, we estimate the variance decomposition of interest rates over the five shorter sub-periods (1970-84, 1985-98, 1999-2007, 2008-19, and 2020-23) used in Sections III and IV. This more detailed demarcation also points to the growing importance of global shocks in explaining interest rate fluctuations over time. In fact, the aggregate role of the global shocks increased to explain 64 percent of the interest rate variation in the most recent period (2020-23)—such that the contribution of the global shocks was greater than that of the domestic shocks for the first time.[58]

Among the four global shocks, demand shocks continued to make the single largest contribution to 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 doubled in the post-1998 sample (from about 14 percent in 1970-98 to roughly 30 percent in 1999-2023).[59] In 2020-23, the role of these two global shocks continued to increase—reaching an average contribution of 41 percent to the interest rate variation across the five 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.[60] More specifically, the combined contribution of global supply and oil price shocks to interest rate fluctuations reached its highest level (of all the sub-periods) in 2020-23 at roughly 24 percent.[61]

The growing importance of global shocks in explaining the variation in interest rates in our sample reflects a combination of the cyclical factors documented above as well as structural changes in monetary policy and increased globalization through a variety of forms. The post-1998 period included much deeper and more synchronized global recessions (in 2009 and 2020) and global downturns (in 2000-01 and 2012). This period also included multiple instances of heightened

[58] 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.
[59] 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.
[60] 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.
[61] 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.

volatility in oil prices (in 2007-09, 2014-16, and 2020-23). The confluence of these developments, combined with increased linkages between countries led to more synchronized global business and inflation cycles across economies. The widespread adoption of inflation-targeting frameworks in the past quarter century also corresponded to a greater synchronization in the monetary policy responses to these global shocks. In the context of the FAVAR estimates, these changes correspond not only to an increased volatility of global shocks, but also an increased sensitivity of policy interest rates to global shocks,[62] with both contributing to the greater role of global shocks over time.

As the role of these global shocks has increased over time, the corresponding importance of domestic shocks has declined, from an average contribution of 77 percent during 1970–98 to 53 percent after 1999. For each of the sub-periods, 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 43 percent of interest rate movements after 1998. The variance share explained by domestic shocks, however, declined significantly in the 2020-23 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 the bottom panel of Chart 14 for each of the time periods. Demand shocks collectively accounted for the largest share of the variation in interest rates (44 percent), followed by monetary policy shocks (37 percent) and a more modest role for supply shocks (20 percent). Both demand and supply shocks became slightly more important over time in driving interest rates, however, such that, from 2020-23 these two shocks explained about 73 percent of the volatility in interest rates.

These changing patterns in the main drivers of rate cycles over time are consistent with results from decomposing the shocks behind inflation (Appendix Chart 5) and output growth (Appendix Chart 6). The contributions of global shocks to the volatility of output growth have increased moderately from 27 percent (in both 1970-84 and 1985-98) to 32 percent (in 1999-2019). The share of global shocks more than doubled (to 70 percent in 2020-23), reflecting the unprecedented and highly synchronized movements in global output following the COVID-19 outbreak. During this last period, all types of global shocks—global demand, supply, oil price, and monetary policy—contributed roughly equally to the output variance.

More interesting is how the drivers of inflation changed over time. The contribution of the global shocks was the largest during 1970-84 (56 percent), reflecting the major impact of the cost-push forces on inflation due to sharp rises in oil prices during this period. The contribution of the global shocks declined substantially (to 21 percent) in the subsequent period (1985-98), but then rose again (to 36-39 percent) during the two sub-periods between 1999 and 2019. The importance of the global shocks then increased sharply to 52 percent in the 2020-23 period. These results suggest that the greater importance of the global shocks in driving rate cycles in the latter sub-periods mirrors the increasingly dominant role of these shocks in explaining business and inflation cycles.

[62] It is worth noting that country sensitivity to domestic shocks has generally not increased.

V.2.3 Drivers of Rates during Tightening and Easing Phases

This sub-section repeats the analysis above but differentiates the roles of these global and domestic shocks in explaining interest rates during the tightening and easing phases identified in Section II. The resulting estimates are shown in Charts 15 and 16 for the economy-specific tightening and easing phases each decade from the 1970s through the 2020s.[63]

The top panel of Chart 15 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 five 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.

The results for the most recent tightening phases over 2021-23 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. However, these periods differ in terms of the relative contributions of global and domestic shocks; global shocks were the dominant force behind tightening phases over 2021-23, 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 (Chart 16). 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.

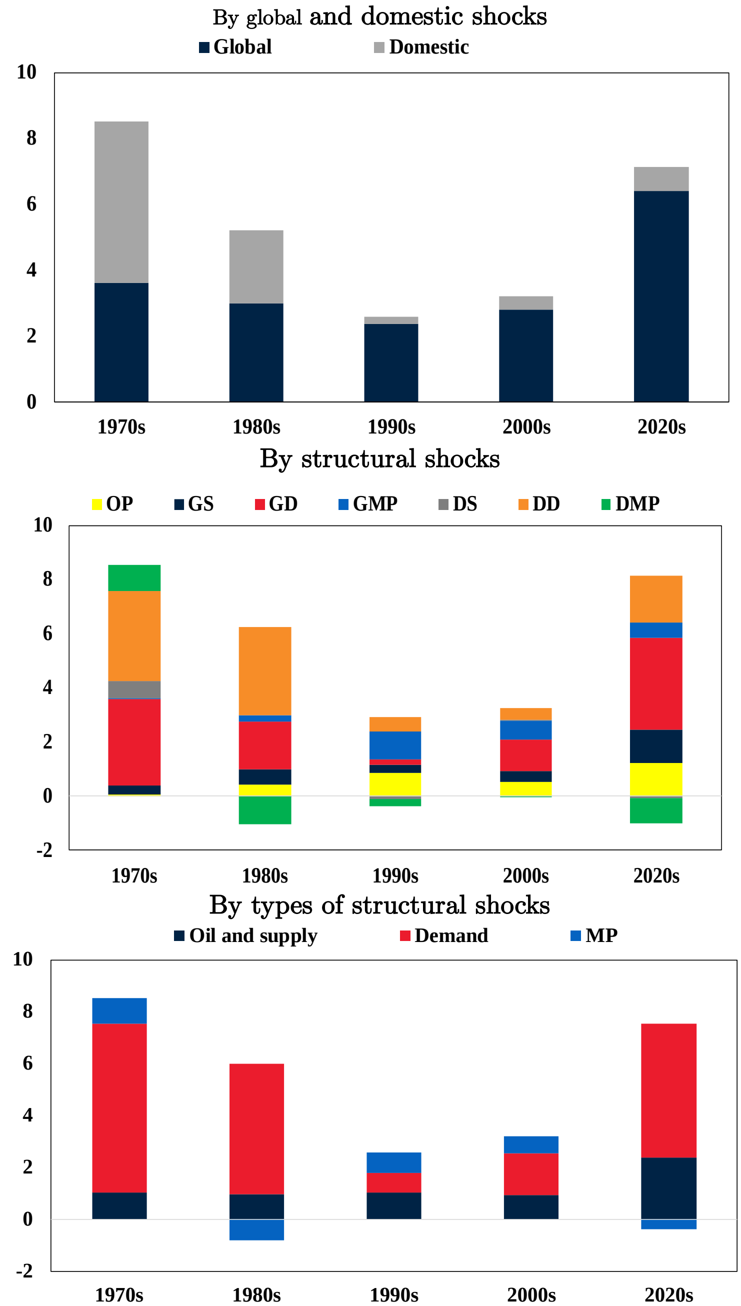
Although the contribution of domestic shocks to easing phases has declined over time, it has still been meaningful in recent decades. For example, during the most recent easing phases around the COVID-19 pandemic, domestic shocks still accounted for 1.1 percentage points (36 percent) of the decline in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

---

[63] 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).

Chart 15 Contributions of Shocks to Interest Rates: Tightening Phases

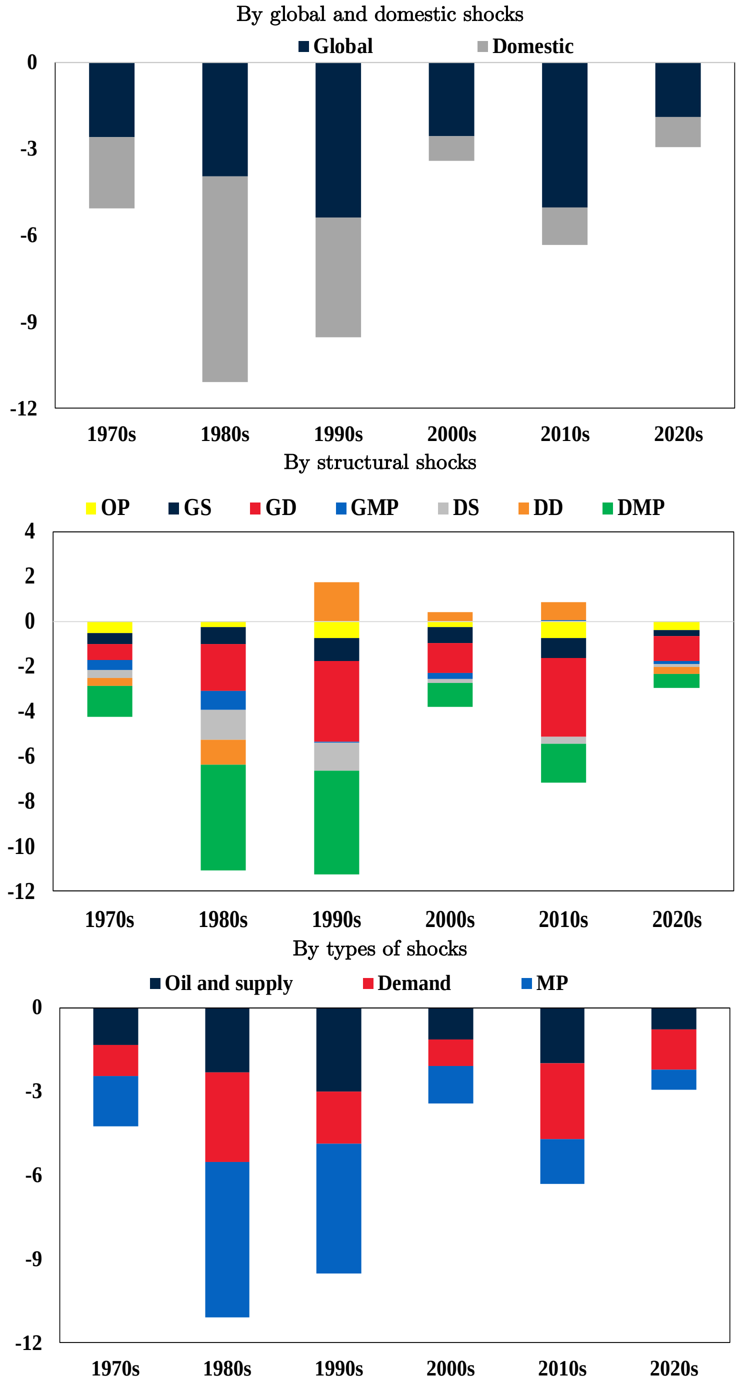
(Average across G5 economies, percentage points)



Sources: Authors' calculations for data from January 1970 through December 2023 for the G5 economies (Canada, the euro area, Japan, the United Kingdom, and the United States).
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.

Chart 16 Contributions of Shocks to Interest Rates: Easing Phases

(Average across G5 economies, percentage points)



Sources: Authors' calculations for data from January 1970 through December 2023 for the G5 economies (Canada, the euro area, Japan, the United Kingdom, and the United States). Notes: Historical decompositions of domestic policy interest rates around the easing phases defined in Section II. See notes to Chart 15 for definitions and details.

Finally, we shift focus from the differential role of global versus domestic shocks to the different categories of shocks (at the bottom of Chart 16). Demand shocks (both global and domestic) are the primary determinant 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 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 2020-23, supporting findings from the literature on the importance of these shocks around the pandemic.[64] 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).

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).

This large role of global supply and demand shocks in the post-pandemic tightening phase likely contributed to the unusually high degree of synchronization in monetary policy during this period (documented in Section IV) and the more aggressive nature of this tightening phase when compared to historical precedents (documented in Section III). To better understand if these shock contributions to the post-pandemic tightening were unique, or typical of other periods when a large share of economies simultaneously tighten monetary policy, we repeat the shock decomposition for three tightening windows: (1) *Highly Synchronized Tightening* periods before 2020 (defined in Section IV.1.1); (2) the *Highly Synchronized Tightening* after 2020; and (3) other tightening periods.

Chart 17 summarizes the average contributions of global and domestic shocks to the levels of policy rates in the five economies during these windows. Not surprisingly, global factors play a much greater role during the pre-2020 *Highly Synchronized Tightening* periods (explaining nearly

[64] 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).

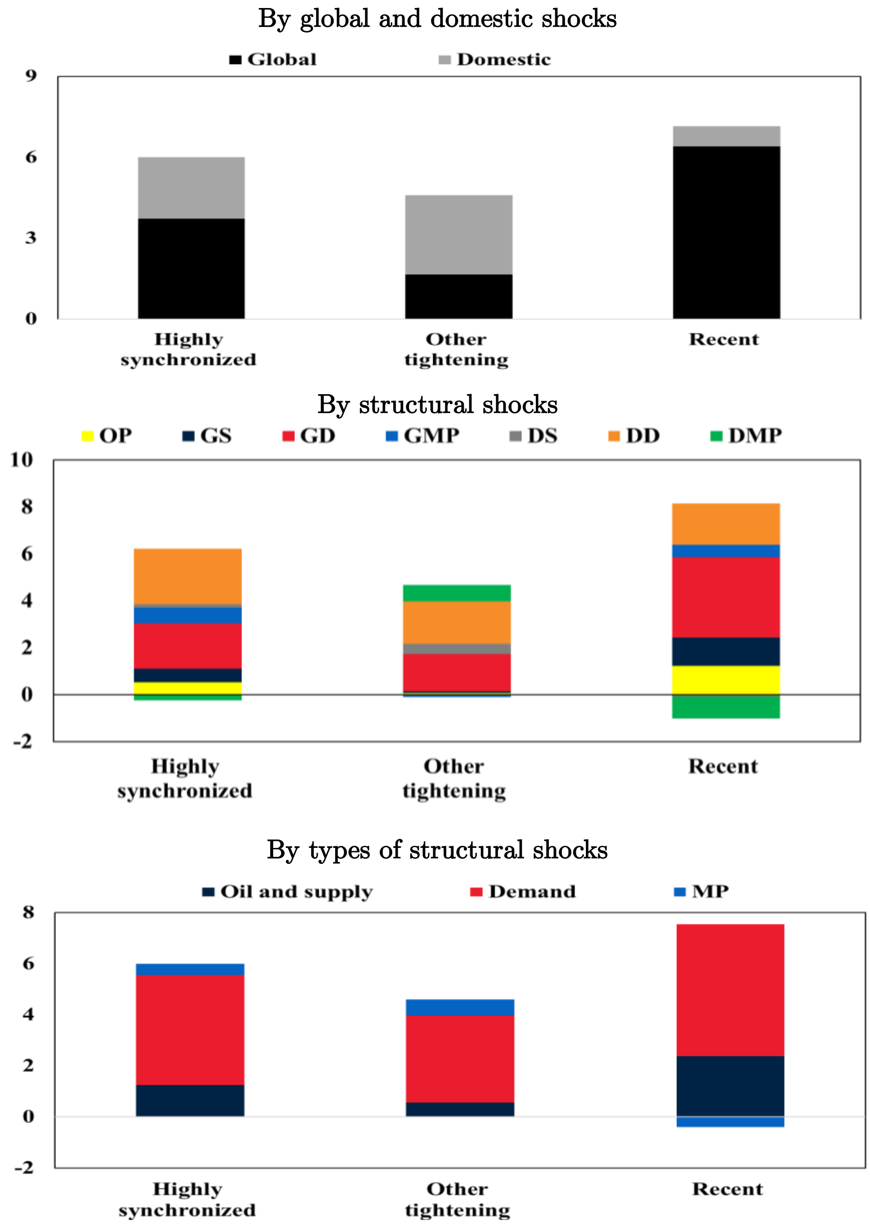
60 percent of rate increases) compared to other tightening periods (explaining 35 percent). While the contributions of global demand shocks are similar across the two types of tightening periods, the contribution of oil and supply shocks increases significantly during the highly synchronized episodes.

More interesting, the contribution of global shocks jumps even higher (to nearly 80 percent) during the post-pandemic tightening phase. This is not only meaningfully larger than the contribution of global shocks to tightening phases in the 2000s or 2010s when the role of global factors had increases, but also meaningfully larger than the contribution of global shocks during earlier *Highly Synchronized Tightening* periods. This increased role of global factors continues to be dominated by the role of global demand shocks, supported by a larger contribution of oil price and global supply shocks. It is worth noting that the contribution of domestic monetary policy is slightly negative—indicating supporting monetary policy on average in the sample.

To conclude, this series of results highlights the increased role of global shocks in driving interest rate fluctuations, not only over 2020-24, but since the 1990s. Potentially as important as understanding this growing role for global shocks, however, is understanding the breakdown between the different types of global shocks, as global supply and demand shocks can merit different monetary policy responses (as discussed above). This breakdown is not straightforward, and there is often a tendency to assume global shocks are primarily global supply shocks, thereby underestimating the role of global demand shocks. An overestimation of the role of global supply shocks may have occurred over 2020-23, which is not surprising given the prominent and headline-grabbing supply shocks around COVID-19, the Russian invasion of Ukraine, and multifaceted supply-chain disruptions. Since supply shocks often merit a more muted monetary policy response than demand shocks, however, such an overestimation of the relative supply component (and underestimation of the demand component) in the recent global shocks may have contributed to the relatively slow shift to tightening monetary policy in response to the post-pandemic inflation (as documented in Section III).

Chart 17 Contributions of Shocks to Interest Rates: Highly Synchronized Tightening Periods

(Average across economies, percentage points)



Sources: Authors' calculations based on G5 economies (Canada, the euro area, Japan, the United Kingdom, and the United States). Notes: Historical decompositions of domestic policy interest rates around the *Highly Synchronized Tightening* and other tightening phases defined in Section IV.1. *Highly Synchronized Tightening* periods are: 1979m4–1980m3, 1988m8–1989m12, 2000m1–2000m6, and 2005m10–2007m9. "Recent" tightening period is between 2022m4-2023m6. See notes to Chart 15 for definitions and details.

VI. Rate Cycle: Holds, Premature Adjustments, Exits and Divergence

Given the long and variable lags for monetary policy to affect the economy, a perennial challenge for central banks is evaluating when to stop raising rates during a tightening phase, or when to stop cutting rates (or end quantitative easing) during an easing phase.[65] Similarly, even if central banks are not actively adjusting monetary policy, assessing when to begin tightening or easing can be challenging when the economic outlook is uncertain and/or the existing restrictiveness of monetary policy is difficult to assess (e.g., when the neutral interest rate is uncertain). Can we learn anything from historical rate cycles about when to stop adjusting rates and when to transition between tightening and easing phases? And do the shocks behind rate cycles and/or the extent of global synchronization of rate cycles affect an economy's ability to successfully exit a phase?

In an effort to address these questions, this section brings together various pieces of analysis developed throughout this paper to examine the historical experience with "exits", i.e., the end of tightening and easing phases. It begins by evaluating the characteristics and incidence of "holding periods" (when policy rates are unchanged and all QE programs have ended), and then "premature adjustments" (when an attempt to shift out of a phase is then reversed). The section ends by examining the historical experience of exiting from *Highly Synchronized Tightening* periods. This includes a closer look at the evolution of activity and inflation after the 1979 tightening phase, the only historical period that shares some key characteristics with today: a synchronized global tightening with a large supply-shock component; substantial divergence in when economies transitioned to easing phases, and several major economies transitioned to easing before the United States.

VI.1. Holding Periods

To begin, we utilize the dates denoting the start of easing and tightening phases defined in Section II for our sample of 24 economies from January 1970 to May 2024. We will refer to these turning points as successful exits from a phase and calculate two statistics to study the "holding periods" before a successful exit:

- *Hold Duration*: the number of months when policy is "on hold" at the end of a phase, defined as (i) after the last increase in the policy rate during a tightening phase, or (ii) after the last decrease in the policy rate and after any QE program has ended (defined in Section II) during an easing phase.[66]

- *Hold Share of Phase*: the number of months that policy is "on hold" (defined above) relative to the total duration of the relevant tightening or easing phase.

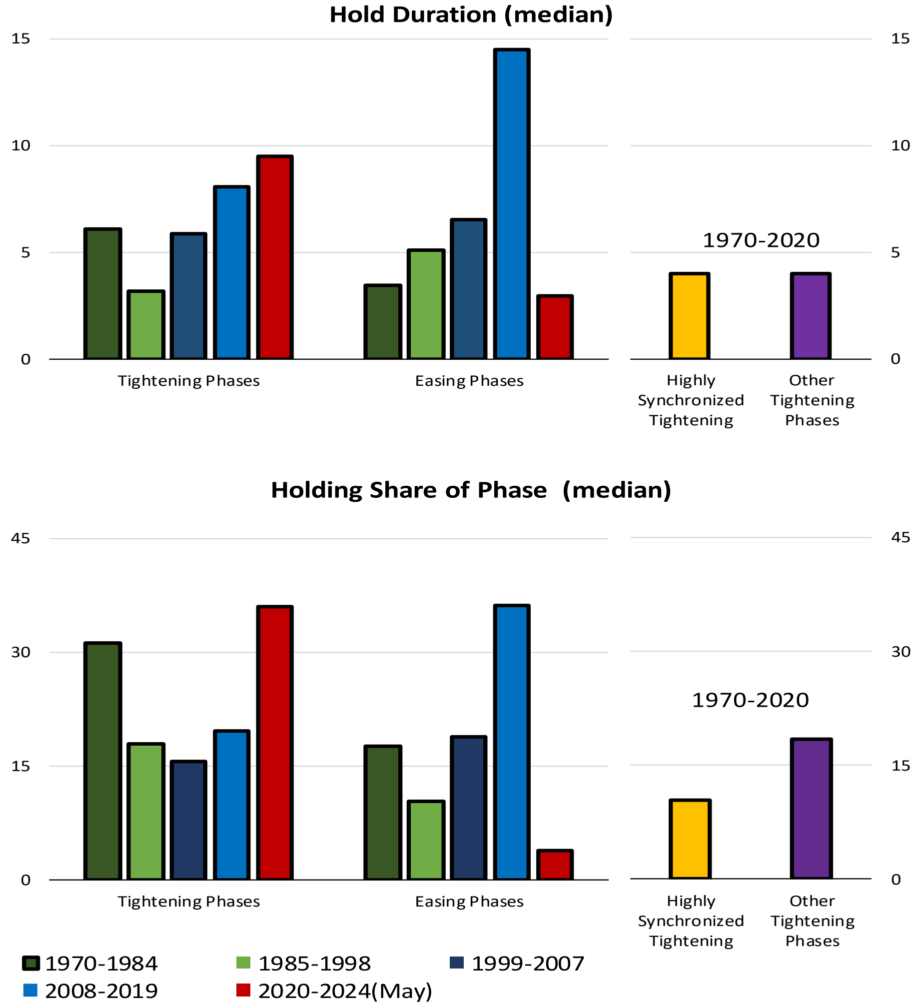
Chart 18 shows the resulting medians for easing and tightening phases for each of the five sub-periods used throughout this paper (and defined in Section III) through May 2024.[67] The graphs show several noteworthy patterns. At the end of tightening phases, policy interest rates are generally on hold for several months—ranging from a median of 3 months during 1985-1998 to 8 months from 2008-19—with the length gradually increasing over time to almost 10 months during

[65] For evidence on the lags, see Friedman (1961), Christiano et al. (1999) and Aruoba and Drechsel (2024).
[66] We continue to define a "change" in the policy interest rate as greater than or equal to 0.1 percentage point. We also consider policy "on hold" even if the central bank is continuing QT as these programs are considered "in the background" and not the active tool of monetary policy for our sample.
[67] We focus on medians instead of means as several extreme observations affect the means; for example, Switzerland was on "hold" for 88 months from 2015-2022, during which it did not lower rates or use QE.

the current period. The median length of holding periods for easing phases also jumped, to almost 15 months during the 2008-19 window, but then dropped sharply after the pandemic. After the COVID-19-related easing, economies were on hold for an average of only 3 months from the last rate cut or end to asset purchases to the first rate hike.

Chart 18 Duration and Share of Holding Periods

(Periods with no change in policy interest rates or asset purchases)



Sources: Authors' calculations based on data from January 1970 through May 2024.
Notes: Chart shows the median duration of holding periods at the end of a phase before a turning point (top panel) or the share of the phase in the holding period (bottom panel). A holding period is the number of months after the last rate increase during a tightening phase or after the last rate decrease and end of any government QE programs. Movements in the policy interest rate <0.1 percentage point do not qualify as a change. Right side of the chart shows the same statistics across all Highly Synchronized Tightening periods before 2022 (in yellow) or in all tightening phases that are not Highly Synchronized.

These differences between tightening and easing phases—and the unusual duration of holding patterns since the pandemic—are even more striking when this *Hold Duration* is scaled relative to the length of the corresponding phase (at the bottom of Chart 18). As of May 31, 2024, for the economies in our sample that were in a tightening phase (all except Japan), policy rates had been on hold for a median of 36% of the current tightening phase—the longest of any window. In contrast, at the end of the pandemic easing, economies were on hold for a median of only 4% of the entire easing phase—by far the shortest of any historical precedent. This is worth highlighting. The shift from actively easing monetary policy in response to the pandemic to actively tightening was the fastest exit from an easing phase in our sample; in most cases, a period of actively easing or tightening policy is followed by a period with policy on hold in order to let the lags from the policy changes to take effect. In contrast, tightening phases after the pandemic were started even before the full impact of previous easing would have filtered through the economy.

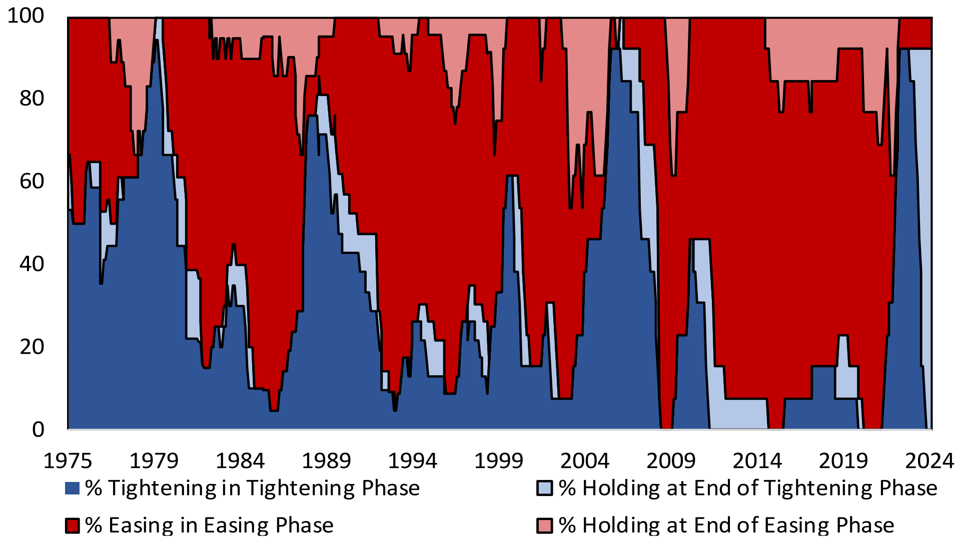
These patterns are consistent with the evolution of GDP growth, unemployment, and inflation discussed in Section III. After easing monetary policy in response to the pandemic, unusually rapid recoveries and the sharp acceleration in inflation (shown in the charts in Section III) prompted central banks to quickly transition from actively easing to tightening policy, with a shorter "hold" at the end of the easing phase than historically occurs. Central banks then tightened monetary policy more aggressively on average than during historical cycles since 1998—whether measured by the initial velocity of rate adjustments, overall pace of rate adjustments, number or rate increases, or overall amplitude of the tightening phase (shown in Chart 7). This unusually aggressive tightening phase has been followed by a "higher for longer" period during which monetary policy has been on "hold" in order to allow the lags for this aggressive tightening to affect the economy and better assess when it is time to transition to an easing phase. Compared to historical episodes, today's longer holding period than has traditionally occurred is a natural counterpart to the unusually aggressive tightening.

Next, we consider the extent to which holding periods are synchronized across countries. Chart 19 repeats the analysis in Chart 11 (which shows the share of economies in a tightening or easing phase), except now also differentiates the period at the end of each phase when monetary policy is "on hold". These holding periods are denoted by lighter red at the end of easing phases and lighter blue at the end of tightening phases. After most tightening "mountains" (i.e., when a large share of economies simultaneously increase interest rates), there is usually a period of several months when a large share of these economies hold interest rates constant (appearing as a large "glacier" on the side of the mountains).

In contrast, to these fairly regular "melting glaciers" of holding periods at the end of tightening phases, the patterns for holding periods at the end of easing phases show a less consistent pattern; these are dispersed more irregularly and can last much longer—particularly in the post-2000 period—more like icebergs of various sizes floating in the larger sea of easing phases. This is consistent with not only less synchronization in the occurrence of easing phases, but also in how they end.

Chart 19 Share of Countries in Easing and Tightening Phases, including Holds

(Percent of sample)



Sources: Authors' calculations based on data from January 1970 through May 2024.
Notes: Chart shows share of sample in easing and tightening phases, including the portion of each for which policy is "on hold" before a turning point. "On hold" is the period after the last rate increase during a tightening phase, or after the last rate decrease and end of any QE programs during an easing phase. Movements in the policy interest rate <0.1 percentage point do not qualify as a change.

Is this longer holding period at the end of the current tightening phase unusual? Or is it typical of historical periods when a large share of economies simultaneously tightens monetary policy, and the shocks behind the tightening have a larger global component (as shown in Section IV.2)? To better place today's long holding period in context, the right side of Chart 18 compares holding periods during the *Highly Synchronized Tightening* periods (initially introduced in Section IV1.1) to all other holding periods before the pandemic (with results for the pandemic already shown).

Before the post-pandemic tightening, the median length of holding periods did not vary based on the degree of global synchronization (although the bottom panel shows that these holding periods comprised a shorter fraction of the overall tightening phase for the more synchronized periods, which tend to be shorter). The most recent post-pandemic, *Highly Synchronized Tightening* continues to stand out as involving an unusually long holding period (by both measures), however, even when compared to earlier *Highly Synchronized Tightening* periods.

VI.2 Premature Adjustments

Next, we examine another measure related to transitioning between phases in a cycle: "premature adjustments." These are periods when the policy rate is adjusted in the opposite direction of the phase (i.e., increasing rates during an easing phase or decreasing rates during a tightening phase), but the rate change does not subsequently meet the criteria to be a turning point denoting the transition to the next phase. In most cases, this is because the rate change is reversed soon afterward.

We focus on two statistics: [68]

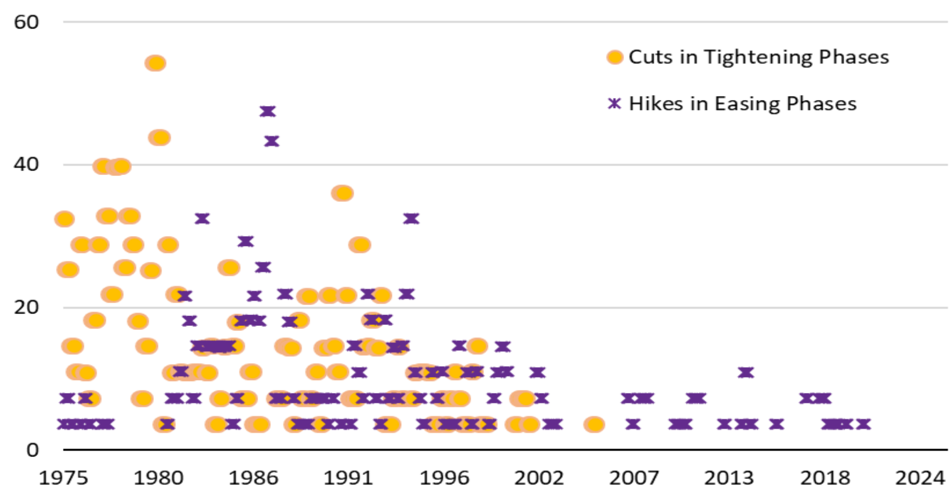
- *Number of Premature Changes*: the number of times the policy rate is adjusted out-of-sync with the phase each quarter (i.e., the number of rate decreases during a tightening phase or the number of rate increases during an easing phase).[69]

- *Share of Premature Changes*: the total number of rate adjustments that are out-of-sync rate with the phase each quarter (as defined above) relative to the total number of economies in the sample.

Chart 20 shows the share of the sample with these out-of-sync rate changes per quarter, with many more *Premature Adjustments* in the first half of the sample. This greater frequency of out-of-sync rate adjustments earlier in the sample reflects a combination of factors: higher interest rates that were more frequently adjusted in both directions; central bank mandates that were focused on targets other than inflation (such as the money supply or the exchange rate); and different measures for policy interest rates that were more sensitive to market pricing in some cases (and not active decisions by the central bank).

Chart 20 Premature Adjustments during Easing and Tightening Phases

(Out-of-sync rate adjustments per quarter as percent of sample)



Sources: Authors' calculations based on data from January 1975 through December 2023.
Notes: Chart shows the number of premature rate changes (i.e., out-of-sync rate adjustments) as a percent of the sample. Premature changes are defined as changes in the policy interest rate >=1 basis point that are rate increases during an easing phase or rate decreases during a tightening phase and which are not identified as turning points that denote a transition to the opposite phase. Euro area economies are included individually through 1998, and then the euro area is included as one economy starting in 1999.

[68] We do not count a QE program that is ended, and then restarted, as a premature adjustment, as ending a QE program could be considered similar to a "hold" for interest rates. Similarly, a hold for interest rates followed by a reduction in interest rates is not considered a premature adjustment.
[69] We continue to only include rate increases/decreases greater than 0.1 percentage point.

More relevant for monetary policy today, however, are patterns in the latter half of the sample, when policy rates were at lower nominal levels, when central banks were more focused on inflation targets, and the policy rate was directly adjusted by central banks at less frequent intervals. Chart 21 provides more detail on each of the out-of-sync adjustments from 1999 through end-2023, with premature hikes (during easing phases) at the top and premature cuts (during tightening phases) at the bottom.

Over the period 1999-2023, there were 52 rate increases during an easing phase that did not translate into a shift to a tightening phase.[70] These are clustered into several distinct windows and occur in 9 of the 13 economies in the sample over this period. If the COVID-19 pandemic had not occurred, the last cluster of *Premature Adjustments* could have been successful turning points that started a tightening phase. It is no surprise that many of these preliminary adjustments occurred in small-open economies, which are more vulnerable to external shocks and tend to have less monetary policy independence.

In contrast to the frequent and broad-based occurrence of *Premature Adjustments* during easing phases since 1998, there are relatively few examples of central banks reducing interest rates during tightening phases and then having to reverse course and/or not successfully transition to an easing phase. More specifically, the bottom of Chart 21 shows that since 1999, there have been only nine *Premature Adjustments* during tightening phases—and only one since 2002. Several of these adjustments were multiple rate cuts in the same country around the same period, such that there were only four distinct episodes when interest rates were cut prematurely: Canada (1999m3 and 1999m5), New Zealand (2001m3, 2001m4, 2001m5, 2001m9, 2001m11), Sweden (2001m9) and the United Kingdom (2005m8).[71]

A closer look at central banks' monetary policy reports around these episodes suggests that premature easings were mainly driven by weak (expected) domestic conditions and low inflation, albeit these often resulted from unfavorable external conditions. The Bank of Canada's interest rate cuts in 1999 were in response to the adverse developments in Asia and the fallout from the Russian debt moratorium, both of which contributed to weak domestic demand and inflation near the lower end of the Bank's target range. The Reserve Bank of New Zealand's rate cuts in 2001 also reflected slowing growth in main trading partners, while the Riksbank's 2001 cuts were primarily a consequence of the 9/11 terrorist attacks in the United States.

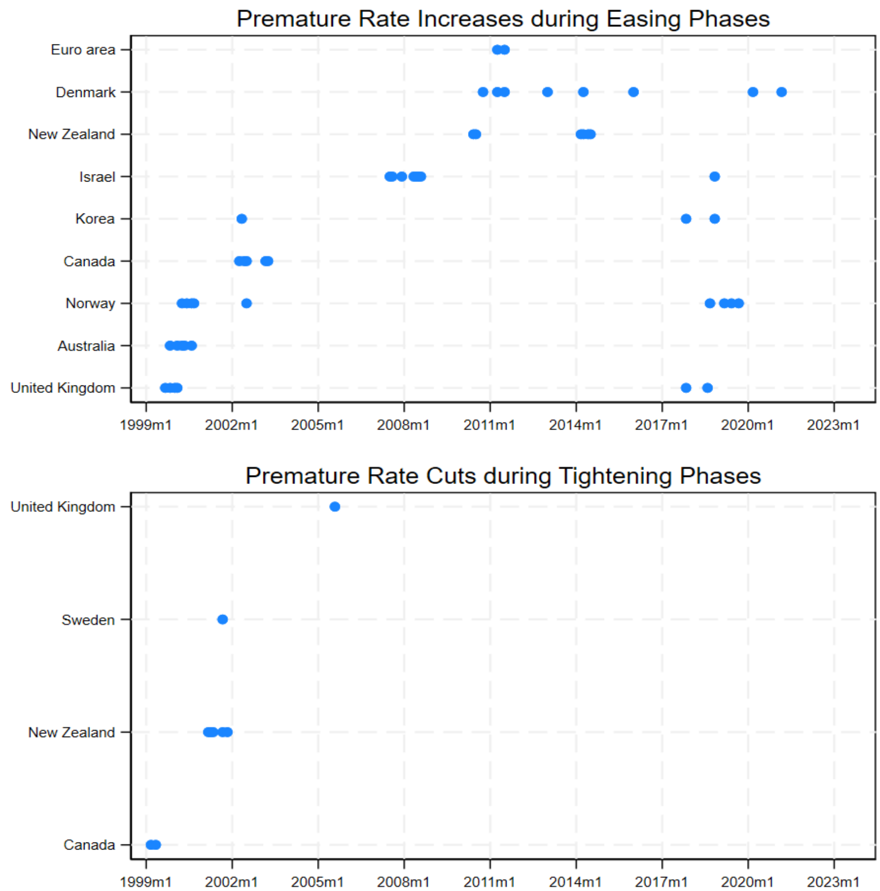
Do these economies with out-of-sync rate adjustments show a different evolution of measures of activity and inflation before their premature adjustments? To test this, we repeat the analysis of Section III examining the evolution of six macroeconomic variables around turning points, except now define t=0 using two metrics: (a) when a rate change is a premature adjustment (defined above); or (b) when a rate change is a successful exit (i.e., a transition to the next phase of the cycle).

[70] We do not include very recent adjustments to policy rates that are likely to qualify as turning points when more time has passed, i.e., the reductions in policy interest rates in Israel, Sweden, and Switzerland and the increase in Japan since the start of 2024.

[71] It is worth noting that this last premature adjustment during a tightening phase occurred when a country attempted to cut rates with a majority of the sample (including the United States) in a tightening phase.

Chart 21 Premature Adjustments: 1999-2023

Policy rate increases during easing phases and decreases during hiking phases



Sources: Authors' calculations based on data from January 1999 through December 2023. Notes: Graph shows each case when an economy increased (decreased) rates by at least 0.1 percentage point during an easing (tightening) phase. We do not include rate adjustments in 2024, which could become a successful exit and transition to the next phase.

The results depend on the time period considered—which is not surprising given the small number of independent observations for premature adjustments (especially for tightening phases since 1999). Focusing on longer sample periods (such as starting in 1975 or 1990), measures of activity are generally similar for both groups before the rate adjustment at t=0, but inflation is higher (particularly core inflation) in economies that subsequently reverse their rate cuts. Also, countries that make preliminary adjustments often see more deterioration in the labor market relative to countries that successfully exit a tightening phase. Granted, these are only rough comparisons of economic trends around rate adjustments and do not incorporate any forward-looking information that is critical to central bank decisions, but they are consistent with inflation (and particularly core inflation) playing a role in whether a rate adjustment is premature versus becoming the turning point to a new cycle.

VI.3 Highly Synchronized Tightening Periods: Exits and Divergence

Countries can exit from an easing or tightening phase for a range of reasons—from slow-moving domestic developments that merit modest changes in rates toward an equilibrium level, to a global pandemic, supply shock, or financial crisis that merits a sharp adjustment in rates. We focus on one type of exit that is most relevant for economies today—when central banks transition from a synchronized global tightening phase to an easing phase. More specifically, we focus on how countries exited from the four *Highly Synchronized Tightening* periods (defined in Section IV), including the extent of divergence across economies as well as relative to the US exit. Then we focus on one period that shares some similarities with what is occurring in 2024 in terms of several advanced economies cutting rates before the United States—the exit from the 1979-80 tightening phase.

To begin, Chart 22 shows the date of each economy's exit from the four *Highly Synchronized Tightening* periods (starting in 1979m4, 1988m8, 2000m1, and 2005m10). More specifically, each turning point is the date of the rate cut that starts the easing phase after the tightening linked to the date listed at the top.[72] The turning point for the United States is in red and for the euro area in blue. The marker for each country denotes if a country is an "early easer" (i.e., reduces rates before the United States), a "US tracker" (i.e., reduces rates within 6 months of the first US rate cut); or "late easer" (i.e., reduces rates more than 6 months after the United States).

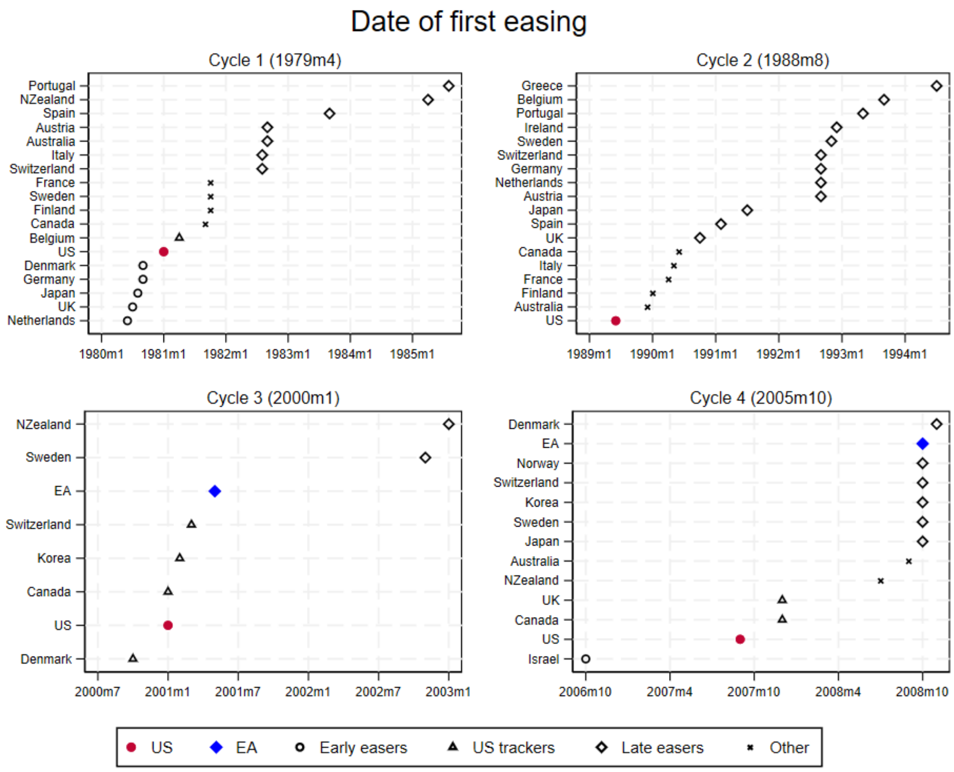
These graphs show several noteworthy patterns. First, the United States is usually one of the earliest—if not the earliest—to cut interest rates after a *Highly Synchronized Tightening* period. The United States was the first to cut rates after the 1988 tightening, tied for second (after Denmark) after the 2000 tightening, and second (after Israel) after the 2005 tightening. The only one of these four periods when multiple central banks lowered interest rates before the United States was after the 1979 tightening, when the Netherlands, the United Kingdom, Japan, Denmark, and Germany all cut rates before the United States. Since the creation of the ECB, the euro area had not reduced interest rates before the Federal Reserve after a *Highly Synchronized Tightening* period until 2024.

Another noteworthy pattern in Chart 22 is the bunching of exits. During some windows, a large number of economies suddenly reduce rates and shift to an easing phase simultaneously. A closer look at the dates suggests why; these "bunches" reflect the start of a global recession or other types of adverse shocks—such as the fall of 1982 (a global recession), fall of 1992 (the collapse of the Exchange Rate Mechanism), spring of 2001 (global downturn), and fall of 2008 (Global Financial Crisis). These patterns highlight an important point—a sharp, *Highly Synchronized Tightening* period is often followed by a global recession or financial crisis. These types of exits from the tightening phases are not a gradual process spread over time, but a rapid shift from tightening to easing as the economic environment deteriorates.

[72] An economy only has a turning point if it was defined as being in a tightening phase at some point in the relevant *Highly Synchronized Tightening* period, with the dates listed in Section IV.1.1.

Chart 22 Turning Points after Highly Synchronized Tightening Periods

Date of exit that starts an easing phase

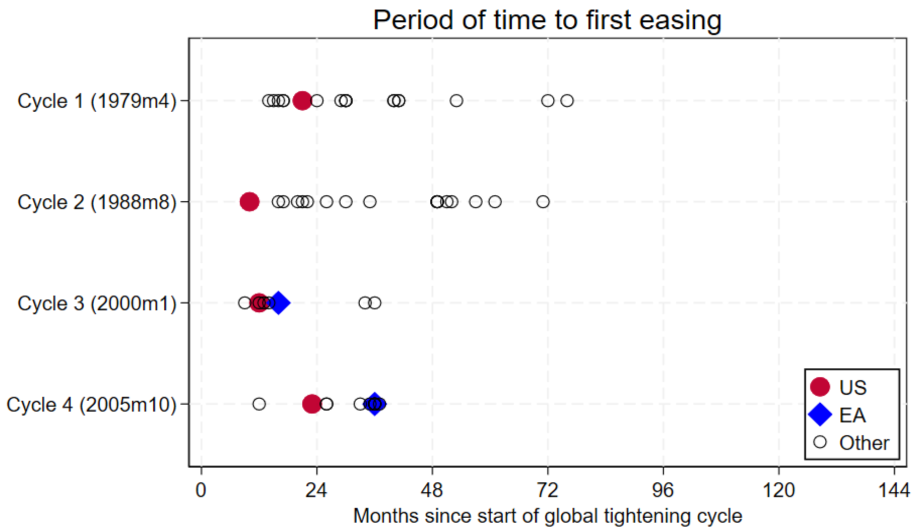


Sources: Authors' calculations. Notes: Each cycle is a "Highly Synchronized Tightening" period, as defined in Section IV.1.1. "Early easers" shift to an easing phase before the United States; "US trackers" shift within 6 months of the United States, and "Late easers" shift more than six months after the United States.

Next, Chart 23 combines the turning points from Chart 22 into one graph, using event time on the x-axis and t=0 denoting the start of each *Highly Synchronized Tightening* period. This chart again accentuates that the United States is usually one of the earliest economies to decrease rates and shift to an easing phase. The graph also shows, however, very different degrees of divergence in terms of the length of time from the first country exiting the tightening phase until the last. The exits from the 1979 and 1988 tightening phases were much more spread out over time than after the 2000 and 2005 tightening phases. Exits after the 1979 and 1988 tightening periods extended across roughly 6 years, double the 3 years during which all countries exited after the 2000 and 2005 tightening periods. Even these shorter windows, however, are substantially longer than current market expectations for when the advanced economies in our sample will begin cutting interest rates.

Chart 23 Time to Exit after a Highly Synchronized Tightening Period

Months to start of easing phase



Sources: Authors' calculations. Notes: Denotes months from the start of the cycle (listed at the left) to the rate cut denoting the turning point that starts the subsequent easing phase. Each cycle is a "Highly Synchronized Tightening Period," as defined in Section IV.1.1.

What determines if an economy tends to "follow the Fed" when shifting from a *Highly Synchronized Tightening* period to an easing phase? At a very high level, and ignoring many other important considerations for monetary policy, economies with weaker economic activity, a softer labor market, and lower inflation would be more likely to lower rates earlier. To test this, we focus on the evolution of the macroeconomic variables studied in previous sections (defined in Section III.1.2) for "early easers" versus "later easers" (defined above).[73] We focus on the first *Highly Synchronized Tightening* period (beginning in 1979), as this is the only period when several economies lowered rates before the United States, allowing us to evaluate differences for "early easers".

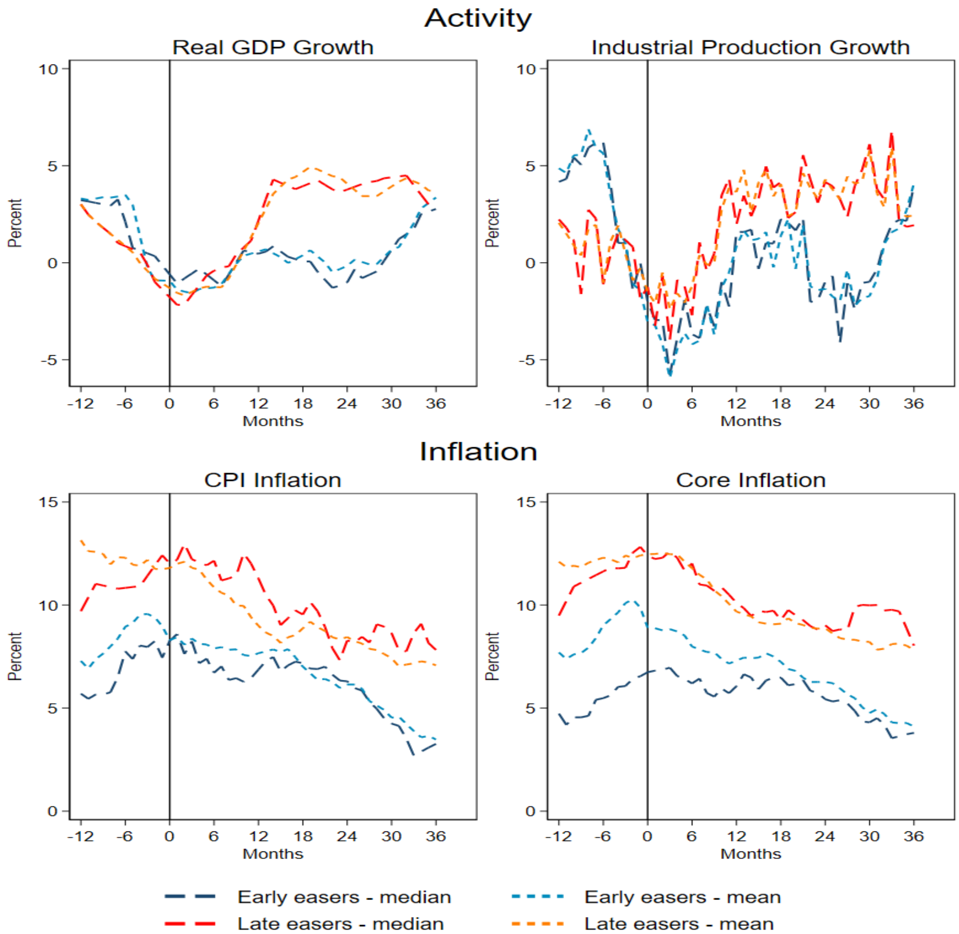
Chart 24 suggests that the variable most correlated with whether countries cut rates before the United States, or waited until much later, was inflation. More specifically, at the start of their easing phases, the median inflation rate for countries that waited more than 6 months after the United States to cut rates was double that of countries that cut rates before the United States.[74] In contrast, GDP growth and IP growth was similar at t=0 for "early easers" and "later easers" before the first rate cut (albeit IP growth had been declining more quickly beforehand in early easers). Inflation appeared to be more important than activity or the labor market in determining when countries start reducing interest rates after this global tightening phase.

[73] We do not report results for the labor market as the corresponding data is only available for one "early easer" for the 1979 tightening period.

[74] Countries that reduced rates around the same time as the United States had inflation rates very similar to the "early easers" in the year before the first rate cut.

Chart 24 Macroeconomic Variables: Early vs. Late Exits from 1979 Synchronized Tightening

Means and medians for country groups based on start of easing phase



Sources: Authors' calculations. Notes: Graphs shows mean and median values for each economic variable for two groups of economies: (1) "Early easers" are economies which shifted to an easing phase before the United States and (2) "Late easers" shifted more than six months after the United States. Date is set with t=0 as the start of the easing phase for the relevant economy. See Section III.1.2 for definitions of macroeconomic variables.

This pattern of economies with lower inflation being more likely to cut interest rates and exit a tightening phase earlier appears to also apply to today. As of June 18, 2024, six of the twelve economies in our sample that have been in a tightening phase since 2022 have reduced interest rates at least once: Israel, Switzerland, Sweden, Canada, Denmark and the euro area. Average CPI and core inflation rates are 2.6% and 2.1% for this group of "early easers", with inflation close to targets for most economies (and core inflation below 2% in half). In contrast, average CPI and core inflation is 3.2% and 3.6%, respectively, in the six economies that have been in a tightening phase but not reduced interest rates. CPI inflation is 3% or higher in four of these economies, and core inflation is 3% or higher in five (and close to 4% in half). Of course, there are many other factors that determine the appropriate time to cut rates (including better measures to capture underlying inflationary pressures and inflation expectations) and this is a very simplistic exercise, but it also suggests that current inflation can be an important guidepost for determining the relative timing of exits from a tightening phase.

VII. Conclusions: Insights for Policy Today

In order to place today's monetary policy cycle in the historical context, this paper uses a range of approaches, from applying business cycle methods to identify and analyze turning points in rate cycles, to time-series techniques employing dynamic factor and factor-augmented vector autoregressive (FAVAR) models to analyze the sources of these rate cycles. The insights resemble those from the parable of "the blind men introduced to an elephant"; the most applicable comparison (and corresponding response strategy) varies based on your specific perspective.[75]

Today's monetary policy cycle in advanced economies is unique from many perspectives—but also shares some important similarities with cycles from earlier periods. This section summarizes the key insights from these multifaceted historical comparisons relevant for central bank strategies today as they transition out of a period of globally synchronized tightening. To avoid ending up as the blind men disagreeing about the elephant, it is necessary to view today's rate cycle from several different angles. In this way, a mosaic emerges that allows one to better understand this cycle's unique features, as well as its similarities to prior experiences.

The post-pandemic tightening in monetary policy has been unprecedented in many dimensions. It involved the most synchronized period of rate increases over the 55 years in our sample of advanced economies. This was in response to the strongest initial rebound in economic activity (measured using several metrics), along with the fastest acceleration in inflation. This transition from actively easing to actively tightening monetary policy was also the fastest pivot in any historical period—with a median of only 3 months from the last easing (through rate cuts or asset purchases) to the first rate hike. Nonetheless, this shift to tightening was still unusually late based on comparisons of the evolution of economic activity, labor markets, and inflation to that at the start of prior tightening episodes. The subsequent tightening phase was the most aggressive by most characteristics since the 1990s, reversing the previous trend of tightening phases becoming more muted over time. Rates have also been held constant at their peaks for longer than has occurred at the end of historical tightening phases.

These unusual characteristics of this most recent monetary policy cycle reflect an equally unusual confluence of shocks starting in 2020, combined with a long-term and slow-moving backdrop of interest rates becoming more globalized since 1970. Global shocks explained about 65 percent of the variation in interest rates over 2020-23 (the first time that these shocks contributed to over half of the variation in interest rates) and 80 percent of the increases in interest rates during the 2022 tightening phase. This is not only substantially more than historical precedents, but substantially more than earlier highly synchronized tightening phases. These recent global shocks included unusually large contributions of global supply and oil price shocks—more than double their contribution during the well-known oil price shocks in the 1970s and 1980s. This prominent role for global shocks post-2020, however, also occurred against the backdrop of a multi-decade trend of increased synchronization of interest rates, with the contribution of the global interest rate factor roughly tripling from the start of our sample to before the 2020 pandemic.

---

[75] There are several different versions of this parable. The common theme is that several blind men are allowed to touch one part of an elephant and their resulting description varies widely based on what they touch. For example, the man touching the trunk compares it to a snake, the man touching the leg compares it to a tree trunk, the man touching the body compares it to a wall, and the one touching the tail compares it to a rope. In some versions, the men come to blows over their disagreements—a lesson on the importance of understanding the whole picture and not an isolated view.

While it would be easy to stop here and simply describe the current monetary policy cycle as unique, what also emerges from this multifaceted analysis are several key similarities between the post-pandemic tightening phase and certain historical periods. The aggressive tightening in monetary policy after the pandemic is a reversion to historical tightening phases by most measures (such as the number, initial velocity, average pace, and overall amplitude of rate hikes) after unusually muted tightening phases since 2008. As in the last few years, demand shocks—both global and domestic in origin—explain the lion's share of the variation in interest rates across most of the sample, particularly during tightening phases. While global shocks have played an increasing role since the 1970s, and become dominant since 2020, this primarily reflects a continuation of the increasing significance of global demand shocks—not the much-discussed oil price and other supply shocks.

Perhaps most important, after the unprecedented swings in activity and inflation since 2020, most macroeconomic variables are now returning to levels typical of this stage of a tightening phase (on average across our sample of advanced economies). If one simply compared these average macroeconomic measures at this point in a tightening phase, and ignored the paths since $t=0$ (the date of the first rate hike), today's tightening phase would not appear unusual. Of course, these averages mask important difference across individual countries, but it is a striking return to normalcy after a period of many economic records.

These historical precedents are also useful for putting today's exit from a period of aggressive monetary policy tightening in context. There have been four episodes of highly-synchronized global tightening in monetary policy in advanced economies since 1970; in only one case—after the 1979-80 tightening—did several economies shift to an easing phase before the United States.[76] In this case, there was substantial divergence in when countries transitioned to easing—with initial rate cuts spread out over almost three years. The main distinction between countries that cut rates before the United States versus after was inflation; economies which cut earlier had meaningfully lower headline and core CPI inflation, but did not have meaningful differences in other measures of economic activity--including for the labor market.

These insights from historical rate cycles have several direct implications for monetary policy today. First, even though central banks were slower to start tightening monetary policy than in past cycles (and with the benefit of hindsight), the subsequent aggressive path of rate hikes and unusually long period holding rates constant at higher levels seems to have caught them up.

But second, and closely related, any recalibration of interest rates going forward should be gradual (barring any unexpected shocks), taking into account domestic circumstances and the substantial uncertainty as to whether rate cycles have reverted to pre-2008 patterns. This could involve substantial divergence in when individual economies adjust rates. In the one historical precedent when several economies started easing policy before the United States following a period of a highly synchronized global tightening, there was substantial divergence in when economies began cutting rates, with the timing of rate cuts correlated with inflation rates.

Third, although central bank mandates focus on domestic inflation, monetary policy decisions are likely to increasingly be influenced by global shocks. While the global shocks behind the recent swings in inflation and monetary policy were unprecedented, this is against a backdrop of a greater globalization in policy rates over time. This reflects not only larger global shocks, but a larger sensitivity of domestic policy rates to these global shocks. This is unlikely to change. Policy

[76] This is also a useful comparison to today as global oil and supply shocks were important, although there are also important differences, i.e., the monetary framework and anchoring of inflation expectations.

interest rates can—and should—still diverge to reflect domestic economic conditions, but this divergence will be around a larger, shared global component.

Finally, this increased global component in monetary policy does not necessarily imply that central banks will be responding more to global supply shocks (including oil and other commodity shocks). Instead, global shocks will likely continue to be predominantly demand shocks—as occurred during the 2020-24 rate cycle. Correctly identifying the components of global shocks that are demand versus supply is important as this decomposition could imply different monetary policy responses—with supply shocks generally requiring a more muted response (albeit subject to the characteristics of the shock and state of the economy, as discussed in Bandera et al., 2023). It is possible that overestimating the supply component of the post-2021 global shocks resulted in a slower-than-optimal response to the post-pandemic inflation. Granted, identifying global supply and demand shocks in real time is challenging, especially during periods of heightened macroeconomic volatility. Improving our ability to accurately identify these global demand and supply shocks will be increasingly crucial, however, as international factors are likely to continue to play an outsized role in the determinants of interest rates and inflation.

References

Afrouzi, H., M. Halac, K. Rogoff, and P. Yarad. 2023. "Monetary Policy Without Commitment." NBER working paper 31207.

Adrian, T., and Estrella, A., (2008), "Monetary Tightening Cycles and the Predictability of Economic Activity", Economics Letters, Vol. 99, No. 2, pp. 260-64.

Antolín-Díaz, J., and Rubio-Ramírez, J. F., (2018), "Narrative Sign Restrictions for SVARs", American Economic Review, Vol. 108, No. 10, pp. 2802-29.

Aruoba, S. B., and Drechsel, T., (2024), "The Long and Variable Lags of Monetary Policy: Evidence from Disaggregated Price Indices". Unpublished mimeo, University of Maryland.

Auer, R. A., Levchenko, A. A., and Sauré, P., (2019), "International Inflation Spillovers through Input Linkages", Review of Economics and Statistics, Vol. 101, No. 3, pp. 507-21.

Avdjiev, S., Gambacorta, L., Goldberg, L., and Schiaffi, S., (2020), "The shifting drivers of global liquidity", Journal of International Economics, Vol. 125, 103324.

Baffes, J., Kose, M. A., Ohnsorge, F., and Stocker, M., (2015), "The Great Plunge in Oil Prices—Causes, Consequences, and Policy Responses", Policy Research Note 1, World Bank, Washington, DC.

Ball, L., (2011), "The Performance of Alternative Monetary Regimes." Handbook of Monetary Economics, Elsevier Press, Volume 3B, pp. 1303-1343.

Bandera, N., Barnes, L., Chavaz, M., Tenreyro, S. and von dem Berge, L., (2023), "Monetary policy in the face of supply shocks: the role of inflation expectations", Sintra ECB Forum working papers.

Benigno, P., and Eggertsson, G., (2023), “It’s Baaack: The Surge in Inflation in the 2020s and the Return of the Non-Linear Phillips Curve.” NBER Working Paper No. 31197, National Bureau of Economic Research, Cambridge, MA.

Bernanke, B., 2004. “The Great Moderation,” Remarks at the Meetings of the Eastern Economic Association, Washington, February 20.

Bernanke, B., and Gertler, M., (1989), “Agency Costs, Net Worth, and Business Fluctuations.” American Economic Review, Vol. 79, No. 1, pp. 14-31

Bernanke, B., and Blanchard, O., (2024), “Analysing the Inflation Burst in Eleven Economies.” In B. English, K. Forbes and A. Ubide, eds., Monetary Policy Responses to the Post-Pandemic Inflation. CEPR.

Bernanke, B., and Mishkin, F., (1992), “Central Bank Behavior and the Strategy of Monetary Policy: Observations from Six Industrialized Countries”, NBER Macroeconomics Annual 1992, Vol 7.

Bernanke, B., Boivin, J., and Eliasz, P., (2005), “Measuring the Effects of Monetary Policy: A Factor-Augmented Vector Autoregressive (FAVAR) Approach”, Quarterly Journal of Economics, Volume 120, No. 1, pp. 387-422,

Bernanke, B., and Mihov, I., (1998), “Measuring Monetary Policy”. Quarterly Journal of Economics Vol. 113, No. 3, pp. 869-902.

BIS (Bank for International Settlements), (2019), “Large Central Bank Balance Sheets and Market Functioning,” Markets Committee Report prepared by a Study Group chaired by Lorie Logan and Ulrich Bindsell, October, Annex Tables D1 and D2.

Brimmer, A. F., (1983), “Monetary Policy and Economic Activity: Benefits and Costs of Monetarism", American Economic Review, Vol 73, No. 2, pp. 1-12.

Burns, A. F., and Mitchell, W. C., (1946), “Measuring Business Cycles,” New York, National Bureau of Economic Research, Cambridge, MA.

Bry, G., and Boschan, C., (1971), Cyclical Analysis of Time Series: Selected Procedures and Computer Programs. Cambridge, MA: National Bureau of Economic Research.

Caldara, D., Ferrante, F., Iacoviello, M., Prestipino, A., and Queralto, A., (2024), “The international spillovers of synchronous monetary tightening”, Journal of Monetary Economics, 141, pp. 127-52.

Carriero, A., and Corsello, F., and Marcellino, M., (2019), “The Global Component of Inflation Volatility”, CEPR Discussion Paper No. DP13470.

Castelnuovo, E., and Surico, P., (2010), "Monetary Policy, Inflation Expectations and The Price Puzzle”, Economic Journal, Royal Economic Society, Vol. 120, No. 549, pp. 1262-83.

Charnavoki, V., and Dolado. J. J., (2014), “The Effects of Global Shocks on Small Commodity- Exporting Economies: Lessons from Canada”, American Economic Journal: Macroeconomics Vol. 6, No. 2, pp. 207-37.

Chatterjee, A., (2016), “Globalization and monetary policy comovement: International evidence”, Journal of International Money and Finance, 68, pp.181-202.

Christiano, L. J., Eichenbaum, M., and Evans, C. L., (1999), “Monetary policy shocks: What have we learned and to what end?” Handbook of Macroeconomics, Vol. 1, pp. 65–148.

Ciccarelli, M., and Mojon, B., (2010), “Global Inflation”, The Review of Economics and Statistics, Vol. 92, No. 3, pp. 524-35.

CGFS (Committee on the Global Financial System), (2019), “Unconventional Monetary Policy Tools: A Cross-Country Analysis,” CGFS Papers No. 63, October. Annex 2.

Claessens, S., and Forbes, K., (2001), “International Financial Contagion: An Overview of the Issues and the Book,” in S. Claessens and K. Forbes, eds., International Financial Contagion, Boston: Kluwer Academic Press.

Claessens, S., and Kose, M. A, (2018), “Frontiers of Macro-Financial Linkages,” BIS Paper No. 95, Bank for International Settlements Publications.

Claessens, Stijn, Kose, M. A, and Terrones, M., (2009), “What Happens During Recessions Crunches and Busts?” Economic Policy. Vol. 24, pp 653-700.

Claessens, S., Kose, M. A, and Terrones, M., (2011), “Financial Cycles: What? How? When?”, NBER International Seminar on Economics. Vol. 11, Available at https://www.journals.uchicago.edu/doi/10.1086/658308

Claessens, S., Kose, M. A, and Terrones, M., (2012), “How Do Business and Financial Cycles Interact?” Journal of International Economics. Vol. 87, pp 178-90.

Clarida, R., Gali, J., and Gertler, M., (1999), “The Science of Monetary Policy: A New Keynesian Perspective”, Journal of Economic Literature, Vol. 27, pp. 1661-707.

Cogley, T., and Sargent, T. J., (2005), “Drifts and Volatilities: Monetary Policies and Outcomes in the Post WWII US”, Review of Economic Dynamics, Vol. 8, No. 2, pp. 262-302.

Cook, T., and Hahn, T., (1989), “The Effect of Changes in the Federal Funds Rate Target on Market Interest Rates in the 1970s”, Journal of Monetary Economics 24, pp. 331-351.

Crucini, M. J., Kose, M. A., and Otrok, C., (2011), “What are the driving forces of international business cycles?”, Review of Economic Dynamics, Vol. 14, No. 2, pp. 156-75.

Dees, S., Pesaran, M. H., Smith, L. V., and Smith, R., (2010), "Supply, Demand and Monetary Policy Shocks in a Multi-country New Keynesian model", ECB Working Paper, No. 1239.

Del Negro, M., Eusepi, S., Giannoni, M. P., Sbordone, A. M., Tambalotti, A., Cocci, M., and Linder, M., (2013), "The FRBNY DSGE Model", Federal Reserve Board of New York Staff Report 647.

Del Negro, M., Gleich, A., Goyal, S., Johnson, A., and Tambalotti, A., (2022), "Drivers of Inflation: The New York Fed DSGE Model's Perspective," Federal Reserve Bank of New York Liberty Street Economics.

de Soyres, F., and Saijid, Z., (2024), "Lessons from Past Monetary Easing Cycles," FEDS Notes, Board of Governors of the Federal Reserve System, May 31, 2024.

Di Giovanni, J., Kalemli-Özcan, S., Silva, A. and Yıldırım, A., (2022), "Global Supply Chain Pressures, International Trade and Inflation," ECB Forum on Central Banking.

Di Giovanni, J., Kalemli-Özcan, S., Silva, A., and Yildirim, M. A., (2023), "Pandemic-Era Inflation Drivers and Global Spillovers." NBER Working Paper 31887, National Bureau of Economic Research, Cambridge, MA.

Deutsche Bundesbank, (2020), "Patterns of international business cycles", Monthly Report, October 2020, pp. 41-65.

Du, W., Forbes, K., and Luzzetti, M., (2024), "Quantitative Tightening Around the Globe: What Have We Learned?", NBER Working Paper 32321, National Bureau of Economic Research, Cambridge, MA.

Duval, M. R. A., Cheng, M. K. C., Oh, K. H., Saraf, R., and Seneviratne, M., (2014), "Trade integration and business cycle synchronization: A reappraisal with focus on Asia", International Monetary Fund.

English, W., Forbes, K., and Ubide, A., (2024), "Monetary Policy Responses to the Post-Pandemic Inflation", CEPR (February).

English, W., Forbes, K., and Ubide, A., (2021), "Monetary Policy and Central Banking in the Covid Era", CEPR (March).

Estrella, A. (2022). "Yield Curve Spreads and the Risk of Recession." Finance, Economics and Monetary Policy Discussion Papers, No. 2201, Federal Reserve Board.

European Central Bank, (2019), "Characterising the current expansion across non-euro area advanced economies: Where do we go from here?, Economic Bulletin, 2/201.

Federal Reserve Bank of San Francisco (2004), "How Did the Fed Change Its Approach to Monetary Policy in the Late 1970s and Early 1980s?" Economic Research Department.

Fernández-Villaverde, J., Guerrón-Quintana, P. A., and Rubio-Ramírez. J., (2010). “Reading the Recent Monetary History of the U.S., 1959-2007.” NBER Working Paper 15929, National Bureau of Economic Research, Cambridge, MA.

Ferreira, T., and Shousha, S., (2023), “Determinants of Global Neutral Interest Rates”, Journal of International Economics 145, 103833.

Forbes, K., (2019a), “Commentary: Riders on the Storm”. Challenges for Monetary Policy, Symposium in Jackson Hole, WY organized by the Federal Reserve Bank of Kansas City, pp. 61-81.

Forbes, K., (2019b), “Inflation Dynamics: Dead, Dormant, or Determined Abroad?”, Brookings Papers on Economic Activity, Fall, pp. 257-338.

Forbes, K., Gagnon, J., and Collins, C., (2022), Low Inflation Bends the Phillips Curve Around the World,” Economia Volume Vol. 45, No. 89, pp. 52-72.

Forbes, K., Hjortsoe, I., and Nenova, T., (2018), “The Shocks Matter: Improving Our Estimates of Exchange Rate Pass- Through”, Journal of International Economics, Vol. 114, pp. 255-75.

Forbes, K., Hjortsoe, I. and Nenova, T. (2020), “International Evidence on Shock-Dependent Exchange Rate Pass-through”, IMF Economic Review, Vol. 68. No. 4, pp. 721-63.

Forbes, K., and Warnock, F., (2012), “Capital Flow Waves: Surges, Stops, Flight and Retrenchment”, Journal of International Economics, Vol. 88, pp. 235-51.

Forbes, K., and Warnock, F., (2021), “Capital Flow Waves—or Ripples? Extreme Capital Flow Movements Since the Crisis”, Journal of International Money and Finance, Vol. 116, 102394.

Frankel, J., and Rose, A., (1998), “The Endogeneity of the Optimum Currency Area Criteria”, Economic Journal, Vol. 108, pp. 1009–25.

Friedman, M. (1982). Monetary policy: Theory and practice. Journal of Money, Credit and Banking, Vol. 14. No. 1, pp. 98-118.

Fratto, C., Vannier, B. H., Mircheva, B., de Padua, D., Poirson Ward, H., (2021), “Unconventional monetary policies in emerging markets and frontier countries”, IMF Working Paper 2021/014.

Friedman, M. (1961), “The lag in effect of monetary policy,” Journal of Political Economy, Vol. 69, pp. 447–66.

Fry-McKibbin, R., McKinnon, K., and Martin, V. L., (2022), “Measuring Global Interest Rate Comovements with Implications for Monetary Policy Interdependence”, RBA Annual Conference Papers, Reserve Bank of Australia.

Furlanetto, F., and Lepetit., A., (2024), “The Slope of the Phillips Curve", Finance and Economics Discussion Series No. 43. Federal Reserve Board.

Gagliardone, L., and Gertler, M., (2023), “Oil prices, monetary policy and inflation surges”, NBER Working Paper 31263, National Bureau of Economic Research, Cambridge, MA.

Gambetti, L., Pappa, E., and Canova, F., (2008), “The Structural Dynamics of U.S. Output and Inflation: What Explains the Changes?”, Journal of Money, Credit and Banking, Vol. 40, No. 2-3, pp. 369-88.

Garratt, A., Lee, K., Mise, E., and Shields, K., (2008), “Real-time representations of the output gap”, Review of Economics and Statistics, 90 (4), pp. 792-804.

Gerlach, S., and Smets, F., (1995), “The Monetary Transmission Mechanism: Evidence from the G-7 countries”, BIS Working Papers 26, Bank for International Settlements.

Giannone, D., and Primiceri, G., (2024), “The drivers of post-pandemic inflation”, Paper prepared for the 2024 ECB conference in Sintra, Portugal.

Goldberg, L., and Krogstrup, S., (2019), “International capital flow pressures”, NBER Working Paper 24286, National Bureau of Economic Research, Cambridge, MA.

Ha, J., Kose, M. A., and Ohnsorge, F., eds., (2019), Inflation in Emerging and Developing Economies: Evolution, Drivers, and Policies, Washington, DC: World Bank.

Ha, J., Kose, M. A., and Ohnsorge, F., (2021), “Inflation during the Pandemic: What Happened? What Is Next?”, CEPR Discussion Paper 16328.

Ha, J., Kose, M. A., and Ohnsorge, F., (2022), “Global Stagflation”, CEPR Discussion Paper 17381.

Ha, J., Kose, M. A., and Ohnsorge, F., (2023), “One-stop Source: A Global Database of Inflation”, Journal of International Money and Finance, Vol. 137.

Ha, J., Kose, M. A., Ohnsorge, F., and Yilmazkuday, H. (2023), “Understanding the Global Drivers of Inflation: How Important Are Oil Prices?”, Energy Economics, Vol. 127.

Ha, J., Kose, M. A., Ohnsorge. F., and Yilmazkuday, H. (2024), “What Explains Global Inflation”, IMF Economic Review (forthcoming).

Ha, J., Kose, M. A., Otrok, C., and Prasad, E. S., (2020), “Global Macro-financial Cycles and Spillovers”, NBER Working Paper 26798, National Bureau of Economic Research, Cambridge, MA.

Harding, D., and Pagan, A., (2002), “Dissecting the Cycle: A Methodological Investigation”, Journal of Monetary Economics, Vol. 49, pp. 365–81.

Hartmann, P., and Smets, F., (2018), “The First Twenty Years of the European Central Bank: Monetary Policy”, Working Paper 2219, European Central Bank.

Havranek, T., and Rusnak, M., (2013), “Transmission Lags of Monetary Policy: A Meta-Analysis”, International Journal of Central Banking, Vol. 9, No. 4, pp. 39-76, December.

Henriksen, E., Kydland, F. E., and Šustek, R., (2013), “Globally correlated nominal fluctuations”, Journal of Monetary Economics, Vol. 60, pp. 613-31.

Hobijn, B., Miles, R., Royal, J., and Zhang, J., (2023), “The Recent Steepening of Phillips Curves.” Chicago Fed Letter, Vol. 475.

Imbs. J., (2006), “The Real Effects of Financial Integration”, Journal of International Economics, Vol. 68, No. 2, pp. 296–324.

Jarociński, M., and Karadi, P. 2020. Deconstructing monetary policy surprises—the role of information shocks. American Economic Journal: Macroeconomics 12(2): 1-43.

Jordá, O., Schularick, M., and Taylor, A., (2017), “Macrofinancial History and the New Business Cycle Facts”, NBER Macroeconomics Annual, University of Chicago Press, Vol. 31, No. 1, pp. 213-63.

Jordá, O., and Taylor, A., (2019), “Riders on the Storm”, Challenges for Monetary Policy, Symposium in Jackson Hole, WY, organized by the Federal Reserve Bank of Kansas City.

Kiley, M. T., 2020, "The global equilibrium real interest rate: concepts, estimates, and challenges", Annual Review of Financial Economics 12, pp. 305-26.

Kiyotaki, N, and Moore, J., (1997), “Credit Cycles,” Journal of Political Economy, Vol. 105, pp. 211–48.

Kollmann, R., Lubik, T. and Roeger, W., 2021, "Secular Stagnation, Low Interest Rates and Low Inflation: Causes and Implications for Policy", Journal of Economic Dynamics and Control, Vol 132, No. 104212.

Kose, M. A., Otrok, C., and Whiteman, C. H., (2003), “International Business Cycles: World, Region, and Country-Specific Factors”, American Economic Review, Vol. 93, No. 4, pp. 1216-39.

Kose, M. A., Otrok, C., and Whiteman, C. H., (2008), “Understanding the Evolution of World Business Cycles”, Journal of International Economics, Vol. 75, No. 1, pp. 110-30.

Kose, M. A., Prasad, E., and Terrones, M., (2003), “How does globalization affect the synchronization of business cycles?” American Economic Review, Vol. 93, No.2, pp. 57-62.

Kose, M. A., Otrok, C., and Prasad, E., (2012), “Global Business Cycles: Convergence or Decoupling?”, International Economic Review, Vol. 53, No. 2, pp. 511-538.

Kose, M. A., and Terrones, M., (2015), "Collapse and Revival: Understanding Global Recessions and Recoveries", International Monetary Fund, Washington, DC.

Kose, M. A., Sugawara, N., and Terrones, M. E., (2020), "What Happens During Global Recessions?" in F. Ohnsorge and M. A. Kose, eds., A Decade After the Global Recession, pp. 55-114, Washington, DC: World Bank.

Krippner, L. (2013). "Measuring the Stance of Monetary Policy in Zero Lower Bound Environments." Economics Letters, Vol. 118, No.1, pp. 135-138.

Lane, P. R., (2022), "Monetary policy in the euro area: the next phase." Remarks for high-level panel "High Inflation and Other Challenges for Monetary Policy", Annual Meeting, European Central Bank.

Lenza, M., and Primiceri, G. E., (2022), "How to Estimate a Vector Autoregression After March 2020." Journal of Applied Econometrics Vol. 37, No. 4, pp. 688-99.

Lindenberg, N., and Westermann, F., (2012), "Common Trends and Common Cycles among Interest Rates of the G7-Countries", Journal of Macroeconomics, Vol. 34, No. 4, pp. 1125-40.

Madeira, C., Madeira, J., and Monteiro, P. S., (2023), "The Origins of Monetary Policy Disagreement: The Role of Supply and Demand shocks", Review of Economics and Statistics, pp. 1-45.

Mandler, M., and Scharnagl, M., (2022), Financial Cycles in Euro Area Economies: A Cross-Country Perspective Using Wavelet Analysis. Oxford Bulletin of Economics and Statistics, Vol. 84, No. 3, pp. 569-93.

Melolinna, M., (2015), "What Has Driven Inflation Dynamics in the Euro Area, the United Kingdom and the United States?", ECB Working Paper 1802, European Central Bank.

Miranda-Agrippino, S., and Rey, H., (2020), "The global financial cycle after Lehman", AEA Papers and Proceedings, Vol. 110, pp. 523–28.

Monacelli, T., and Sala, L., (2009), "The International Dimension of Inflation: Evidence from Disaggregated Consumer Price Data", Journal of Money, Credit, and Banking, Vol. 41 (s1), pp. 101-20.

Mumtaz, H., and Surico, P., (2009). "The Transmission of International Shocks: A Factor-Augmented VAR Approach", Journal of Money, Credit and Banking, Vol. 41 (s1), pp. 71-100.

Orphanides, A., and Norden, S. V., (2002), "The unreliability of output-gap estimates in real time," Review of Economics and Statistics, Vol. 84, No. 4, pp. 569-83.

Orphanides, A., (2003), "Historical monetary policy analysis and the Taylor rule", Journal of Monetary Economics, Vol. 50 No. 3, pp. 983-1022.

Rey, H., (2013), “Dilemma not trilemma: the global financial cycle and monetary policy independence,” Technical report, Proceedings - Economic Policy Symposium - Jackson Hole.

Rogoff, K., (2003), “Globalization and Global Disinflation”, Federal Reserve Bank of Kansas City Economic Review, Vol. 88, No. 4, pp. 45-78.

Rogoff, K., (2007), “Impact of Globalization on Monetary Policy”, The New Economic Geography: Effects and Policy Implications, Federal Reserve Bank of Kansas City.

Rogoff, K., (2013), “What’s the Problem with Advanced Economies?” Project Syndicate, December 4.

Romer, C., and Romer, D., (2023), “Presidential Address: Does Monetary Policy Matter? The Narrative Approach after 35 Years”, American Economic Review, Vol. 113, No. 6, pp. 1395-423.

Shapiro, A. H., (2022), “How Much Do Supply and Demand Drive Inflation?” Federal Reserve Bank of San Francisco Economic Letter 15, pp. 1-6.

Smets, F., and Wouters, R., (2007), “Shocks and Frictions in US Business Cycles: A Bayesian DSGE Approach”, American Economic Review Vol. 97, No. 3, pp. 586-606.

Stock, J. H., Watson, M. W., (1999), "Business cycle fluctuations in US macroeconomic time series," Handbook of Macroeconomics, edited by J. B. Taylor and M. Woodford, edition 1, volume 1, pp. 3-64, Elsevier.

Summers, L. H., (2015), “Policy Corner: Have we entered an Age of Secular Stagnation?” IMF Economic Review, Vol: 63, No: 1, 277-280.

Taylor, J. B., (1993), "Discretion versus policy rules in practice". Carnegie-Rochester Conference Series on Public Policy 39: 195–214.

Tenreyro, S., (2023), "The economy and policy trade-offs", LSE Research Online Documents on Economics 117623, London School of Economics and Political Science.

Uhlig, H., (2005), “What Are the Effects of Monetary Policy on Output? Results from an Agnostic Identification Procedure”, Journal of Monetary Economics, Vol. 52, No. 2, pp. 381-419.

Uhlig, H., (2017), “Shocks, Sign Restrictions, and Identification.” Advances in Economics and Econometrics, No. 2, pp. 95-112.

Woodford, M., (2003), Interest and Prices: Foundation of a Theory of Monetary Policy”, Princeton, NJ: Princeton University Press.

World Bank, (2024), Global Economic Prospects, January, World Bank Publications, Washington DC.

Appendix 1: Identification of Rate Cycles

Section II discusses the application of the BBQ algorithm in Harding and Pagan (2002) to identify local maxima and minima in policy interest rates and thereby define rate cycles. A simple application of this algorithm to the data on policy interest rates, however, can be problematic due to several characteristics of the interest rate data—particularly long windows when there is no change in i_t. To address this and more accurately identify the turning points of easing and tightening phases consistent with changes in central bank policy stances, we start with the dates identified in the BBQ algorithm, but then make several adjustments and add additional criteria for a month to qualify as a turning point. This appendix describes the process used to identify the easing and tightening phases in more detail.

First, we apply the BBQ algorithm in Harding and Pagan (2002) to the policy rate data, with one adjustment. Early in the sample, when the policy rate is market-determined in some countries, there are occasionally sharp spikes in the rate that appear to primarily reflect shifts in market sentiment, shifts that are quickly reversed. To avoid classifying these temporary market-based fluctuations as turning points in a cycle, we smooth across these spikes by replacing i_t with $(i_{t+1} + i_{t-1})/2$ if the policy rate changes by more than 500 basis points in one month.

Second, we set three parameters for the BBQ algorithm: (1) the window on each side of a local maxima and minima must be at least 18 months; (2) a full cycle (including both tightening and easing phases) must be at least 36 months; and (3) any individual phase of a cycle (either a tightening or easing phase) must last at least 7 months. The first two criteria require relatively long windows on each side of a turning point and for the full cycle in order to capture changes in policy which are not reversed quickly; this also avoids classifying changes in policy rates that largely reflect market movements as turning points in the policy cycle. The shorter window for individual phases in a cycle, however, still allows short periods when central banks adjust policy rates to qualify as an easing or tightening phase (such as a rapid reduction in rates over one month in response to a shock).

Third, we require i_t to increase or decrease for month t to qualify as the start of a tightening or easing phase, respectively. This requirement sounds obvious—but is necessary as the dating algorithm incorrectly identifies about 10 false "turning points" during long periods when there is no change in interest rates. This requirement is also needed to correctly date turning points when the exact month identified by the algorithm is slightly off due to substantial volatility in the data or the smoothing around spikes (as mentioned above). Also, if any of these adjustments causes a "false" phase to be dropped, then the subsequent phase must also be dropped as an easing phase must be followed by a tightening phase (and vice versa).[77]

Fourth, we require that the change in the policy rate identified as a turning point must be "meaningful or lasting". To qualify as "meaningful or lasting", we require: (a) either a change in rates of at least 50 basis points over one month, or (b) at least one rate changes (of any size) over a year after the first change such that the policy rate is at least 30 basis points higher/lower one

---

[77] For example, the algorithm initially identified Switzerland as starting a tightening phase in July 2016 and starting an easing phase in December 2020—despite there being no change in Switzerland's policy rate from January 2015 (when the rate was lowered to -0.75) through May 2022. Therefore, we drop the falsely identified turning point in July 2016, as well as in December 2020, so that Switzerland remains in an easing phase from 2010 (when it started lowering rates) through May 2022 (when its first rate hike since before 2015 meets the criteria to start a tightening phase).

year after the first change in rates. These dual criteria allow for a turning point to occur if there is only one adjustment in the policy rate but the adjustment is sufficiently large.[78]

These criteria also allow for turning points to occur with more modest and gradual rate adjustments. An example is the Federal Reserve's 25bps rate increase in December 2015, which was not followed by another rate increase for a year (and then followed by a series of rate hikes). It is worth highlighting, however, that several periods when rates are adjusted and then reversed within a year will not meet these "meaningful or lasting" criteria and thereby will not qualify as a turning point. For example, the ECB increased rates 25bps in April 2011 and July 2011, and then lowered rates by the same amounts in November and December of the same year, such that the policy rate in March 2012 was at the same level as in March 2011. The two, short-lived rate hikes do not qualify as a turning point that starts a tightening phase, and are instead classified as a "false start" during a longer easing phase.

Fifth, if a country adopts a new QE program but is not already in an easing phase, or starts a new QT program but is not already in a tightening phase, we allow the announcement of the new program to count as a turning point, i.e., the start of a new easing or tightening phase, respectively, even if there is no corresponding change in the policy rate.[79] In practice, this criteria rarely binds as most central banks lower interest rates before starting QE and raise rates before starting QT, but it could be important if a country is near the lower bound and choses to use balance sheet policy to ease monetary policy instead of lowering rates further.[80]

Finally, we make several adjustments to the start dates of cycles due to challenges using the algorithm at the start of time series or when there is a long period when rates are not adjusted in both directions. This requires three adjustments: (1) Identify the start of Portugal's initial tightening phase as March 1977, which is immediately after the only rate cut over an extended tightening phase (which does not have a clear enough turning point for the algorithm to define the start of the tightening phase); (2) Identify the start of the ECB's initial tightening phase as November 1999, the date of the first rate increase after the April 1999 rate cut and the beginning of a series of rate hikes—a turning point which the algorithm does not capture with the time series

[78] An example is the Bank of Canada 150bps rate cut in March 2020, which was not followed by any subsequent cuts (as rates were at the lower bound).

[79] As discussed in Section II, we only include announcements of new asset purchase programs involving government bonds and primarily intended for monetary policy goals (i.e., not market dysfunction). More specifically, for the US, we include the LSAP for Treasuries (announced March 2009), but do not include the LSAP for agency debt and MBS (announced November 2008) or the Maturity Extension Program in 2011. For the Euro area, we include the OMT (announced August 2012) and PSPP (announced January 2015), but do not include the Corporate Bond Purchase Programme (announced October 2011) or Asset-backed Securities Purchase Program (announced September 2014). For the UK, we include the announcement of the start of QT (February 2022), but do not include subsequent announcements adding active bond sales or about delays and updates around the 2022 LDI crisis. Defining whether an asset purchase program is intended primarily to achieve price stability and support activity (i.e., monetary policy goals) or to provide liquidity and stabilize markets is not always clear, so we include any programs with joint goals. We do not include programs providing short-term liquidity, such as the asset purchases announced by the BoE in response to the LDI crisis in 2022.

[80] In our sample, there are only two episodes when the announcement of a new balance sheet program qualifies as a turning point to identify a new phase. First is the start of an easing phase in Sweden in March 2020, when the Riksbank announced a new QE program but did not lower interest rates (which were at zero). Second is the start of a tightening phase in Sweden in April 2022, when the Riksbank announced the start of QT but did not start raising the policy rate until May.

starting in 1999;[81] and (3) identify the start of Denmark's post-pandemic tightening phase as January 2022, a turning point which is not captured in the algorithm due to the extended prior period with no meaningful change in rates.

[81] We identify cycles for individual members of the euro area based on their policy interest rates through end-1998, at which point their easing or tightening phase is defined as ending. Starting in 1999, the euro area begins its first phase, and the individual member countries no longer have individual phases.

Appendix Table 1 Turning Points: The Start of Tightening and Easing Phases

	Start of Phase	
	Tightening	Easing
Australia	1973m2	1982m9
	1984m2	1986m1
	1988m2	1989m12
	1994m8	1996m7
	2002m5	2008m9
	2009m10	2011m11
	2022m5	
Canada	1973m4	1976m11
	1978m3	1981m9
	1987m4	1990m6
	1997m6	2001m1
	2004m9	2007m12
	2010m6	2015m1
	2017m7	2020m3
	2022m3	
Denmark	1973m7	1977m1
	1979m6	1980m9
	1990m3	1992m12
	1999m11	2000m10
	2005m12	2008m11
	2022m7	
Israel	1993m11	1996m8
	2002m2	2002m12
	2005m9	2006m10
	2009m8	2011m10
	2022m4	
Japan	1973m4	1975m4
	1979m4	1980m8
	1989m5	1991m7
	2006m7	2008m10
Korea, Rep.		1993m5
	1997m12	2001m2
	2005m10	2008m10
	2010m7	2012m7
	2021m8	

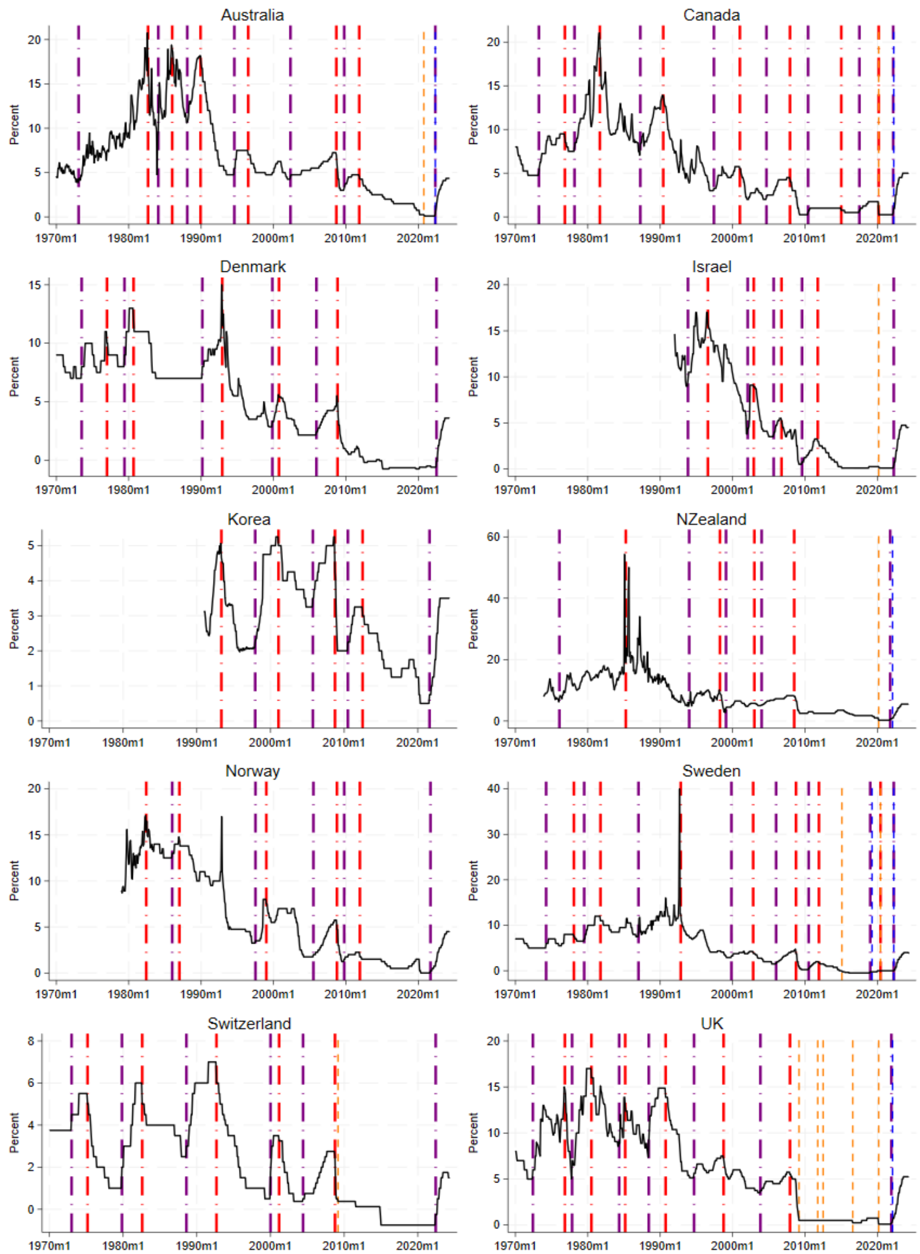
	Start of Phase	
	Tightening	Easing
New Zealand	1976m2	1985m4
	1994m1	1998m4
	1999m2	2003m1
	2004m1	2008m7
	2021m10	
Norway		1982m6
	1986m1	1987m1
	1997m7	1999m1
	2005m7	2008m10
	2009m10	2011m12
	2021m9	
Sweden	1974m4	1978m2
	1979m7	1981m10
	1987m1	1992m11
	1999m11	2002m11
	2006m1	2008m10
	2010m7	2011m12
	2019m1	2020m6
	2022m4	
Switzerland	1973m1	1975m3
	1979m11	1982m8
	1988m8	1992m9
	2000m1	2001m3
	2004m6	2008m10
	2022m6	
United Kingdom	1972m6	1976m11
	1977m11	1980m7
	1984m5	1985m3
	1988m6	1990m10
	1994m9	1998m10
	2003m11	2007m12
	2021m12	
United States	1972m1	1974m7
	1977m1	1981m1
	1983m3	1984m8
	1987m1	1989m6
	1994m2	1995m7
	1999m6	2001m1
	2004m6	2007m9
	2015m12	2019m8
	2022m3	

	Start of Phase	
	Tightening	Easing
Euro area	1999m11	2001m5
	2005m12	2008m10
	2022m7	
Austria	1980m1	1982m9
	1988m7	1992m9
	1975m4	
Belgium	1972m11	1981m4
	1983m11	1985m5
	1988m7	1993m9
Finland	1972m11	1974m7
	1976m1	1981m10
	1988m8	1990m1
France	1972m11	1974m7
	1976m1	1981m10
	1988m8	1990m4
Germany	1972m10	1974m10
	1979m1	1980m9
	1983m9	1985m4
	1988m6	1992m9
	1997m10	
Greece		1982m10
	1984m2	1986m7
	1987m10	1994m7
	1997m6	
Ireland		1986m3
	1988m6	1992m12
Italy	1973m9	1977m6
	1979m10	1982m8
	1987m8	1990m5
	1994m8	1996m7
Netherlands	1972m11	1974m10
	1977m11	1980m6
	1983m5	1985m8
	1988m7	1992m9
	1997m3	
Portugal	1977m3	1985m8
	1989m3	1993m5
Spain	1973m7	1983m9
	1988m9	1991m2
	1995m1	1995m12

Sources: Authors' calculations, based on identification of rate cycles described in Section II, with data from January 1970 – May 2024.Notes: Phases for individual countries in the euro area and the euro area as a whole are in the column on the right. Members of the euro area can have national cycles through 1998, after which phases are reported for the euro area as a whole.

Appendix Chart 1 Rate Cycles: Advanced Economies, non-euro area

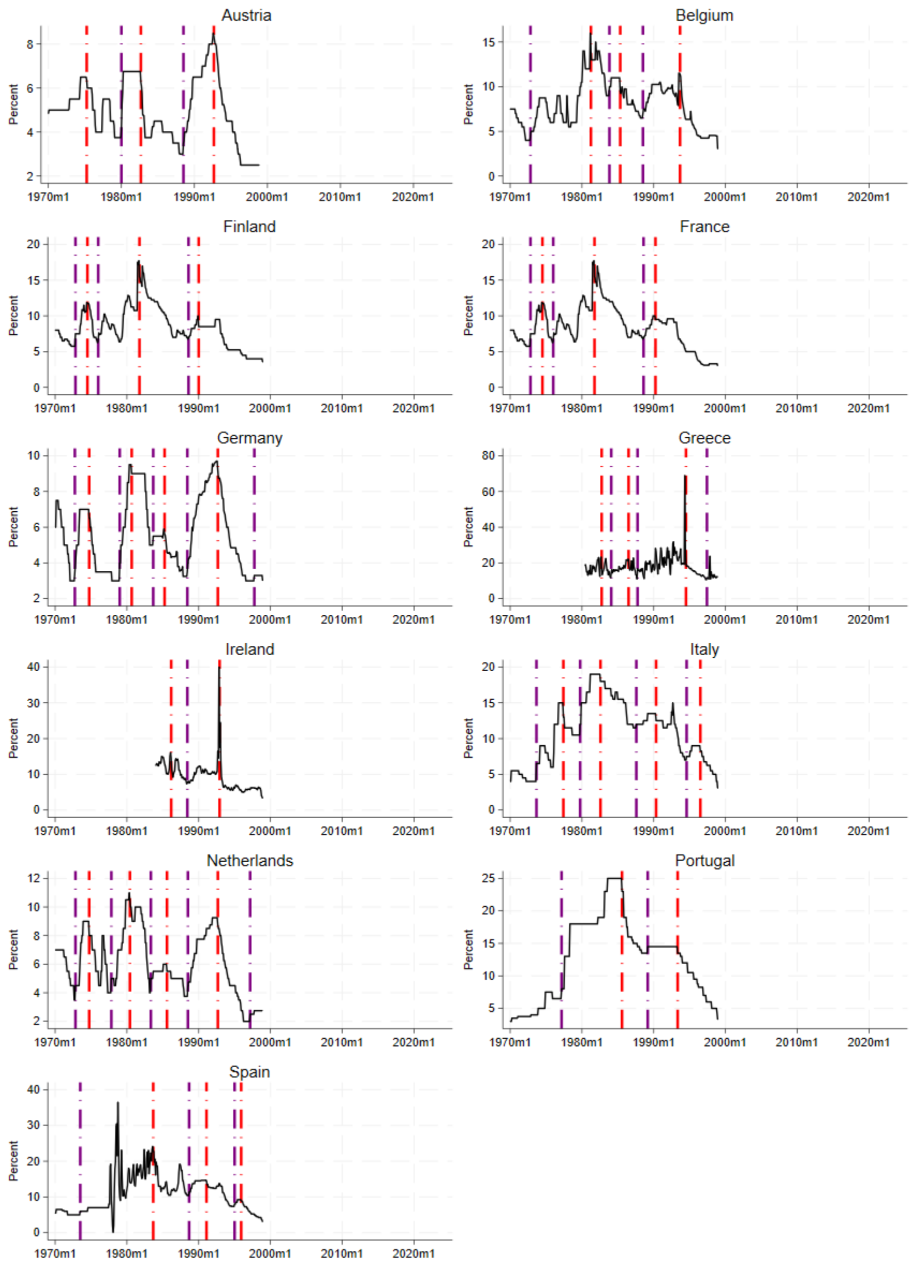
Policy Interest Rates, Easing and Tightening Phases and New QE and QT Programs



Sources: Authors' calculations based on the rate cycle dating methodology described in Section II, with data through May 2024. Notes: The solid black line is the policy interest rate. Dashed purple and red lines indicate the start of tightening and easing phases, respectively. Dashed blue and orange lines represent the announcement of new QT and QE programs, respectively, and only include the announcement of major new programs involving government bonds and aimed at providing monetary stimulus; we do not include announcements of changes to an ongoing QE/QT program or balance sheet programs aimed primarily at providing liquidity. These are not turning points that denote the start of an easing or tightening phase unless there is also a red or purple line.

Appendix Chart 2 Rate Cycles: Euro area, pre-ECB

Policy Interest Rates, Easing and Tightening Phases and New QE and QT Programs



Sources: Authors' calculations based on the rate cycle dating methodology described in Section II, with data through May 2024. Notes: The solid black line is the policy interest rate. Dashed purple and red lines indicate the start of tightening and easing phases, respectively. Dashed blue and orange lines represent the announcement of new QT and QE programs, respectively, and only include the announcement of major new programs involving government bonds and aimed at providing monetary stimulus; we do not include announcements of changes to an ongoing QE/QT program or balance sheet programs aimed primarily at providing liquidity. These are not turning points that denote the start of an easing or tightening phase unless there is also a red or purple line.

Appendix Table 2 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)
Core CPI	Core Consumer Price Index, following OECD classification: Headline CPI excluding food and energy components. Inflation rates are calculated on a month-over-month basis or relative to 12 months earlier based on the analysis.	OECD, Ha, Kose, Ohnsorge (2023)
Output	Real gross domestic product index based on chain-linked volume (in local currencies). The reference year is 2015. Real GDP growth rates are calculated on a quarter-over-quarter basis or over the past 12 months based on the analysis.	OECD, Haver Analytics
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
Unemployment rate	Unemployment rate (in percent): unemployment/labor market participation	OECD
Employment	Number of persons employed with age 15 and over (in thousands)	OECD, IFS, ILO, FRED,
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 1970m1 to 2024m3, except policy rate data is through 2024m5. Economies included are Australia, Austria, Belgium, Canada, Switzerland, Germany, Denmark, Spain, Finland, France, the United Kingdom, Greece, Ireland, Israel, Italy, Japan, the Republic of Korea, Netherlands, Norway, New Zealand, Portugal, Sweden, the United States, and the euro area.

Appendix Table 3 Characteristics of Rate Cycles over Time

	Duration		Number of Rate Changes		Pace (pp/change)		Velocity (first 6 months)		Amplitude (in pp)	
	Tightening	Easing	Tightening	Easing	Tightening	Easing	Tightening	Easing	Tightening	Easing
Full Period	47.2	78.7	14.3	16.9	1.0	-0.6	1.7	-2.6	7.7	-7.7
Pre-ECB: 1970-98	49.9	65.6	16.2	20.1	1.2	-0.7	1.8	-2.1	8.9	-9.3
Post-ECB: 1999-2024	35.1	109.3	9.2	11.8	0.3	-0.4	1.0	-1.6	2.8	-4.2
1970-1984	54.9	48.3	16.7	13.8	1.3	-1.0	2.2	-2.8	9.6	-7.5
1985-1998	39.2	71.4	12.5	21.7	0.9	-0.7	1.6	-2.0	6.2	-9.4
1999-2007	38.1	62.6	9.7	12.2	0.3	-0.4	0.9	-1.4	2.7	-4.3
2008-2019	36.1	125.2	8.1	11.3	0.3	-0.4	0.6	-1.6	2.1	-4.0
2020-2024 (May)	27.4	120.2	10.5	10.2	0.4	-0.4	1.6	-1.4	4.2	-3.4
Change or percent change from 1970-84 period to 2008-19 period										
Change	*-18.7*	*77.0*	*-8.6*	*-2.4*	*-1.1*	*0.6*	*-1.6*	*1.2*	*-7.5*	*3.5*
% Change	*-0.3*	*1.6*	*-0.5*	*-0.2*	*-0.8*	*-0.6*	*-0.7*	*-0.4*	*-0.8*	*-0.5*

Sources: Authors' calculations using the turning points for rate cycles listed in Appendix Table 1 and data ending on May 31, 2024. Notes: This table shows averages across all tightening or easing phases within the given time period, The number and pace of rate adjustments only include "in-sync" rate adjustments. Velocity and amplitude are the total change in rates (in any direction) over the first six months of the phase or entire phase, respectively. Averages are calculated for each economy, and then over the sample as a whole. Members of the euro area are included as individual countries through 1998, and then the ECB cycle is included from 1999.

Appendix Table 4 Variance Contributions of Global Factors

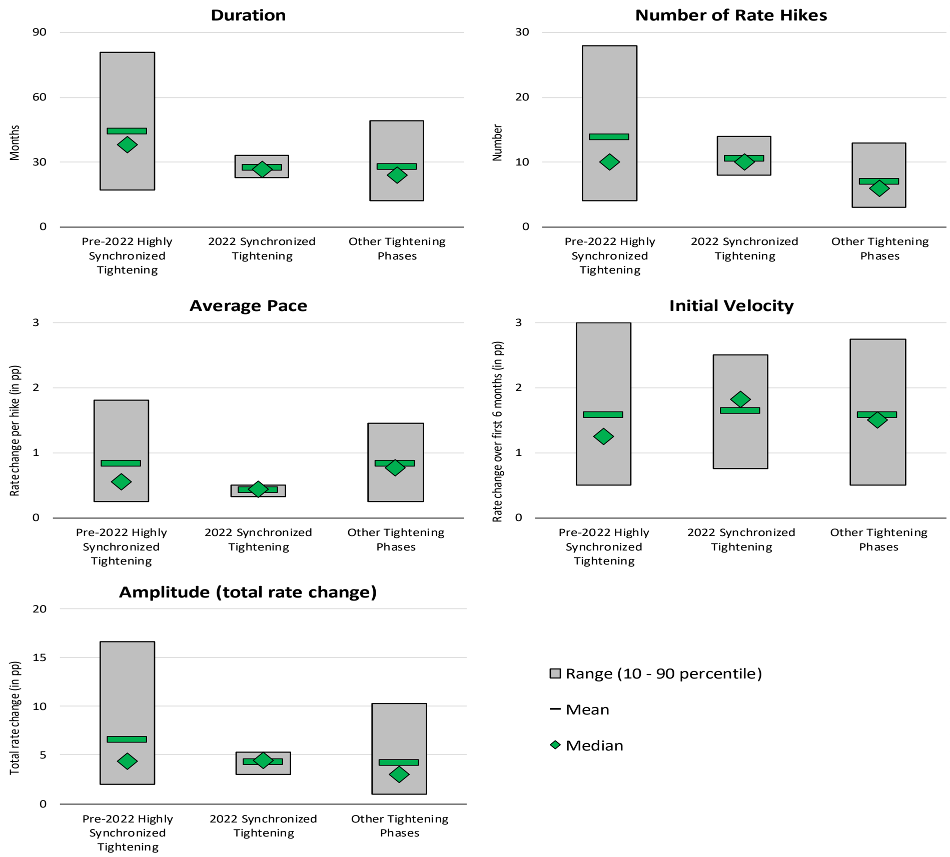
(Percent of total variation, averages across countries)

Global factors	70-23	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	38.4
Inflation	21.5	9.6	32.0		11.2	13.1	22.0	23.7	34.3
Output growth	23.6	6.5	39.7		7.1	10.7	15.7	13.2	46.9

Sources: Authors' calculations based on data from January 1970 – March 2024.
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 2 for variable definitions.

Appendix Chart 3 Characteristics of Different Types of Tightening Periods

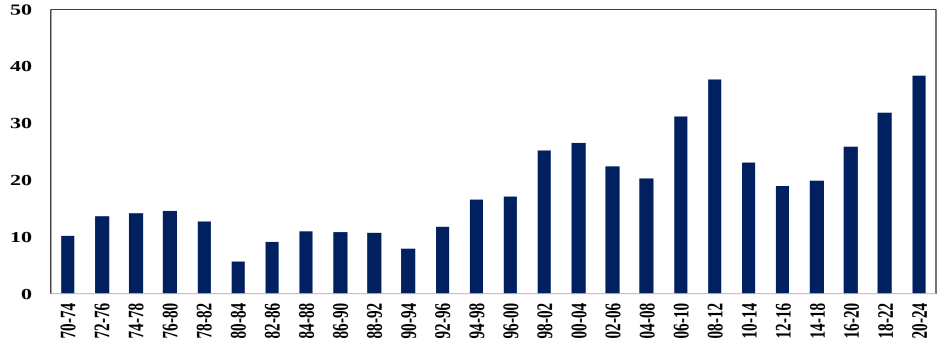
Highly Synchronized Tightening Periods, the 2022 Highly Synchronized Tightening Period, and Other Tightening Phases



Sources: Authors' calculations based on the cycle dating methodology described in Section II. Data from January 1970 to May 2024.
Notes: *Highly Synchronized Tightening* periods are when at least 60% of the sample is in a tightening phase and at least 60% of the sample is increasing policy interest rates in the quarter. The 2022 *Highly Synchronized Tightening* is reported separately. "Other Tightening Phases" are tightening phases not included in these first two groups. See Section III for variable definitions.

Appendix Chart 4
Variance Contribution of the Global Interest Rate Factor: 5-year Rolling Windows

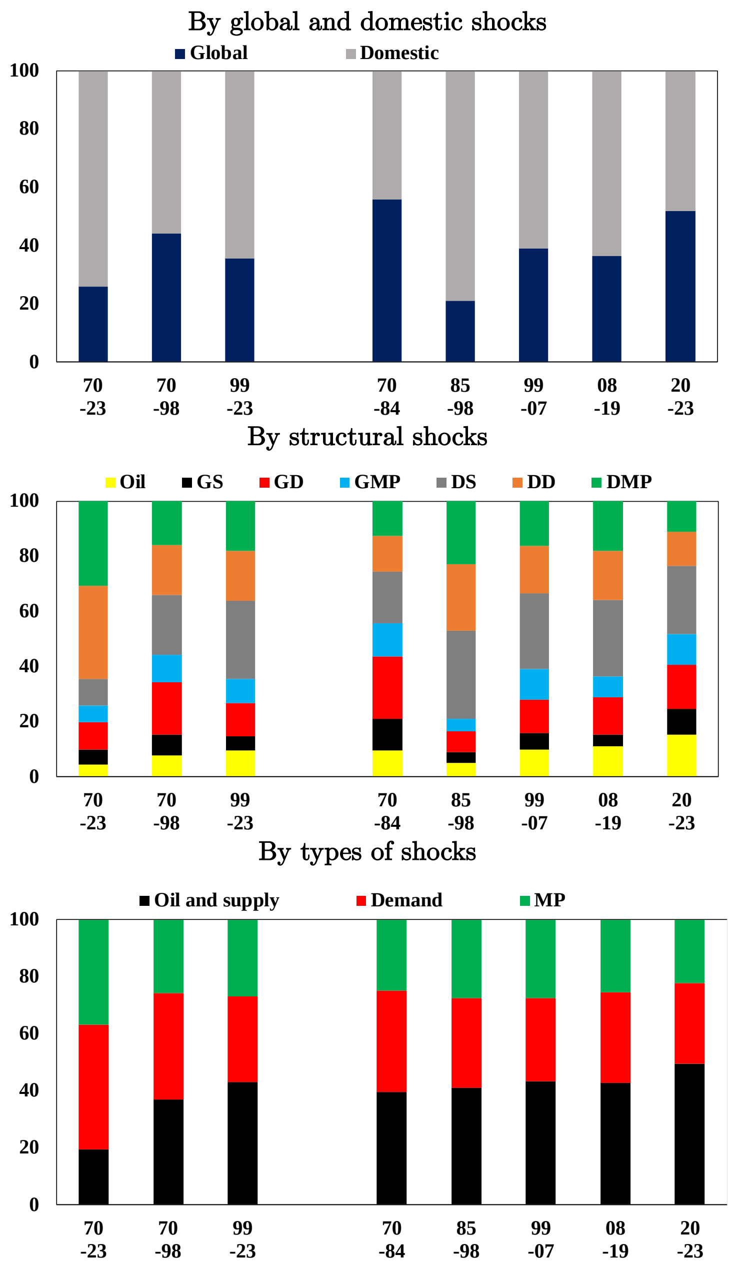
(Percent of total variation)



Sources: Authors' calculations.
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.

Appendix Chart 5 Contributions of Shocks to Inflation

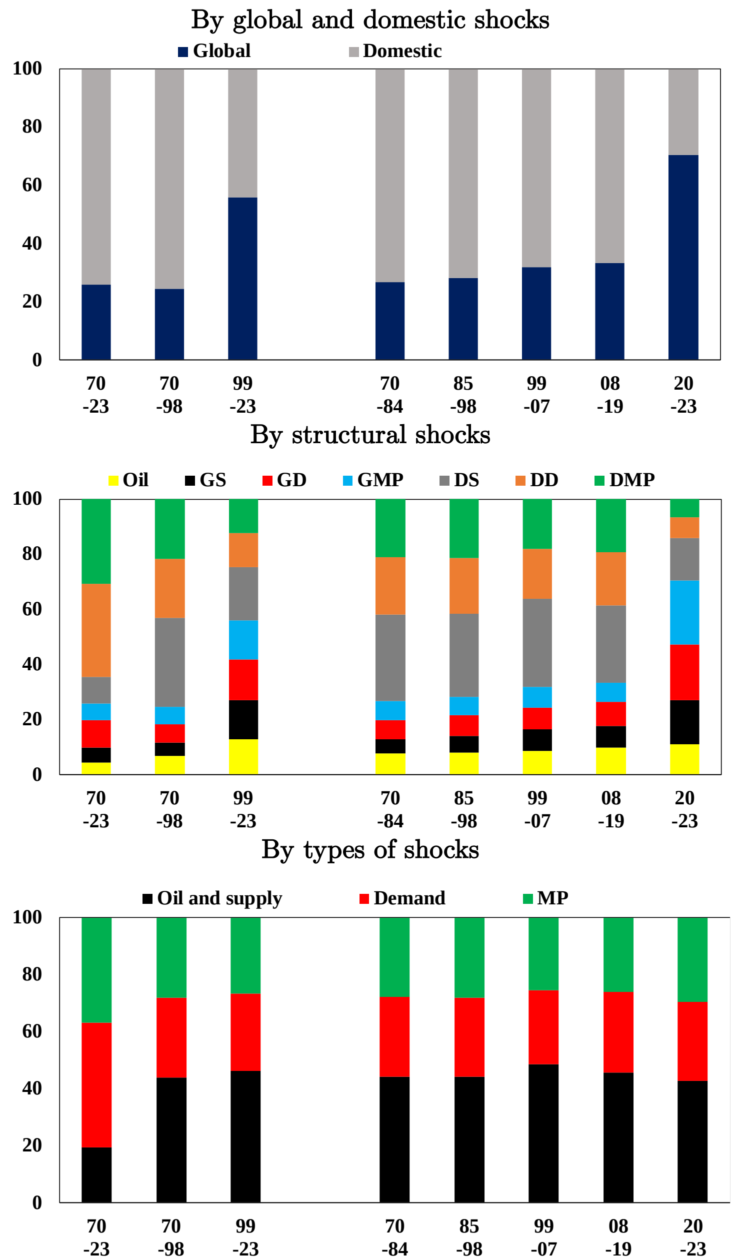
(Percent of total variation)



Sources: Authors' calculations based on data from January 1970 through December 2023 for the G5 economies (Canada, the euro area, Japan, the United Kingdom, and the United States). Notes: Forecast error variance decompositions of domestic CPI inflation based on FAVAR models (as explained in Section IV) that consist of four global variables (global output growth, inflation, monetary and oil prices) and three domestic variables (domestic output growth, inflation, and monetary policy 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

Appendix Chart 6 Contributions of Shocks to Output Growth

(Percent of total variation)



Sources: Authors' calculations based on data from January 1970 through December 2023 for the G5 economies (Canada, the euro area, Japan, the United Kingdom, and the United States). Notes: Forecast error variance decompositions of domestic output growth on FAVAR models (as explained in Section IV) that consist of four global variables (global output growth, inflation, monetary and oil prices) and three domestic variables (domestic output growth, inflation, and monetary policy 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.