Where It All Begins: Eurodollars and International Monetary Policy Transmission under Bretton Woods

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Abstract

The origins of modern financial globalization are often traced to the rise of the Eurodollar market in the 1960s. Yet it remains unclear whether this early phase of globalization constrained national monetary policies under capital controls and fixed exchange rates. This paper revisits international monetary transmission under Bretton Woods (1948–1971). We construct a new monthly series of exogenous U.S. monetary policy shocks based on unanticipated changes in the Federal Reserve discount rate at the daily frequency. Our measure shows that U.S. monetary policy produced strong domestic effects on inflation, output, credit, and unemployment, and induced capital inflows into the United States. U.S. tightening also raised Eurodollar and foreign interest rates after the restoration of current account convertibility in 1958, indicating increasing financial integration. However, we find no significant effects on foreign output or prices, consistent with domestic regulation and market segmentation limiting the domestic transmission of interest rates in other countries.

Keywords: International monetary transmission; U.S. monetary policy shocks; Bretton Woods system; Eurodollar market; Capital controls; Financial globalization; Trilemma.
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1 Introduction

International monetary policy spillovers have become a central theme in modern macroeconomics. A large body of evidence shows that policy rate changes in major financial centers transmit across borders through financial arbitrage, affecting domestic interest rates, asset prices, and macroeconomic conditions.[1] In financially open economies, such spillovers arise either because fixed exchange rates impose the classical trilemma constraint, or—under flexible regimes—because common risk-premia movements propagate a global financial cycle, turning the trilemma into a "dilemma."

Despite this progress, a key question remains unresolved: *how much financial openness is required for monetary spillovers to operate?* The empirical literature rarely addresses this issue explicitly, in part because it almost exclusively studies the post-1990 period of deep financial globalization (or 'hyper-globalization'). Existing evidence therefore leaves open whether international monetary transmission is a phenomenon specific to the hyper-globalization era, or a more general feature of the international monetary system.

This question is particularly relevant when revisiting the Bretton Woods system (1944–1971). Although this period is still commonly characterized as one of monetary autonomy under fixed exchange rates, ensured by extensive capital controls, historical scholarship paints a more nuanced picture. Capital controls and foreign exchange restrictions initially insulated national policies. Yet the restoration of current account convertibility beginning in 1958, coupled with the blossoming of the Eurodollar market which stemmed from it Schenk [1998], progressively reopened channels for cross-border arbitrage [Bordo, 1993]. Thus, there is a tension in the literature, acknowledged by many scholars yet unresolved [Schenk, 2013, Eichengreen, 2016, Obstfeld and Taylor, 2017]: did the Bretton Woods system constitute a parenthesis of genuine monetary autonomy enabled by financial restrictions, or did nascent financial openness already make fixed exchange rates increasingly incompatible with domestic policy independence?[2]

Did Bretton Woods effectively insulate national monetary policy? When did spillovers re-emerge? And through which channels did they operate? To answer these questions, we

[1] See, among others, Kim [2001], Uribe and Yue [2006], Bruno and Shin [2015], Rey [2015], Dedola et al. [2017], Kalemli-Özcan [2019], Degasperi et al. [2023].

[2] "During the 1960s the Bretton Woods system was further undermined by innovations in international banking and capital markets, first with the expansion of the Eurodollar market and then its translation into the Eurobond market. These markets operated outside the capital controls and prudential supervisory systems of national central banks and allowed greater convertibility to stretch the post-war solution to the Mundell-Fleming policy trilemma, which relied on closed capital markets to facilitate pegged exchange rates while preserving national monetary policy sovereignty" [Schenk, 2013, 186]. "Bretton Woods was then an experiment with an alternative trilemma configuration: stable exchange rates, greater monetary autonomy, and limits on capital flows. In practice, however, monetary policy was acyclic. Capital controls provided only partial insulation (more partial as the period progressed)." [Eichengreen, 2016, 8] "In sum, by eliminating capital mobility, the Bretton Woods system set up a resolution of the monetary trilemma based on exchange-rate stability and a degree of autonomy of monetary policy" [...] "However, one result of the Bretton Woods system's successes was that the opportunity for capital flows inevitably grew and unwanted leakages increasingly seeped through." [Obstfeld and Taylor, 2017, 10-11]

construct a new monthly series of exogeneous U.S. monetary policy shocks for 1948–1971 by extracting unanticipated movements in the Federal Reserve discount rate—the key central bank instrument observed by domestic and foreign policymakers at that time—purged of contemporaneous market movements and predictable macroeconomic information.[3] In order to study the international impact of U.S. shocks and their mechanisms, we assemble newly digitized monthly macro-financial data for a panel of countries and augment these with monthly data on Eurodollar interest rates and a subset of U.S. capital flows (namely, short-term liabilities to foreigners reported by banks).

Our analysis yields four main findings. First, U.S. monetary policy was at work during Bretton Woods and affected the U.S. macroeconomy significantly. An exogenous increase in the discount rate leads to conventional macroeconomic responses: industrial production, credit and inflation decline, while unemployment rises. The effect is delayed for production and inflation (by 8 and 12 months respectively) but the responses of these variables are still faster than those found by Romer and Romer [2004] with their measure of monetary policy shocks starting in 1969.

Second, we document a clear financial channel of international monetary policy transmission: U.S. monetary tightening raises Eurodollar rates and induces private capital inflows into the United States. A 100-basis-point exogenous discount rate shock immediately increases the domestic federal funds rate by a similar magnitude and also has a strong effect on the Eurodollar rate, which quickly adjusts to reach a one-to-one pass-through (100-basis-point) after one month. This provides the first quantitative evidence that the Eurodollar market indeed constrained U.S. and foreign monetary policies as it re-opened cross-border arbitrage well before deeper financial liberalization and complete abolishment of capital control in US and Europe. An exogenous rise in the US discount rate also immediately triggered a significant 5% increase in the short-term liabilities of US banks held by foreign entities and a 25% increase of the liability of US banks to their foreign branches (funding through the Eurodollar market).

Third, the transmission of U.S. policy abroad changed sharply over time, as the result of the abolishment of foreign exchange controls. Prior to the restoration of convertibility in 1958, foreign interest rates and exchange rates remain unresponsive to U.S. policy shocks. In this initial phase, stringent foreign-exchange controls deliver the textbook trilemma corner. After convertibility was restored in advanced economies by 1959, and the eurodollar market quickly expanded, spillovers emerged despite continued capital controls.

[3]Following recent attempts to apply high-frequency identification to historical data [Cloyne et al., 2022, Bouscasse, 2022, Bazot et al., 2024], we build our shock (monetary policy surprises) in two steps. We first purge the discount rate from daily fluctuations in the money market rate, the stock market and the exchange rate occurring before the monetary policy decision. We then regress this residual on vintage monthly economic variables to be sure that the shock could not be predicted by information available to contemporary economists. This second step is similar to the one applied by Bauer and Swanson [2023b] to more recent data in order to isolate surprises not predictable by macroeconomic outcomes.

Fourth, the international transmission of U.S. monetary policy began to operate during the post-1959 phase of the Bretton Woods system, but it primarily affected financial variables, most notably money market rates. In contrast, we find no robust or significant response of output or inflation to these shocks.

This finding constitutes the international counterpart of a growing literature that has documented the limited transmission of domestic interest rate changes to the domestic economy in other countries than the U.S. in the 1950-1960s (Monnet [2014], Reinhart and Sbrancia [2015], Aikman et al. [2016], Monnet [2018b]) as well as contemporary accounts such as (Shonfield [1965], Thurow [1971], Hodgman [1973]). The disconnect between interest rates and macroeconomic activity was the product of extensive banking regulation and government intervention in credit markets. Many lending and deposit rates remained regulated and legally fixed, and a large share of credit was issued by government-backed special credit institutions at subsidized rates. So domestic credit markets remained segmented and often unresponsive to the money market rate. This interpretation is further supported by the fact that foreign yields on government securities responded less than short-term money market rates to U.S. monetary policy shocks. Regulatory constraints on the holding of domestic public debt during this period [Reinhart and Sbrancia, 2015, Monnet and Vari, 2023]—often described as "financial repression"—limited arbitrage across sovereign bond markets. As a result, and unlike today [Kalemli-Özcan, 2019, Degasperi et al., 2023], U.S. bond yields increased more than foreign sovereign yields following an exogenous rise in U.S. interest rates.

Taken together, our results indicate that the restoration of currency convertibility alone was sufficient to reintroduce monetary interdependence under Bretton Woods through short-term money markets. Only the pre-1958 phase provided full monetary autonomy; once convertibility returned, even limited financial openness constrained independence under fixed exchange rates by transmitting U.S. shocks to foreign money markets. While this raised concerns among central banks, its effects on the real economy and sovereign bond markets remained moderate at the time, owing to stringent domestic financial regulation and credit controls.

This paper contributes to several strands of work in the literature. By providing causal evidence that even incomplete financial openness can transmit monetary shocks under fixed exchange rates, we clarify the conditions under which the trilemma operates [Obstfeld and Taylor, 2004, Obstfeld et al., 2019]. We also show that partial capital controls and domestic financial regulation suppress spillovers in asset markets (especially government bonds) more effectively than in money markets, thus contributing to the literature on the global financial cycle and the autonomy of monetary policy [Miranda-Agrippino and Rey, 2020]. Consistent with Klein and Shambaugh [2015] and related work, capital controls only imperfectly insulate money markets. But controls on current account transactions (foreign exchange controls) do.

We document that limited financial liberalization—i.e., strong credit regulation or what is often termed "financial repression"—was associated with the absence of monetary spillovers to the real economy. In such a heavily regulated environment with segmented credit markets, freely determined money market rates affected only a narrow portion of economic activity. Monetary policy outside the United States was largely implemented through quantitative credit controls—such as credit ceilings, reserve requirements, and liquidity ratios—and could therefore be partly disconnected from movements in market interest rates. In recent years, a small strand of literature has examined how this form of "monetary policy without interest rates" operated under Bretton Woods and what its macroeconomic consequences were [Monnet, 2014, Aikman et al., 2016, Galati et al., 2021]. Also relevant to our work is Degorce [2023], who shows that a substantial share of credit—often close to or exceeding 50% in many Asian and European countries during this period—consisted of "public credit," that is, subsidized loans granted below market rates by government-backed specialized credit institutions. For a limited number of countries (not fully overlapping with our sample), he further shows that public credit was strongly countercyclical and could shield domestic macroeconomic variables from international shocks.

Interestingly, the Bretton Woods configuration bears resemblance to contemporary China, where short-term interest rates, exchange rates, and capital flows respond to U.S. monetary policy, while production and inflation remain partly insulated by domestic credit policies and the central bank's reliance on quantitative instruments of credit control [Ho et al., 2018].[4] Just as we do for advanced economies under Bretton Woods, De Leo et al. [2022] document a disconnect between the central bank policy rate and the money market rate in today's emerging markets, with the latter responding more strongly than the former.

We also contribute to the literature on Bretton Woods, Eurodollars, and financial openness. While the Bretton Woods system remains a central reference point for both policy and academic debates on the international monetary system [Farhi and Maggiori, 2018, Gourinchas et al., 2019, Obstfeld, 2024, Lagarde, 2025, McCauley, 2026], very few studies have used modern econometric tools to investigate how the system worked. Although it is well known that the Eurodollar market expanded sharply in the 1960s [Schenk, 1998, McCauley and Schenk, 2020], the extent to which it really altered the autonomy of U.S. monetary policy—or the exposure of other countries—remains uncer-

[4] Miranda-Agrippino et al. [2023], Lodge et al. [2024] compare the international transmission of U.S. and Chinese monetary policies but do not examine the impact of U.S. policy on China specifically. Wang et al. [2023] show that capital flows to and from China respond to U.S. shocks but do not analyze the effects on Chinese output and inflation. We are not aware of more recent studies studying the impact of U.S monetary shocks on China. Degasperi et al. [2023] document that industrial production and inflation in emerging markets react as strongly to U.S. monetary shocks as in OECD economies, but they do not explore how these reactions are heterogeneous and may depend on government credit policies and domestic financial regulation.

tain. Obstfeld et al. [2005] show that average interest rate differentials were larger during Bretton Woods than in other periods, suggesting some insulation, yet their analysis does not identify the effects of exogenous monetary shocks, not do they look at the evolution over the 25 years of the Bretton Wood system. Monnet and Puy [2020] examine the management of gold and FX reserves but without making the link with international monetary policy transmission.

We also add to the literature on foreign exchange controls and capital controls in the 1930s Mitchener and Wandschneider [2015] by showing what happened to them after the Second World War. Such measures were imposed either in response to banking and currency crises in the wake of the Great Depression or as wartime emergency measures. Rather than instituting them in the first place, Bretton Woods charted a way towards the removal of foreign exchange-controls. Our findings show that the period 1944-1958 had much in common with the 1930s as portrayed by Nurkse [1944] in his magisterial account: rigid exchange-rates and capital controls which provided countries with a certain degree of monetary autonomy.

Last but not least, we build the first series of exogenous monetary policy shock for the United States before the 1970s. The influential Romer and Romer [2004] series of policy shocks begins only in 1969, excluding most of the Bretton Woods years. Romer and Romer [2002] show earlier evidence of Federal Reserve responsiveness to inflation and output in the 1950s, but they do not estimate its effect. Bordo [2010], Hetzel [2023] also argue that the Fed policy (often contractionary) was active and influenced inflation and the business cycle starting at least 1951, until it turned mostly passive and expansionary after 1965. But they did not compute a series of policy shocks, nor assessed quantitatively how these successions of contractionary and expansionary phases affected inflation, production and the unemployment rate. In a recent paper, Romer and Romer [2024] confirm, based on narrative evidence, that the Fed policy could be very (September 1958) or mildly (October 1947, August 1955, and December 1968) contractionary during this period. But they only identify dates of contractionary policy rather than a continuous series of the monetary policy stance. Nor do they study the international impact of Fed monetary policy decisions.

2 Historical background: Financial Restraints and Liberalization under the Bretton Woods system

This section first provides a brief overview of the Bretton Woods system, from its establishment to its dissolution. It was characterized by fixed exchange rates, albeit with relatively wide fluctuation bands, and with the United States at its center. We then describe the gradual increase in financial openness during this period, marked by the

restoration of currency convertibility and the development of the Eurodollar market. We emphasize three main points. First, current account convertibility (i.e., the removal of foreign exchange controls on trade-related transactions) was restored in most OECD countries in the late 1950s, allowing arbitrage between domestic and foreign currency through the exchange rate, while capital controls on other assets largely remained in place. Second, strong domestic financial regulation led to segmented credit markets at the national level, limiting the transmission of central bank and money market rates to the broader economy. Third, the rapid expansion of the Eurodollar market throughout the 1960s increasingly constrained central banks' ability to adjust their policy rates independently.

2 .1 A short history of the Bretton Woods system

The Bretton Woods system originated at a multilateral conference held in Bretton Woods (New Hampshire, USA) from 1 to 22 July 1944. The system was founded on the Articles of Agreement of the IMF. Signing the agreement made a country a member of the IMF and subject to the rules of the international monetary system.[5] It also implied fixing the exchange rate relative to the U.S. dollar. The Bretton Woods agreements thus placed the United States at the center of the international monetary system. Only the United States was required to maintain gold convertibility, exchanging gold for dollars upon request by foreign central banks. The first declaration of official par values by 32 countries occurred in December 1946, and the IMF began operations (with its first loan to France) on 1 March 1947. It was the first time countries formally agreed on the rules of the international monetary system and signed a legally binding agreement constraining their choice of exchange rate regime and capital openness [Bordo, 1993]. It was also the first time gold was granted a status in international law, rather than solely in domestic law [Monnet, 2026]. This differed sharply from earlier gold standard regimes, which had developed in a decentralized manner.

Countries pegged their currencies to the U.S. dollar, and exchange rates could be adjusted with IMF approval in the case of a fundamental disequilibrium. In practice, however, devaluations were rare, especially after the coordinated devaluation of September 1949 [Bordo, 1993, Monnet, 2026]. Some flexibility remained, as exchange rates were allowed to fluctuate within a $\pm 1\%$ band around parity. Any official buying or selling rate deviating by more than 1 percent from parity constituted a "multiple currency practice," which was prohibited by the IMF [de Vries, 1969]. In such cases, the currency was considered inconvertible.

Standard accounts often portray Bretton Woods as a homogeneous period of fixed exchange rates and strict capital controls, dominated by U.S. hegemony and allowing

[5]The IMF came into official existence on 27 December 1945, when 29 countries signed its Articles of Agreement. Although the USSR had been a major participant at Bretton Woods, it ultimately remained outside the IMF.

monetary policy autonomy elsewhere. However, it is necessary to move beyond such simplifications and the "mythology" of Bretton Woods [James, 2011]. In practice, it took more than a decade for major economies to restore currency convertibility, a key objective for rebuilding global trade. Initially, only the United States (and Switzerland) had no convertibility constraints. For this reason, some scholars argue that Bretton Woods effectively began only in 1959 [Bordo, 1993, Bordo et al., 2019]. The gradual reopening of international financial markets, beginning with the gold market, transformed the system. After currency convertibility was widely restored, central banks rebuilt gold reserves and pressure emerged on the U.S. gold parity. The private gold market in London, reopened in 1954, became a focal point. U.S. authorities intervened in late 1960 to stabilize the gold price and subsequently coordinated interventions with other major economies through the Gold Pool (1961–1968). During this period, the gold–dollar parity was effectively a managed price [Bordo et al., 2019].

In early 1968, interventions became too costly, leading to the collapse of the Gold Pool. The United States then introduced a two-tier system: the official gold price (for central bank transactions) was separated from the market price. As the market price rose, pressure on the dollar intensified, and the prospect of devaluation gained credibility [James, 1996]. At the same time, surplus countries such as Germany and Japan criticized U.S. monetary and fiscal expansion for exporting inflation and undermining the system [Bordo, 1993]. Dissatisfaction with the dollar peg also increased in a context of growing financial integration [Schenk, 2016, Altamura, 2017, Monnet, 2018a]. Germany moved to a floating exchange rate on 29 September 1969 [Emminger, 1977, Gray, 2007]. Concerns over the value of dollar reserves intensified, and demand for gold convertibility rose. On 15 August 1971, the United States suspended gold convertibility, which we take as the end of the Bretton Woods system.

With one of its central pillars removed, the system effectively collapsed. The IMF continued to operate, and countries briefly attempted to preserve fixed exchange rates. Under the Smithsonian Agreement (December 1971) and again in February 1973, the U.S. dollar was devalued against major currencies, particularly the Deutsche Mark and the yen. Over time, many countries abandoned their dollar pegs, shifting instead to managed floats or regional arrangements such as the European Monetary System [Ilzetzki et al., 2019]. By the mid-1970s, roughly half of the countries previously pegged to the dollar had exited the system [O'Rourke and Vicquéry, 2025].

2 .2 Current Account (Foreign Exchange) Control vs. Capital Control, and the Restoration of Currency Convertibility

The Bretton Woods system aimed to restore global trade while preserving domestic policy autonomy. In addition to allowing exchange rate adjustments, these dual objectives were

reflected in the differentiated treatment of current and capital account controls Helleiner [1996], Quinn and Toyoda [2008]. *Current account controls* (also known as foreign exchange controls) applied to payments related to trade and remittances. They included limits on purchasing foreign currency for imports, restrictions on profit remittances, and caps on travel allowances. In practice, they often implied multiple exchange rates and made it difficult to hold foreign-currency accounts, as most transactions had to be intermediated by the central bank. *Capital controls* applied to financial transactions such as foreign investment (securities or land) and banking activities, including restrictions on foreign asset holdings or reserve requirements on foreign liabilities.

The IMF Articles of Agreement made clear in Section VIII that eliminating current account restrictions was a central objective, aimed at restoring currency convertibility and facilitating trade. They required the "avoidance of restrictions on current payments" (VIII.2), the "avoidance of discriminatory currency practices" (VIII.3), and the "convertibility of foreign-held balances" (VIII.4). By contrast, capital controls were explicitly permitted under Section VI.3:

> Members may exercise such controls as are necessary to regulate international capital movements, but no member may exercise these controls in a manner which will restrict payments for current transactions or unduly delay transfers of funds in settlement of commitments.

Although members were granted a three-year transition period in 1945 to remove current account controls, the process took much longer. The restoration of currency convertibility is generally dated to 27 December 1958, when eight Western European countries (including the United Kingdom) declared convertibility for current account transactions [Bordo, 1993, 42 et al.]. Japan followed in 1964, although most controls had already been lifted by 1960 [Iwami, 1995]. Using exchange rate quotes across financial centers, Degorce [2025] shows that before 1958 there were large deviations from the law of one price, implying that currency arbitrage for trade transactions was effectively impossible. [6]

Full capital account liberalization was not a Bretton Woods objective.[7] Nevertheless, it became a goal for some countries with the creation of the OECD in 1961, which introduced a "Code of Liberalization of Capital Movements." However, the OECD framework allowed numerous exceptions, and full capital-account liberalization was not achieved before the end of the Bretton Woods system [Helleiner, 1996, chap. 2]. In Europe, only Germany and Switzerland fully liberalized capital outflows (France briefly did so

[6] Consistent with Bordo [1993], this evidence also indicates that current account controls were not uniformly applied across countries. Canada did not impose foreign exchange controls against the U.S. dollar [Siklos, 2009].

[7] See [Helleiner, 1996, chap. 2] for a thorough analysis of the postwar endorsement of capital controls.

in 1966–1968), while maintaining controls to limit inflows and prevent currency appreciation [Bakker and Chapple, 2003, Bakker, 2012].

Current and capital controls were often substitutes. Following the restoration of current account convertibility, some countries strengthened capital controls to limit arbitrage across markets, particularly for financial securities. A prominent example is the Interest Equalization Tax introduced in the United States in 1963, designed to reduce purchases of foreign securities by U.S. residents without raising domestic interest rates; it was extended to offshore lending by U.S. banks in 1965 [Bakker and Chapple, 2003]. In advanced economies, capital controls remained widespread until the 1980s–1990s. Although sometimes used to manage capital inflows (e.g., reserve requirements on foreign liabilities in Switzerland and Germany in the 1960s and 1970s; Dorrance and Brehmer [1961], Emminger [1977]), they were often long-lasting and complemented broader financial regulations and credit allocation policies [Eichengreen and Rose, 2014, Monnet, 2018b]. Put differently, capital controls were rarely used as flexible macroprudential tools. Their effectiveness in limiting short-term international spillovers in the absence of foreign exchange controls remains debated [Erten et al., 2021]. But although capital controls remained in place, the removal of current account (foreign exchange) controls was, a priori, sufficient to enable straightforward currency conversion and international arbitrage between exchange rates.

2 .3 Credit Regulation and Domestic Interest Rate Disconnect

While capital controls limited cross-border movements, financial systems during the Bretton Woods era were primarily characterized by pervasive state control over domestic credit allocation. Some scholars describe this period as one of "financial repression" [Reinhart and Sbrancia, 2015], marked by extensive government intervention in credit markets. However, this term mainly refers to policies keeping interest rates low to facilitate public debt financing and does not fully capture the broader set of instruments used to guide credit allocation, economic development, and the business cycle.

One consequence of such regulation was that market interest rates played a relatively limited role in directing credit and financial flows [Battilossi, 2003, Monnet, 2018a]. Although money and stock markets existed, the financial system remained segmented, so no single interest rate summarized overall financial conditions. Typically, most long-term credit was allocated at subsidized rates by the Treasury or public banks, with rates varying across sectors and firms. Only short-term commercial bank credit and the bonds of large firms were significantly influenced by market conditions. This began to change in the early 1970s—at different speeds across countries—but full domestic financial liberalization was achieved only in the 1980-90s in most OECD economies [Abiad et al., 2010].

Within this global context, the United States was an exception. Although deposit rates were regulated under Regulation Q and the short-term asset markets remained somewhat segmented [Carlson and Wheelock, 2018], U.S. financial markets were deeper than elsewhere: the money market was more liquid, the stock market larger, and—crucially—the country lacked public credit institutions providing subsidized loans for industrial policy [Hodgman, 1973].[8] By contrast, most European and Asian economies experiencing rapid growth maintained controls on banks' deposit and lending rates. A large share of total credit (often close to 50%) consisted of subsidized loans provided by government-backed institutions [Degorce, 2023]. This share was even higher for medium- and long-term investment credit [Monnet, 2018a]. Credit allocation was therefore largely governed by rationing, and fluctuations in money market rates had limited impact on firms' financing costs.

As a result, and unlike in the United States, the central bank policy rate in Europe and Asia could affect the money market rate but it was often not representative of the overall monetary policy stance. For monetary policy purposes, central banks relied instead on quantitative tools such as credit ceilings, reserve requirements, and liquidity ratios [Monnet, 2014]. This disconnect between quantities and prices became especially pronounced as OECD economies began to open financially in the 1960s, so much that central bankers considered allowing domestic interest rates to respond to international conditions (or to influence capital flows) while managing domestic objectives through alternative instruments [Argy, 1971, Hodgman, 1973, Monnet, 2018b].[9]

2 .4 The Eurodollar Market and its Consequences for Monetary Policy

Eurodollar deposits are U.S. dollar deposits held outside the United States. By the 1960s, transfers between these deposits had become the main international interbank market [Schenk, 1998, Altamura, 2017, McCauley and Schenk, 2020]. The Eurodollar market emerged in the mid 1950s in London as large pools of dollars accumulated abroad, particularly in Europe, and their expansion was driven by European investment, multinational activity, Soviet concerns about U.S. asset seizure, and—most importantly—U.S. deposit-rate ceilings (Regulation Q). For U.S. banks, attracting Eurodollar deposits through their foreign branches provided a way to circumvent domestic ceilings on deposit interest

[8] At a time when some U.S. policymakers and economists suggested emulating the European model [Thurow, 1971], Hodgman [1973] argued that structural differences made such policies ineffective in the United States (p. 161).

[9] In some countries—notably the United Kingdom, following the 1959 Radcliffe Report—interest rate policy was used primarily for public debt management, while fiscal policy and quantitative tools targeted the business cycle [Kaldor, 1960, Aikman et al., 2016].

rates.[10]

Schenk [1998] shows that Eurodollar deposits emerged in mid-1955, when London banks—especially the Midland Bank—began actively attracting dollar deposits for arbitrage purposes. In her account, the return to de facto current-account convertibility in the U.K. in 1955 was crucial because it restored the conditions for international monetary arbitrage and freer cross-border payments; the rising supply of dollars in London, as the US balance-of-payments turned negative, was another important factor. Although the U.K. temporarily reintroduced exchange controls in 1957, and full current account convertibility was only officially announced at the end of 1958 together with most other Western European countries, the liberalization of current-account transactions already allowed London banks to attract dollar deposits, swap them into sterling, and profit from higher London interest rates under Britain's tight-money policy.[11]

London banks, soon joined by foreign, especially U.S., banks, accepted dollar deposits and offered higher interest rates than regulated U.S. bank deposits, creating a rapidly expanding offshore market. According to BIS statistics, total U.S. dollar assets and liabilities outside the United States grew from USD 12.5 billion in 1963 to USD 151 billion by the end of 1970 (for comparison, U.S. gold reserves were about USD 11 billion in 1970). Roughly half of these positions were located in the United Kingdom.[12]

The market remained largely unregulated in a jurisdictional grey area: the United States could not regulate dollar deposits held abroad, and the United Kingdom, eager to strengthen London's financial position during balance-of-payments difficulties, chose not to impose controls [Schenk, 2016]. Attempts to restrict the market risked shifting activity to other offshore centers. As a result, no authority assumed responsibility, allowing the Eurodollar market to expand into a key but unregulated component of the postwar financial system, despite widespread capital controls on other foreign assets and liabilities. Although Eurodollars initially circumvented U.S. banking regulations, especially Regulation Q, U.S. authorities eventually tolerated and even encouraged their growth, believing that stronger demand for dollars would support the gold–dollar parity [Helleiner, 1996, Altamura, 2017, Braun et al., 2021, McCauley, 2024].

Other countries, particularly in Europe, followed London's example and accepted Eurodollar activity despite concerns about monetary autonomy. Only Germany attempted to promote international regulation, unsuccessfully [Altamura, 2017]. Most countries adopted an ambivalent stance: they recognized that Eurodollars complicated monetary policy but also sought to develop their financial centers and attract foreign capital [Mon-

[10] By contrast, the other main important money market innovations in the 1960s, the negotiable certificates of deposits, were subject to regulation Q until 1970 [Carlson and Wheelock, 2018].

[11] Contrary to earlier accounts such as Strange [1976], Schenk downplays the importance of the temporary restoration of exchange controls in 1957. She argues that these measures may have encouraged the use of dollar finance at the margin, but that they were relatively limited, short-lived, and chronologically secondary, since the Eurodollar market was already developing before they were introduced.

[12] These figures are drawn from the 1965 and 1971 BIS Annual Reports, pp. 134 and 161.

net, 2018a, Braun et al., 2021, Balaban, 2024].

Although offshore dollar holdings were not new, the scale of the Eurodollar market and its ability to bypass regulation made it transformative. For contemporaries, it marked the emergence of a new form of financial globalization that constrained domestic monetary policy [Klopstock, 1968]. The nature of constraint on monetary policy differed between the U.S. and other countries.

In the United States, the potential conflict between Eurodollars and domestic monetary policy came from capital inflows or outflows driven by reallocation of funds between domestic and foreign branches of U.S. banks [Klopstock, 1968, Gibson, 1971, Levin, 1974]. U.S. banks could arbitrage between U.S. money market rates and Eurodollar rates abroad. Robert Solomon, then chief international economist at the Federal Reserve Board, described how this increased the sensitivity of capital flows to U.S. monetary policy:

> Finally, capital flows reacted to U.S. monetary policy, which was tight during most of 1968 except for a short period in the summer after the tax increase became effective. American banks stepped up their borrowings from abroad, notably from their own branches in the Eurodollar market in London. This accounted for an inflow of almost $2 billion in 1968. [Solomon, 1982, 105]

Eurodollars could thus tame the effect of U.S. monetary policy on the U.S. economy. Because domestic U.S. bank lending was constrained by reserve requirements, higher U.S. interest rates increased funding costs, but access to offshore dollar markets allowed banks to circumvent these constraints [Levin, 1974]. At the same time, the Eurodollar market also enabled large U.S. banks to circumvent Regulation Q. When the Federal Reserve tightened policy without raising deposit-rate ceilings, banks were unable to compete for deposits, inducing disintermediation as funds flowed toward alternative assets. Offshore dollar funding provided a way to replace these lost deposits because it was not subject to domestic interest-rate ceilings [Koch, 2015].

So, in the United States, banks' access to Eurodollar funding effectively relaxed quantitative funding constraints and helped sustain lending despite tighter monetary policy. Conversely, as clearly observed in 1970–1971, Eurodollars could amplify capital outflows during periods of monetary easing, as banks sought higher returns on deposits abroad.[13] Whether the expansionary channel of Eurodollars under tight monetary conditions was operative remained disputed at the time [Gibson, 1971]. Nevertheless, these concerns

[13]This mechanism was clearly described by Charles A. Coombs, Senior Vice President in charge of the Foreign Department of the Federal Reserve Bank of New York, in a report dated March 1971: "But, as U.S. money rates and credit conditions progressively eased in 1970 and early 1971 while European rates lagged well behind, short-term money naturally flowed in heavy volume from the United States to the Euro-dollar market and on from there to the national money markets and central bank reserves of Europe. The great bulk of this flood of short-term money represented repayments by U.S. banks of earlier borrowings of foreign-owned funds from the Euro-dollar market. Thus, the Euro-dollar debt of U.S. banks to their overseas branches plummeted." [Coombs, 1971, p. 189].

contributed to the introduction in 1969 of reserve requirements on U.S. banks' liabilities to their foreign branches [Gibson, 1971, Carlson and Wheelock, 2018].[14].

The constraints were different, but arguably stronger, for non-U.S. countries, which helps explain why concerns were more pronounced abroad [Helleiner, 1996, p. 90 et seq.]. A 1969 report by French leading economists expressed very clearly how the Eurodollar market facilitated international capital mobility and reduced the scope for independent monetary policy:

> This has resulted in the creation of a vast international money market [Eurodollar market], in which more than three-quarters of operations are denominated in dollars. This extraterritorial market of "Eurocurrencies," operating outside the control of national authorities, facilitates short-term capital movements and makes independent monetary policy more difficult for any country.

[Monnet, 2018a, 102]

Eurodollars constrained non-U.S. monetary policy through standard interest rate arbitrage. When Eurodollar rates rose following U.S. tightening, funds flowed out of domestic interbank markets into offshore dollar accounts, reducing liquidity and pushing up local money market rates. Central banks could offset this in the short run through liquidity provision, and exchange rate bands offered limited flexibility Bazot et al. [2024]. Over time, however, arbitrage in a fixed exchange rate system forced convergence between domestic and foreign interest rates, leaving central banks little choice but to follow U.S. policy.

This mechanism was widely recognized, and contemporaries observed increasing comovement between Eurodollar, U.S., and other interest rates [Toniolo and Clement, 2005]. However, Eurodollar rates were influenced by factors beyond U.S. policy and could also feed back into U.S. financial conditions. The correlation between US rates and Eurodollar rates was not always perfect, as these markets were also driven by idiosyncratic shocks Carlson and Wheelock [2018]. A causal analysis is therefore required to assess whether the Eurodollar market acted as a channel for the international transmission of U.S. monetary policy. To this, we now turn our attention.

3 A new series of US monetary policy shocks (1948-1971)

In this section, we first explain why we use the discount rate as the policy rate indicating changes in the Federal Reserve monetary policy stance under Bretton Woods. Building

[14]See the justification given in "Record of Policy Actions of the Board of Governors", *Annual Report of the Board of Governors for 1969*, p.85.

on the seminal contribution of Waud [1970], we present extensive historical evidence supporting the use of the New York Fed's discount rate as an indicator of the U.S. monetary policy stance during this period, and show that changes in this rate could represent surprises to market participants.

We then present our 2-step methodology to build monetary policy surprises based on the unanticipated changes in the discount rate. Finally, estimations using our new exogenous monetary policy shock display conventional reactions of U.S. macroeconomic variables. These results are not obtained when using the changes in the actual discount rate or Fed Funds rate (including with a standard Cholesky decomposition).

3 .1 The Fed discount rate

3 .1.1 The discount rate as the monetary policy rate

The Federal Reserve's key policy rate during most of the Bretton Woods period was the discount rate, not the federal funds rate (hitherto the fed funds rate). In fact, the Federal Open Market Committee (FOMC) did not begin to systematically and explicitly target the fed funds rate until 1982 [Thornton, 2006].[15] Only in 1969, the FOMC had started to agree on an intended fed funds rate for internal use Romer and Romer [2004].

It was clear in contemporary Fed publications and in economists' accounts that the discount rate was the main policy rate used by the Federal Reserve to signal changes in monetary policy stance (see below). This fact has been surprisingly overlooked in most recent studies however.[16] Some exceptions are the seminal narrative approach of Romer and Romer [1989] and a chapter on the history of Fed monetary policy from the 1930s to 1959 of Carlson and Wheelock [2016]. For all dates of exogenous contraction of the monetary policy identified until 1979, Romer and Romer [1989] systematically indicates that the discount rate was raised in addition to some other measures (e.g. tightening of reserve requirement). Carlson and Wheelock [2016] also clearly show that the discount rate was the key policy rate throughout the period 1935-1959, used alongside open market operations and reserve requirements to influence credit conditions and monetary aggregates. This concurs with contemporary accounts by economists and the Federal Reserve itself, on which we rely below. More recently, Carlson et al. [2026] have provided a detailed analysis of Federal Reserve discount-rate press releases in the 1960s and 1970s. They show that these announcements were understood as a key channel of monetary policy communication in the years before the Federal Reserve publicly announced a target for the federal funds rate.

[15] Some authors place the emergence of federal funds rate targeting even later. Meulendyke [1998] argues for the late 1980s, while Lindsey [2003] dates it to the early 1990s. We thank Mark Carlson for drawing our attention to these references.

[16] Clarida et al. [2000] and Romer and Romer [2002], for example, focus exclusively on the fed funds rate when measuring monetary policy stance before Paul Volcker.

In the Appendix, we present excerpts from three historical documents showing that the discount rate was widely recognized as the leading policy rate of the Federal Reserve at the time. First, Figure A1 reproduces a 1971 chart from the *Federal Reserve Bulletin* (from the regular section "National Summary of Business Conditions") summarizing the main interest rates influencing U.S. business conditions. Although this corresponds to a period when the federal funds rate was gaining importance, the figure still highlights the Fed discount rate alongside the Treasury bill rate and long-term government bond yields as key indicators of financial conditions. No equivalent figure featuring the federal funds rate appears in these bulletins.

Second, we provide an example (December 1965) of a typical Federal Reserve statement announcing a change in the discount rate as a shift in the monetary policy stance, with an explicit anti-inflationary objective (Figure A2. More details on this specific policy change are presented in the Appendix.

Third, we show that foreign central banks under Bretton Woods systematically interpreted the Fed's discount rate as the rate reflecting the U.S. monetary policy stance. During this period, the discount rate remained the policy rate for all major central banks, as it had since the nineteenth century (although postwar central banks also relied on quantitative tools), and the Fed was not seen as an exception [Monnet, 2018a]. The Federal Reserve's discount rate was viewed abroad as its policy rate and appears as such in the monthly bulletins and annual reports of the foreign central banks we have consulted, as well as in publications of international organizations. As an illustration, Figure A3 reproduces a table published annually in the BIS Annual Report throughout the Bretton Woods era, summarizing policy rates across major central banks. We reproduce a table from 1971 to show that this remained the case at the end of Bretton Woods, even though the Fed had begun to place greater emphasis on the federal funds rate in the late 1960s. The U.S. discount rate continued to be listed and compared with those of other countries.

3 .1.2 The role of the Fed discount rate and the 'announcement' effect

The discount rate was not the only instrument of the Fed during Bretton Woods (it was complemented by open market operations and reserve requirements), but that it was the leading policy rate indicating changes in the monetary policy stance. This was true despite the fact that discount loans were negligible (in the 1-2% range) in the Federal Reserve's balance sheet during the period [Jefferson, 2024].

The discount rate affected monetary conditions through several complementary channels. First, it influenced the cost of reserves: higher discount rates increased the cost of borrowing from the Federal Reserve, although demand at the Fed discount window depended not only on interest rate differentials but also on liquidity needs and administrative constraints [Jones, 1971, pp. 35–37]. Second, the discount window functioned as

a "safety valve," allowing individual banks to meet temporary reserve needs and thereby enabling the Federal Reserve to conduct more effective open market operations [Board of Governors of the Federal Reserve System, 1971, pp. 6–7]. In practice, at least until the late 1960s, the Fed would conduct open market operations to prevent other short-term rates from exceeding the discount rate [Waud, 1970, Poole, 1975, Lombra and Torto, 1977]. The Federal Reserve's discount rate thus steered other policy rates. This role is close but however differed from what central banks now describe as a "corridor system" [Ennis and Keister, 2008], in which the discount rate serves as a penalty rate at which banks can borrow freely when needed. Under Bretton Woods (especially after the 1955 revision of Regulation A) banks were discouraged from borrowing at the discount window through administrative constraints, and such borrowing carried a strong stigma [Board of Governors of the Federal Reserve System, 1971]. As a result, the discount rate did not operate merely as the ceiling of a market-based mechanism: access to the discount window was also subject to quantitative rationing.

Finally, changes in the discount rate served as public signals of monetary policy [Jones, 1971, pp. 38–40]. In this role, they conveyed an "announcement effect" [Waud, 1970]. The strength of this effect was debated at the time, but most observers agreed that it was likely the main transmission channel, as discount rate changes signaled the Federal Reserve's willingness to adjust open market operations and reserve requirements accordingly. Some economists however argued that the announcement effect was difficult to identify because discount rate changes often followed movements in money market interest rates [Jones, 1971]. To our knowledge, Waud [1970] provides the only early attempt to identify a causal announcement effect by isolating discount rate changes not explained by prior daily movements in financial markets. Cook and Hahn [1988] and Thornton [1998] later showed that discount rate changes continued to signal unannounced changes in the Fed's target for the fed funds rate after 1971 and until the early 1980s (see Carlson et al. [2026] for a more comprehensive review).

3 .1.3 The evolution of Fed's discount rate policy

Contemporary observers noted that the Fed stopped relying exclusively on the discount rate as the policy rate around 1966–1968, and also started to watch closely the fed funds rate[Poole, 1975, Lombra and Torto, 1977]. This view of contemporaries is supported by our own extensive reading of the relevant documents. In particular, the *Record of Policy Actions* published after each FOMC meetings unequivocally shows that the discount rate remained the leading rate until the end of Bretton Woods but the federal funds rate started to be mentioned in 1966. In 1969, the Fed began referring to an intended fed funds rate, but only in internal documents [Romer and Romer, 2004]. This shift did not imply that the discount rate ceased to signal changes in the Fed's policy stance. Rather,

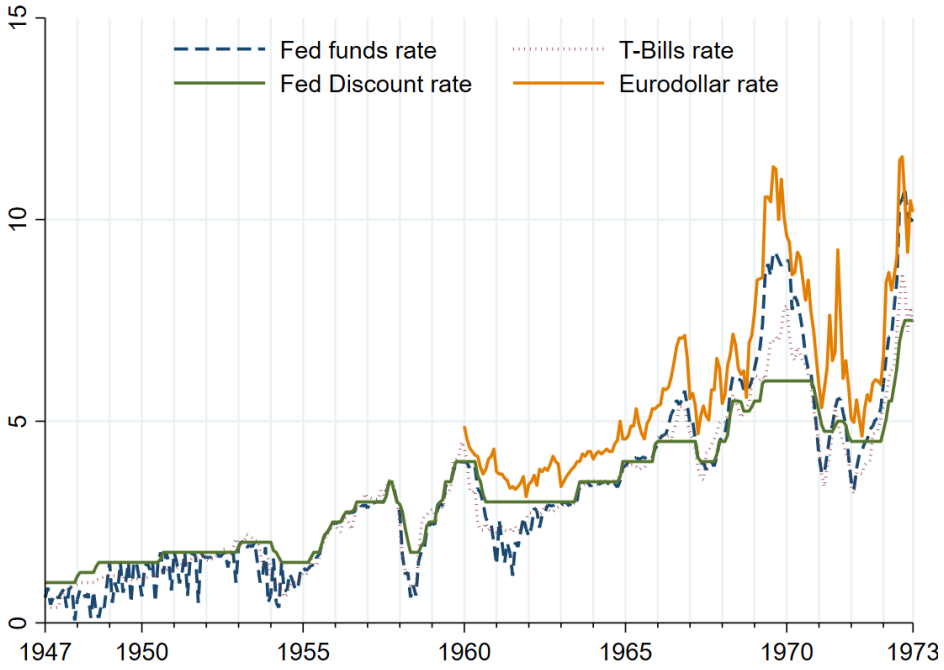


Figure 1: Discount rate of the Federal reserve and main short-term US interest rates, 1947-1973

Sources: Retrieved from FRED, Federal Reserve Bank of St. Louis. The discount rate is the rate of the Federal Reserve Bank of New York. The fed funds rate before 1954 comes from Anbil et al. [2021] (high-value). The Eurodollar rate is the rate on 3-month Eurodollar Deposits in London.

what changed gradually between 1966 and 1969 was that the Fed began to follow the fed funds rate in addition to the discount rate as a guide for its monetary policy operations.[17]

This institutional evolution occurred because, after 1965, the fed funds rate occasionally rose above the discount rate. But this did not become systematic before 1969. The shift reflected changes in bank liability management: whereas banks had previously responded to monetary tightening primarily by adjusting lending terms, they increasingly did so by altering interest rates on short-term borrowing, including in the fed funds market [Lombra and Torto, 1977].[18] The Fed therefore had to pay close attention to

[17]See, for example, in the February 1971 *Federal Reserve Bulletin* (p. 92): " The day-to-day operations in the market by the System Account Manager [of the Fed] have continued to be guided mainly by money market conditions, in part because the information that is available daily and continuously as to the state of the money market—for example, the Federal funds rate and dealer loan rates—reflects the interaction of the demand for and existing supply of bank reserves and hence provides a basis for making daily decisions as to whether the System should be in the market providing additional or absorbing existing reserves; and if so, by how much and through what means." As explained previously and shown on figure A1, the Fed mentionned the fed funds rate but still displayed the dicount rate as its main rate in the bulletins.

[18]Carlson and Wheelock [2018] recently showed that gradual banking deregulation in the 1960s reduced money market segmentation and increased the ability of banks to raise funds using a greater variety of substitutable instruments, including negotiable certificates of deposit. In turn, this implied that larger open market operations were required to produce a given change in the federal funds rate, but that the Fed progressively improved its ability to manage the fed funds market through these open market operations.

developments in the fed funds market. In parallel, it also began to monitor monetary aggregates more closely [Poole, 1975, Lombra and Torto, 1977].

During the period under study, and prior to the end of Bretton Woods, the direction of the discount rate and the fed funds rate diverged only in 1966 and 1970. In these cases, there is evidence that the discount rate was still more representative of the general monetary policy stance. As far as 1966 is concerned, the fact that the discount rate did not follow the increase in the fed funds rate is consistent with Romer and Romer [1989]'s claim that this period does not "belong on a list of episodes in which the Federal Reserve was actively attempting to induce a downturn". Few years later, the fed funds rate began to decline in January 1970, whereas the discount rate was lowered only in November 1970. Whether the early decline in the fed funds rate reflected an exogenous policy decision is uncertain. The economy entered recession and interest rates began to fall, and the intended fed funds rate reported in FOMC meetings in 1970 largely followed, rather than led, the observed decline in the market rate [Romer and Romer, 2004]. 1970 is not considered to be a contractionary monetary policy episode by Romer and Romer [1989, 2024].

Thus, although it is debatable whether the discount rate should be treated as the primary policy rate after 1969, we argue that using it for 1970–1971 does not materially misrepresent the stance of monetary policy during these years. For consistency, we therefore continue to use the discount rate during the final two years of the Bretton Woods system.

One may also question the starting date of our analysis. Since the focus of this paper is on the international monetary system, and in order to ensure consistency and cover the entire Bretton Woods period, we begin in 1948. However, it is well known that the Federal Reserve did not regain full independence over its discount rate policy until the Fed–Treasury Accord of March 1951 [Bordo, 2010, Carlson and Wheelock, 2016]. Despite this important institutional breakpoint, we start our baseline specification in 1948 for two reasons. First, if monetary policy was indeed largely inactive before 1951, this will be captured by our identification strategy and therefore will not bias our results. Second, in their narrative approach, Romer and Romer [1989, 2024] identify a deliberate contractionary monetary policy episode beginning in October 1947 and continuing into 1948, and note that it was implemented through increases in the discount rate and reserve requirements. As discussed earlier, we do not claim that the discount rate was the Fed's only policy instrument, but rather that its exogenous changes served as a clear signal of shifts in the monetary policy stance. The main results presented below are also unaffected if we start in 1951 rather than 1948.

3 .1.4 The Fed Decision-Making Process

Contrary to the post-Bretton Woods framework, in which the federal funds rate is set at regular FOMC meetings, the decision-making process for the discount rate was more complex and irregular. Changes in the discount rate were not tied to scheduled meetings and could occur on any day. Accounting for this institutional structure is crucial for constructing an exogenous series of monetary policy shocks.

During the Bretton Woods period, the Federal Reserve's discount rate was determined within a formally decentralized institutional framework. Under the Federal Reserve Act, each Federal Reserve Bank was required to establish its own discount rate at least every fourteen days. However, these rates were subject to the authority of the Board of Governors, which held statutory power of "review and determination" (Federal Reserve Act, Section 14; Board of Governors of the Federal Reserve System). In practice, discount-rate changes followed a two-step process: a proposal at the regional level followed by approval at the federal level. A rate change could not become effective until approved by the Board, and public announcements were typically made only after this step. This arrangement explains why announcements often occurred several days after the initial decision taken by a Reserve Bank (see announcement dates in Figure A2 and Appendix Section A.2).

Operationally, although the day of announcement was decided by the Federal Board of Governors, discount-rate decisions were made during regular meetings of each Reserve Bank's board of directors. These meetings were not synchronized across districts: some boards met monthly, others twice per month [Carr, 1960]. As a result, changes often appeared sequentially rather than simultaneously. To meet statutory requirements, executive committees could act between meetings when necessary. The Board of Governors also sometimes delayed action until multiple Reserve Banks submitted similar recommendations, approving them jointly.[19] As emphasized by Carr [1960], observed differences in timing across districts often reflected institutional mechanics and coordination rather than independent policy choices.

This decentralized structure was not unique to the postwar period but reflected continuity with earlier Federal Reserve practice [Eichengreen et al., 2015, Cohen-Setton, 2015]. The postwar system thus preserved the original Federal Reserve design while increasingly producing coordinated outcomes. The differences in discount rates between the Reserve Banks became smaller than before the war, and the New York Fed's rate assumed greater prominence.

[19]Further evidence of informal coordination comes from the fact that, at some FOMC meetings, the Chair invited Reserve Bank presidents to submit requests for changes in the discount rate, thereby helping to align discount-rate decisions with broader monetary policy deliberations [Carlson et al., 2026].

3 .1.5 Why the New York Discount Rate Provides the Relevant Policy Signal

Given this decentralized structure, a central methodological issue is which observable rate best captures the stance of U.S. monetary policy. In this paper, we follow the approach of Waud [1970], which is representative of a broader Bretton Woods–era literature treating changes in the New York Fed (FRBNY) discount rate as the primary observable U.S. monetary policy shocks.

Waud [1970] describes the New York Fed as the "bellwether" among Federal Reserve Banks. He shows that changes in the FRBNY discount rate generated measurable "announcement effects" in financial markets, affecting interest rates and asset prices at the time of the announcement. The New York Fed was at the center of U.S. money markets and closely associated with the implementation of open market operations. Accordingly, our empirical strategy uses changes in the FRBNY discount rate. Appendix A.2 lists all discount-rate changes across Reserve Banks during this period and discusses the few cases in which New York's actions diverged from those of other districts. In most cases, New York acted as a leader or early mover in discount-rate changes (see Appendix Figures A2 and Section A.2), and its actions were widely interpreted as reflecting the System's overall policy direction. Even when another Reserve Bank initiated a change, subsequent action by the New York Fed often confirmed the policy signal, and financial markets typically reacted primarily to New York announcements.

3 .2 Construction of exogenous shocks

3 .2.1 Methodology

Building an exogenous policy rate shock requires identifying changes in the central bank's policy rate that are orthogonal to the set of macroeconomic and financial variables influencing the policy decision, as well as to the information set available to policymakers at the time of the decision. In other words, we aim to isolate the unexpected, discretionary component of monetary policy—the portion of policy rate movements that cannot be explained by contemporaneous economic conditions or systematic policy responses. This step is crucial to avoid endogeneity bias: if the same factors that determine the policy rate also affect the variables of interest, failing to purge these confounding influences would distort the estimated effects of monetary policy.

Our identification strategy therefore seeks to "purge" the observed Fed discount rate changes from their endogenous component. In doing so, we follow the spirit of the "narrative approach", which reconstructs monetary policy shocks by discarding the predictable and systematic elements of central bank behavior [Romer and Romer, 2004].

Besides, unlike more recent studies that exploit high-frequency data on futures rates to measure monetary policy surprises (Gertler and Karadi [2015]; Jarociński and Karadi

[2020]; Miranda-Agrippino and Ricco [2021]; Bauer and Swanson [2023a,b]), such data are not available for our historical period. We therefore adopt a "second-best" strategy, extending the approach of Waud [1970] that anticipated modern 'high-frequency' identification. We use daily data on short-term interest rates and exchange rates to approximate the information set of financial markets immediately before the monetary policy decision. This approach allows us to control for rapidly evolving market expectations and to capture the genuinely unanticipated component of central bank rate changes.

As such, our approach is conceptually close to that of Cloyne et al. [2022], who construct a new series of exogenous German monetary policy shocks based on Bundesbank Council meetings between 1974 and 1998. Their identification also combines the narrative framework of Romer and Romer [2004]—finding evidence on the main variables screened by policymakers—with the insights from high-frequency identification, exploiting daily market data available up to the day of each meeting. In both approaches, a "cleaning" regression is used to orthogonalize policy rate changes with respect to the policymakers' contemporaneous information set. For post-1989 Fed policy, Bauer and Swanson [2023b] complement their high-frequency identification using intraday data with a second step where market surprises are purged from the information contained in monthly macroeconomic data. The rationale is to avoid treating as a surprise information that, while not yet incorporated into market interest rates, was nevertheless predictable based on macroeconomic information available to the central bank. We also follow such a two-step procedure.

3 .2.2 Two-step procedure

Our exogenous monetary policy shock is thus defined as a change in the Fed discount rate that is not predicted by contemporaneous movements in financial markets (interbank, exchange rate, and stock markets) or by the state of the macroeconomy as reflected in monthly indicators.

We proceed in two steps. First, we rely on daily-frequency variables—primarily exchange rates, short-term market interest rates (fed funds and t-bills), and stock prices—to capture the financial market information set relevant for expectations about the Fed's imminent decision. In this first step, we regress the daily change in the policy rate on lagged values of these financial variables, effectively "purging" the component of monetary policy that merely adjusts to market outcomes. The residuals from this regression represent innovations in the policy rate orthogonal to contemporaneous financial conditions. Consistent with the Federal Reserve's decision-making process described above, we use the New York Fed's discount rate as the primary policy rate and allow for changes to occur on any working day.

In a second step, we remove any remaining endogenous variation associated with

systematic responses to macroeconomic conditions. Specifically, we consult primary and secondary historical sources to identify the central bank's policy objectives and the key variables that guided its decisions. Although we lack data on real-time forecasts produced and circulated internally before each meeting—as in Romer and Romer [2024]—we have access to historical macroeconomic data (industrial production, price indices, reserves, money supply, exchange rates, etc.) that were available to policymakers at the time of their decision. For recent years, Bauer and Swanson [2023b] show that there is little more information incorporated in the forecasts of the Fed than in these publicly available data. When possible, we rely on "real-time" (vintage) data—that is, statistics available to policymakers at the time of their decision, rather than revised figures published ex post. This ensures that our measure captures the genuine information set of policymakers and not hindsight-corrected data.

We first aggregate the residuals from the daily "first-step" regression to obtain a monthly index of unanticipated policy changes. We then regress this monthly index on the set of macroeconomic indicators that influenced policy decisions at the time. The residual from this second regression constitutes our final measure of the exogenous monetary policy shock, which will serve as the key variable in our subsequent analysis.

We note r_d^{ref} the discount rate, y^j the set j daily variables influencing the policy rate the day before each meeting day d, τ the time between two meetings, and x^k the set of k monthly variables influencing the policy rate over the P previous months $m-p$. Explanatory variables appear both in level and in growth rate (or first-difference). [20] The shock calculation is then obtained from a two stages regression as follow:

$$\Delta r_d^{\text{ref}} = \beta_0 + \beta_1 r_{d-1}^{\text{ref}} + \sum_j \gamma_{j,p} y_{d-1}^j + \sum_j \phi_j \Delta_{d-1 \to d-\tau} y^j + \epsilon_d \tag{1}$$

We then construct a monthly measure of unexpected policy innovations by aggregating the daily residuals within each month:

$$\Delta \hat{r}_m^{\text{ref}} = \sum_{d \in m} \epsilon_d$$

In a second step, we purge this monthly series from its predictable component using macroeconomic information:

$$\Delta \hat{r}_m^{\text{ref}} = \sum_k \sum_{p=1}^{P} \theta_{k,p} x_{m-p}^k + \sum_k \sum_{p=1}^{P} \mu_{k,p} \Delta x_{m-p}^k + \epsilon_m \tag{2}$$

Finally, we normalize the resulting shock to match the scale of observed discount rate changes. Specifically, we rescale the estimated shock so that its standard deviation equals

[20] P has been set according to BIC and AIC information criteria.

that of the actual changes in the discount rate over the sample period. Formally, letting $\widehat{\epsilon}_m$ denote the estimated shock from equation (2), the normalized shock is defined as:

$$\epsilon_m^{\text{norm}} = \widehat{\epsilon}_m \times \frac{\sigma(\Delta r_m)}{\sigma(\widehat{\epsilon}_m)} \tag{3}$$

where $\sigma(\cdot)$ denotes the sample standard deviation and Δr_m the monthly discount rate change. This normalization ensures that the magnitude of the identified shocks is directly comparable to observed changes in the policy rate and facilitates interpretation of the impulse responses in terms of percentage point variations in the discount rate.

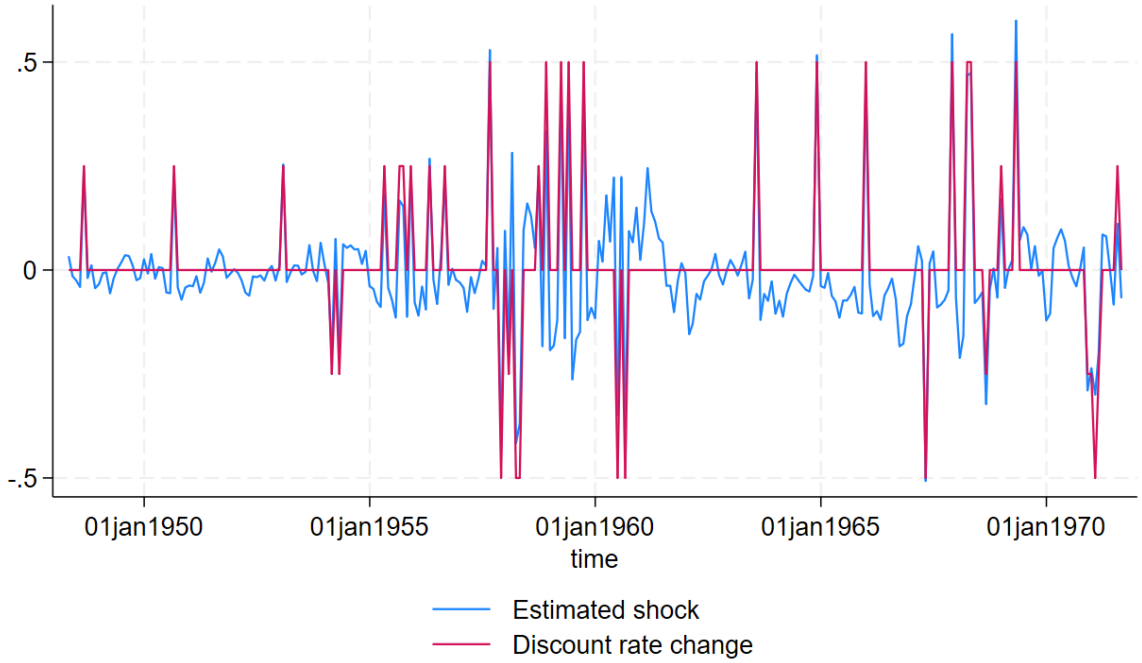
Bretton Woods (1948–1971)	
Variables	**Frequency**
Daily frequency (first-step regression)	
Federal Reserve discount rate (decision of the Discount Committee)	daily
Exchange rates vis-à-vis London, Paris, Berlin (after 1954), and Tokyo (after 1954)	daily
Federal Funds rate (after 1954)	daily
U.S. Treasury bill yields (after 1954)	daily
Dow Jones Industrial Average index	daily
Monthly frequency (second-step regression)	
Monthly sum of residuals from the daily regression (preliminary monetary policy innovation)	monthly
Industrial production index (vintage data)	monthly
Annual inflation rate (vintage data)	monthly
Unemployment rate	monthly
Federal Reserve international reserves	monthly
Bond yields	monthly
Stock market index	monthly
Set of variables unavailable at daily frequency (for the pre-1955 period only)	monthly

Table 1: Variables and frequency used to identify exogenous U.S. monetary policy shocks under the Bretton Woods regime

Table 1 summarizes all the daily and monthly variables we use to perform our two-step procedure and thus identify monetary policy shocks. At daily frequency: the dependent variable is the daily rate change of the Fed discount rate agreed upon during discount committee meeting. Explaining variables are: the exchange rate vis-à-vis London, Paris, Berlin (after 1954), the Fed Fund rate, the Treasury bill yields (after 1954) and the Dow-jones index.[21]

[21]Daily exchange rates are from Accominotti et al. [2025]. The daily Dow Jones index was obtained from https://www.measuringworth.com/datasets/DJA/index.php. The fed funds rate before 1954 is from Anbil et al. [2021]. All other variables were retrieved from FRED, Federal Reserve Bank of St. Louis.

Figure 2: Monetary policy shock vs discount rate change, 1948-1971



At monthly frequency: the dependent variable is the residual of the daily frequency regression, summed for each month. The explaining variables are: the production index, the annual inflation rate, the unemployment rate, the Fed international reserves, the market index, the bonds yield, and, before 1955, the set of variables unavailable at daily frequency. We use vintage data for inflation and production in the estimation.[22] This allows to account for the information available to the central bank in the moment of its choice. We used 4 lags in the monthly calculation ($p = 4$).

3 .2.3 A reconsideration of U.S. monetary policy under Bretton Woods

Figure 2 shows our monetary policy shock series. Consistent with Waud [1970], it suggests that a number of changes in the discount rate were not merely endogenous responses to market and macroeconomic conditions, but instead reflected genuine monetary policy surprises.

We also observe that the shock is more persistently negative during the 1960s, implying that monetary policy was generally more expansionary than market and macroeconomic conditions would have predicted. This finding is consistent with several historical accounts. Romer and Romer [2002] offered a "rehabilitation of monetary policy in the 1950s," based on the empirical finding that the federal funds rate responded to inflation

[22]Consumer Price Index for All Urban Consumers: All Items in U.S. City Average Vintage (FRED, series CPIAUCNS); Industrial Production: Total Index Vintage. (FRED, series INDPRO). All other variables were retrieved from FRED, Federal Reserve Bank of St. Louis.

and the output gap in a manner broadly consistent with a Taylor rule. Bordo [2010] is similarly positive about the tenure of William McChesney Martin (Chairman of the Board of Governors from 1951 to 1970), arguing that "the Fed pursued a sound monetary policy" in the 1950s and that "from 1959 to 1964, the Fed continued to emphasize price stability." Hetzel [2023] likewise characterizes the "early Martin Fed" favorably, writing that Martin "always considered price stability to be the overriding objective" (p. 337).

Our estimated monetary policy shock series is also consistent with the narrative evidence in Romer and Romer [2024], who show that the Fed's contractionary policy beginning in September 1958 reflected a strong commitment to fighting inflation. Their narrative approach also identifies three other major monetary contractions before the 1970s that are visible in our series: October 1947, August 1955, and December 1968.[23]

3 .2.4 Validation at the Daily Frequency

To further assess the validity of our identification strategy, we provide direct evidence at the daily frequency on how short-term interest rates (the federal funds rate) react to changes in the Federal Reserve discount rate. If discount rate changes contain an unexpected component, they should be associated with abnormal movements in money market conditions relative to normal days.

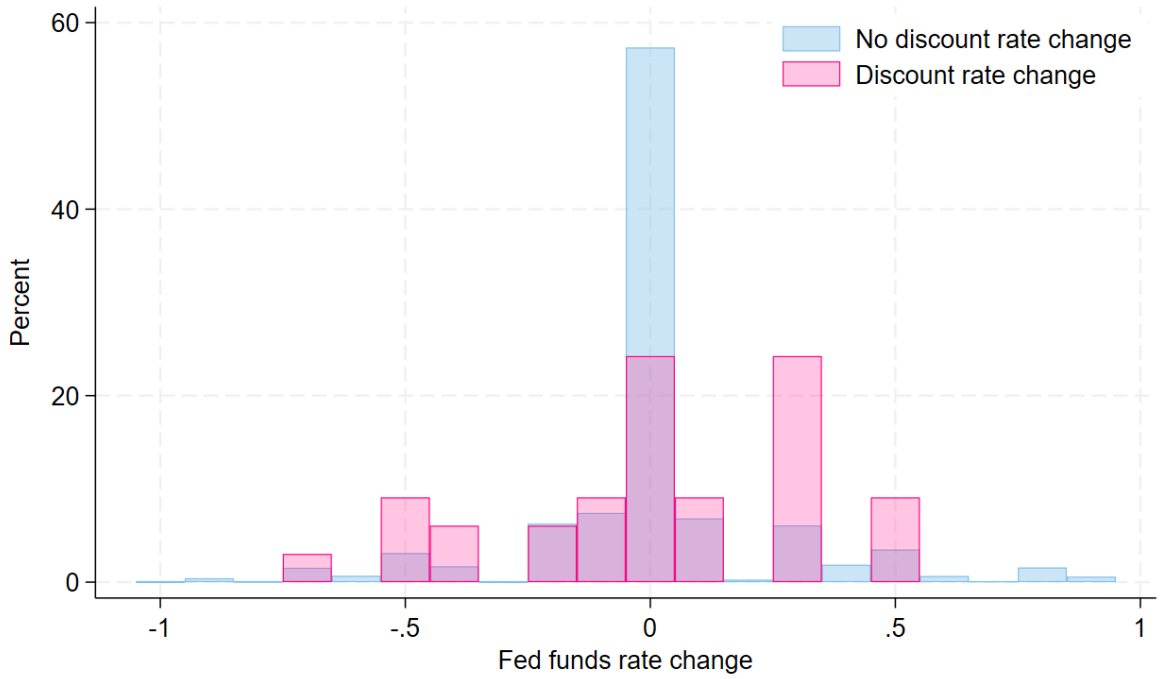
Figure 3 reports histograms of changes in the federal funds rate, distinguishing between days with and without a discount rate change over the period 1948–1971. The comparison reveals two striking patterns.

First, in the absence of a discount rate change, the distribution of federal funds rate variations is strongly concentrated around zero, with relatively limited dispersion. This indicates that, under normal conditions, short-term rates display only modest day-to-day fluctuations. Second, on days when the discount rate is changed, the distribution becomes substantially wider, with a much larger frequency of sizable positive and negative movements. This suggests that discount rate changes are associated with discrete and abnormal adjustments in money market conditions. The slight asymmetry of the distribution, with more mass on the positive side, reflects the predominance of monetary tightening episodes in the sample (also visible on figure 2).

Taken together, these results provide evidence that discount rate changes coincide with unusually large movements in short-term money market interest rates. This is consistent with the presence of an announcement effect, whereby policy decisions convey new information to financial markets and trigger immediate adjustments in money market conditions, as emphasized by Waud [1970].

[23]The literature on other central banks during this period likewise emphasizes that the Fed's policy was viewed favorably in European countries [Monnet, 2018a]. It was perceived as effective in reducing inflation, particularly during the Korean War (1951–1953) and the international price cycle of 1958. Our previous discussion of the Eurodollar market also highlighted the widespread contemporary perception that U.S. monetary policy was tight in 1968 but loose in 1970; see in particular Solomon [1982].

Figure 3: Distribution of daily changes in the federal funds rate, 1948-1971



Note: The figure reports histograms of daily changes in the federal funds rate over a two-day window centered around each date, distinguishing between days with and without a change in the Federal Reserve discount rate. The sample is restricted to the 1948–1971 period.

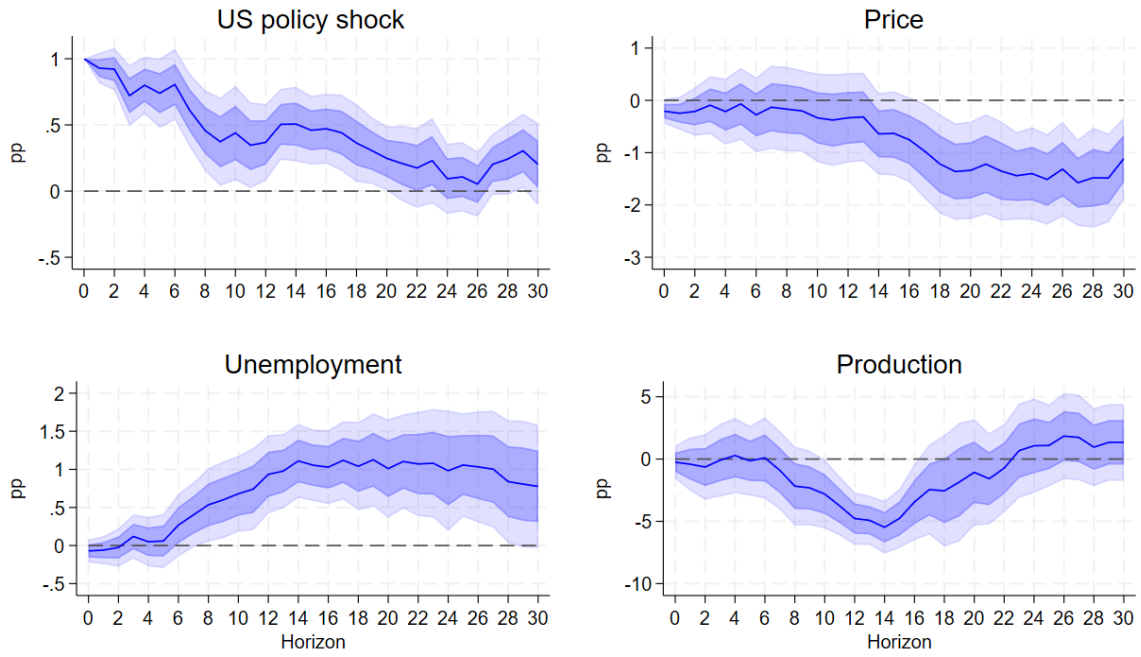
4 Impact of US monetary policy shocks on the US macroeconomy

Having constructed exogenous monetary policy shocks, we now look at the effects of monetary policy shocks on the U.S. macroeconomy (section 4), on Eurodollar rates (section 5) and on the macroeconomy of other countries (section 6). We begin with the impact of US monetary policy shocks on the U.S. To estimate the effect of the monetary policy shock we use local projection:

$$y_{t+h}^{k} = \alpha + \Phi_h(L)Y_{t-1} + \beta_h \Delta r_t^* + month + trend + \epsilon_{h,t} \tag{4}$$

For $h = 0, 1, 2, ..., H$, with H the time horizon for which we want to measure the response to a shock. y_{t+h}^{k} is the value of variable $k = 1, ..., K$ at horizon h. α_i is a constant $\Phi_h(L)$ is the polynomial set of lag operator for endogenous variables, Δr_t^* is the monetary policy shock, and β_h is the estimated parameter which we focus on to see the effect of the shock on the endogenous variables. Our equation also includes monthly dummies and a trend. The number of lags depends on information criteria and is set to three. Newey and West standard errors are used in each estimation to account for serial correlation and heteroscedasticity.

Figure 4: Domestic responses to an exogenous monetary policy shock, 1948-1971

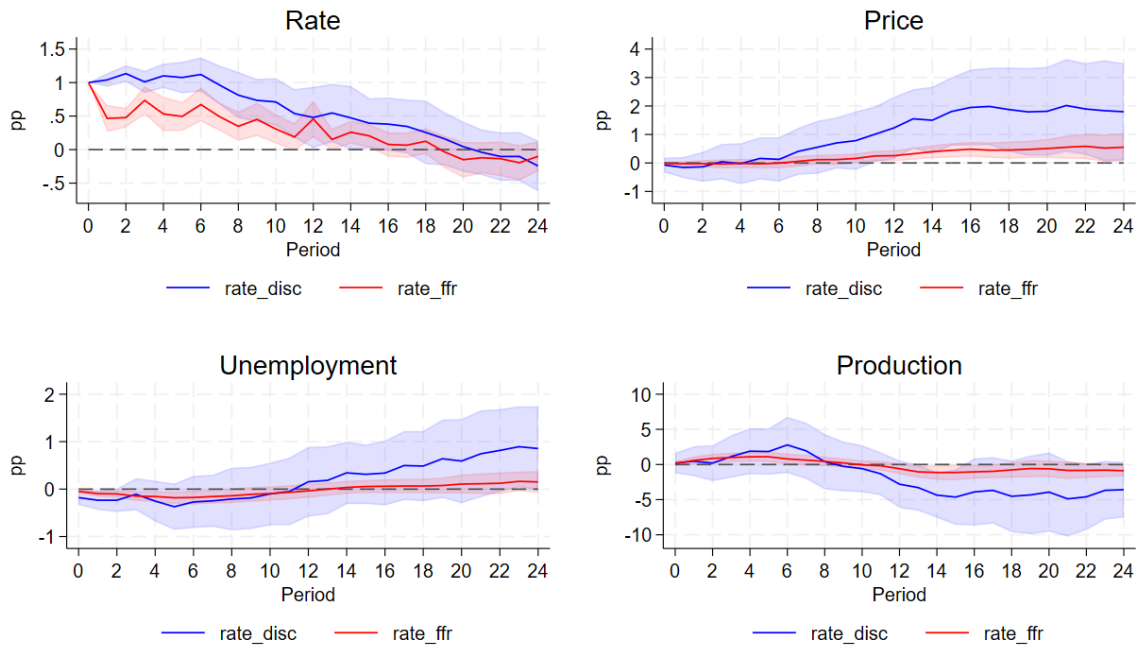


Note: responses to a discount rate surprises of +1pp. Estimation based on Local projections including 3 lags, monthly dummies, and a trend. The sample starts in 1948 and ends in 1971. Error bands, based on Newey and West standard errors, correspond to the 68% and 90% confidence intervals.

Our main estimates in Figure 4 indicate that an unanticipated 1 percentage point increase in the U.S. discount rate during the Bretton Woods period is followed by a gradual and significant decline in inflation, industrial production growth, and a rise in unemployment. Specifically, inflation starts decreasing progressively to become significant 14 months after the shock, reaching approximately -1.5 percentage points after 18 months. There is no 'price-puzzle' (i.e. initial increase in inflation after the shock) and the response is faster than the one found by Romer and Romer [2004] (the decrease of inflation is significant starting 22 months after the shock in their estimations). The twelve-month growth rate of industrial production declines significantly after 10 months, falling by about 5 percentage points after 14 months. In parallel, the unemployment rate rises gradually from 6 months onward, peaking around +1 percentage points. Overall, the results suggest that monetary tightening had strong and persistent real effects during the Bretton Woods era. Figures B1 and B2 in the Appendix show that our results are not sensitive to the choice of lags in the estimation of local projections.

By contrast, figure 5 shows that, when monetary policy shocks are measured using simple changes in the discount rate or in the federal funds rate, the estimated responses are much less consistent with standard monetary transmission mechanisms. In these cases, we observe a pronounced "price puzzle", as inflation either fails to respond at all (in the case of the federal funds rate) or even rises temporarily following a tightening in

Figure 5: Domestic responses to the discount rate and Fed fund rate increase of 1pp (without causal identification), 1948-1971



Note: estimation based on Local projections including 3 lags, monthly dummies, and a trend. The sample starts in 1948 and ends in 1971. Error bands, based on Newey and West standard errors, correspond to the 68% and 90% confidence intervals.

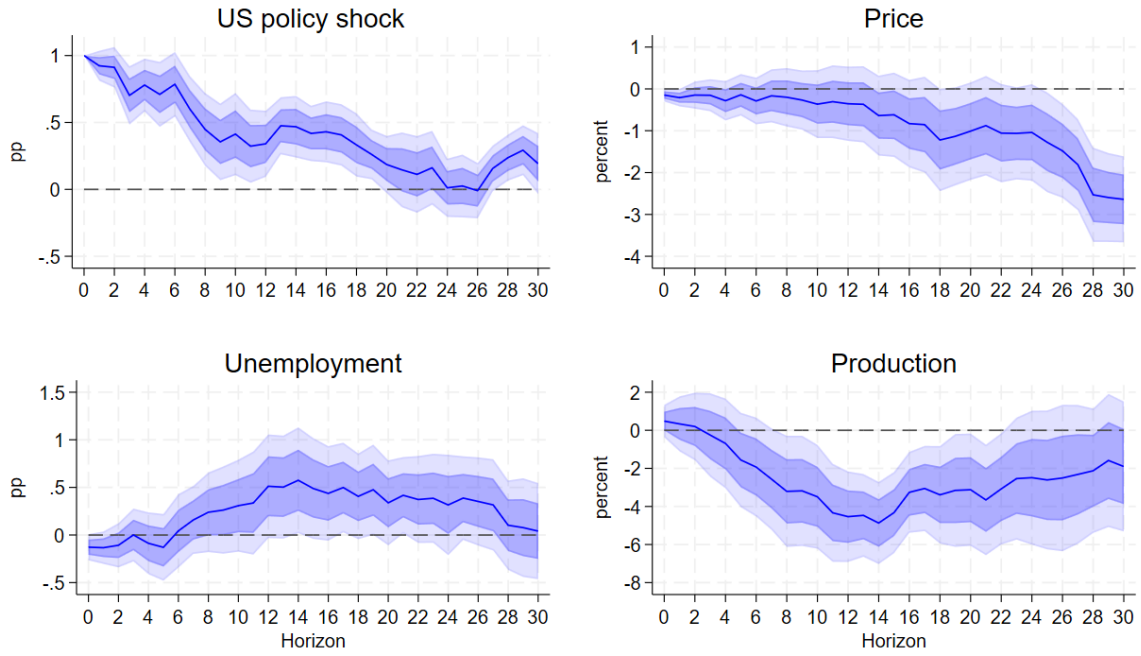
the discount rate. Similarly, an "unemployment puzzle" emerges, with the unemployment rate decreasing rather than increasing after a policy tightening, and a "production puzzle", as industrial production growth initially accelerates. Results are similar when we identify policy shocks to the discount rate and fed fund rates through a standard Cholesky decomposition (see Appendix, figures B3 and B4). Such anomalies are typical symptoms of endogeneity and anticipation effects in monetary policy identification, as emphasized in the literature (e.g., Romer and Romer [2004], Bauer and Swanson [2023b]). When policy rates adjust in response to expected future inflation or output developments, shocks identified through a conventional recursive Cholesky decomposition confound policy reactions with systematic responses to anticipated conditions.

As an additional robustness check, Figure 6 reports the effects of U.S. monetary policy shocks using industrial production and consumer prices in levels rather than the 12-month percentage changes employed in Figure 4. Overall, the results are consistent with our baseline specification. Following a contractionary U.S. monetary policy shock, consumer prices decline significantly after approximately 18 months and reach a trough of about 2.5 percent below baseline after 30 months. Industrial production responds earlier, becoming significantly negative after roughly 8 months and falling by nearly 5 percent after 14 months. These magnitudes are very similar (slightly stronger) to those reported by Romer and Romer [2004] using their post-1969 monetary policy shock series. They find that the price level reaches a maximum decline of about 2 percent after 30 months, with no statistically significant effect before 22 months, while industrial production falls by 4.3 percent at its trough after 22 months. Consistent with these developments, the unemployment rate rises significantly, reaching an increase of roughly 0.5 percentage points after 14 months. These results reinforce the view that U.S. monetary policy had sizable and persistent domestic real effects during this period.

It is also useful to compare these results with those of Bauer and Swanson [2023b] for the post-1973 period. In their baseline specification, a 25 basis point monetary tightening identified from high-frequency surprises around FOMC announcements leads to a decline in industrial production of about 0.35 percent after one year and a gradual fall in consumer prices of roughly 0.05 percent. This is lower than the effect we measured here. When their monetary policy instrument is orthogonalized with respect to contemporaneous macroeconomic and financial news (which corresponds to our second-step above), the real effects measured by Bauer and Swanson [2023b] become roughly four times larger, with industrial production falling by about 1.4 percent after one year, and prices declining more visibly by 0.5 percent. Scaling their 25 bp shock to our 100 bp benchmark, the magnitudes of the Bauer–Swanson responses are in the same vein as ours.

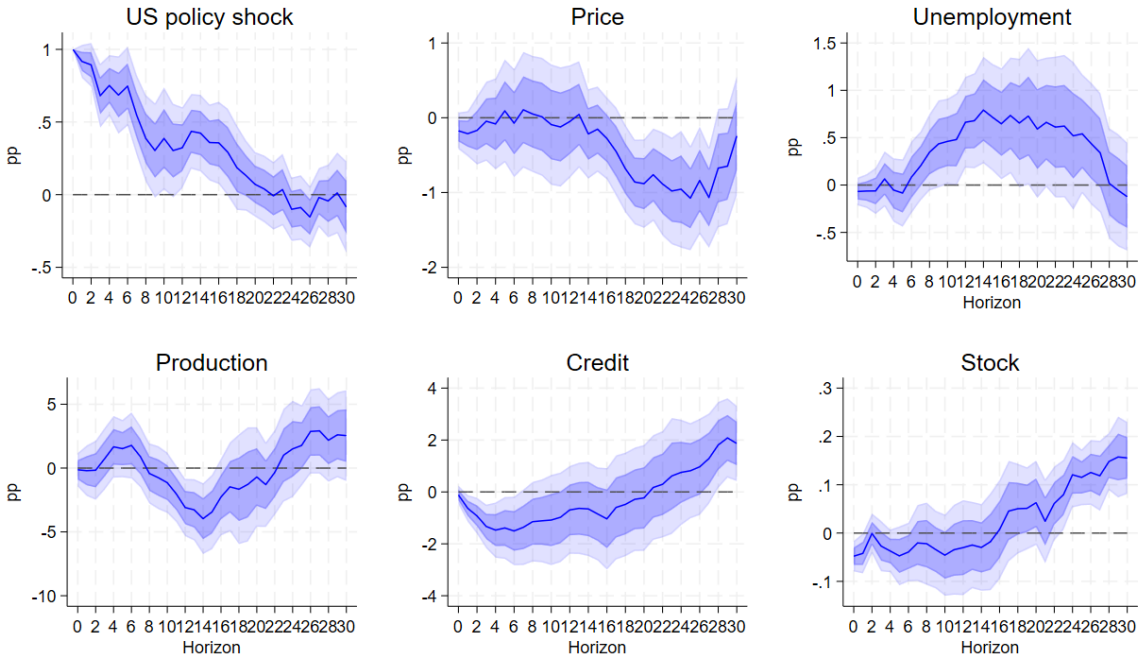
Last, we add credit and stock market to the analysis. Interestingly, we also find in figure 7 that bank credit and stock market prices react significantly and much faster than production and inflation. The effects on these variable is however short-lived, vanishing

Figure 6: Domestic responses to an exogenous monetary policy shock, price an production in log-value, 1948-1971



Note: responses to a discount rate surprises of +1pp. Estimation based on Local projections including 3 lags, monthly dummies, and a trend. The sample starts in 1948 and ends in 1971. Error bands, based on Newey and West standard errors, correspond to the 68% and 90% confidence intervals.

Figure 7: Domestic responses to an exogenous monetary policy shock, adding credit and stock market, 1948-1971



Note: responses to a discount rate surprises of +1pp. Estimation based on Local projections including 3 lags, monthly dummies, and a trend. The sample starts in 1948 and ends in 1971. Error bands, based on Newey and West standard errors, correspond to the 68% and 90% confidence intervals.

within a year.

5 The impact of US monetary policy and Eurodollar rates and capital flows

We now test whether U.S. monetary policy had an immediate impact on Eurodollar deposit rates.

5 .1 Data

The longer available monthly series of interest rate on Eurodollar deposits in the rate on 3-month deposits in London. It was compiled and published by the Bank of International Settlements as well as by the OECD starting in 1960.[24] There is no detailed monthly series of gross or net capital flows for the United States covering this period. Instead, we hand-collected data published by the Federal Reserve in its *Monthly Bulletin* over the entire Bretton Woods era, corresponding to the category "Short-Term Liabilities to Foreigners Reported by Banks in the United States." Crucially, this series distinguishes between private entities (banks, other private financial institutions, and individuals) and official entities, that is, foreign monetary authorities. It is important to note that the series excludes U.S. banks and therefore captures only the arbitrage activity of foreign banks.

To capture the funding of U.S. banks through the Eurodollar market, we use another series available in the *Monthly bulletin* of the Fed: Liabilities of U.S. Banks to Their Foreign Branches. This series is also monthly but starts in 1964 only.[25]

5 .2 Results and implications

The response of the Eurodollar rate to an unanticipated increase in the Federal Reserve discount rate (Figure 8) is immediate, significant, and strong. It closely mirrors the reaction of the federal funds rate, the main interbank rate in the United States. On impact, the Eurodollar rate rises slightly less than the federal funds rate (70 bp vs. 100 bp). In both cases, we observe a full pass-through of the exogenous shock on the discount rate. The response of the Treasury bill rate is also significant but slower, reaching

[24] Organization for Economic Co-operation and Development, Interest Rates: 3-Month or 90-Day Rates and Yields: Eurodollar Deposits: Total for United States [IR3TED01USM156N], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/IR3TED01USM156N

[25] "Starting January 1971, the source distinguishes between plain liabilities and foreign branch holding of special US gov. Securities. We use the total of the two (which corresponds to the figures reported before). For period Jan. 27, 1971 through Oct. 20, 1971, securities include U.S. Treasury Certificates Eurodollar Series and special Export-Import Bank securities held by foreign branches. Beginning July 28, 1971, all of the securities held are U.S. Treasury Certificates Eurodollar Series.

100bp after 2 months. It is consistent with the fact that the T-bill market was not the main interbank market in the U.S. These results indicate that banks actively arbitraged between the U.S. interbank market and the Eurodollar market. The rapid convergence between these rates suggests that banks could easily circumvent capital controls through Eurodollar deposits.

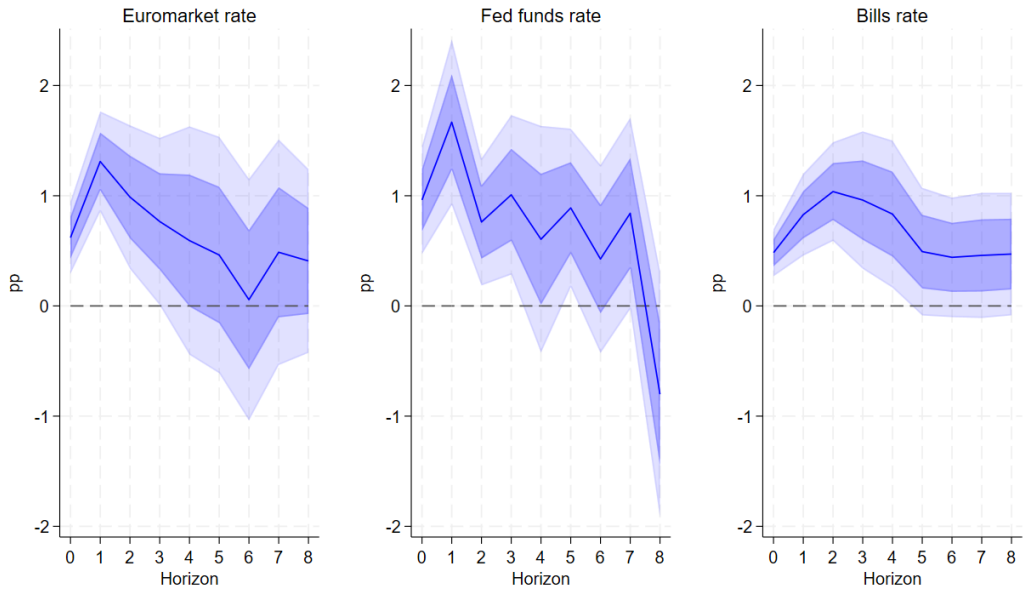
Figure 9 and 10 shows that private capital flows are consistent with these interest rate reactions. Before 1959, when currency convertibility was limited and the Eurodollar market still shallow, we observe no significant response of foreign private institutions' assets in U.S. banks to monetary shocks. Nor do we find any reaction in the assets of official authorities (central banks). By contrast, after 1959, an increase in the Federal Reserve discount rate triggered an immediate but short-lived rise in the assets of foreign private banks held in U.S. banks. Although modest, this effect was significant (at the 95% level) and non-negligible: within a single month, U.S. banks' short-term liabilities to foreign private entities increased by about 4.5%.

More importantly, the right panel of Figure 10 shows a large and persistent increase in U.S. banks' Eurodollar liabilities following a contractionary monetary policy shock (specifically, the liabilities of U.S. banks to their foreign branches). The effect is economically large, reaching approximately 25 percent after two months. This response is consistent with the mechanisms described by Klopstock [1968], Gibson [1971], Levin [1974], Koch [2015], among others (see Section 2), whereby U.S. banks relied on their foreign branches to attract funds through the Eurodollar market during periods of monetary tightening. These inflows could partially offset the effects of higher Federal Reserve interest rates by alleviating funding constraints and sustaining domestic lending.

The reaction of the liabilities held by official institutions (i.e. foreign central banks) in U.S banks is also consistent with our expectations. Before 1958, there is no reaction. After this date, the liabilities decrease immediately after the shock. This means that these foreign official institutions are withdrawing funds from U.S banks to conduct foreign exchange interventions. These interventions follow from the fact that an increase in the U.S. interest rate leads other currencies to depreciate relative to the U.S. dollar.

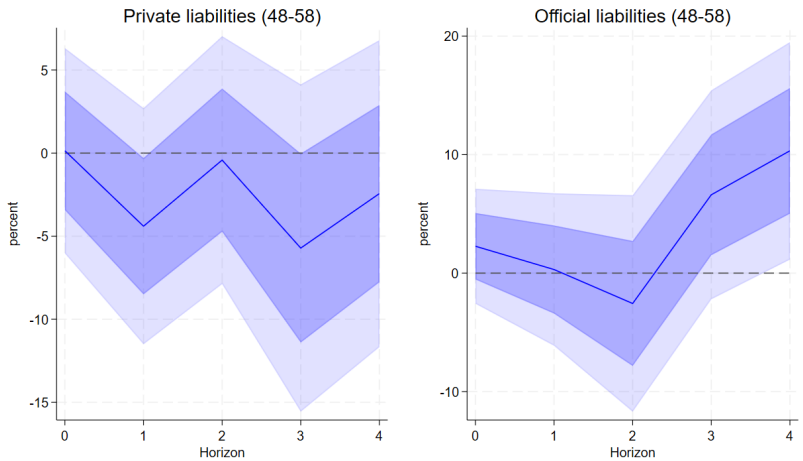
In sum, while the removal of foreign exchange-controls achieved one of the core objectives of Bretton Woods, i..e, the restoration of global trade, this very process gave rise to the blossoming of the Eurodollar market which increasingly replied on export revenues denominated in US dollars but kept in European banks Schenk [1998]. This, in turn, undermined the second objective of Bretton Woods, namely providing a certain sheltering function which, in today's parlance, we would equate with monetary autonomy.

Figure 8: Responses of the Eurodollar rate, the fed funds rate, and the T-bill rate to an exogenous monetary policy shock (1960-1971)



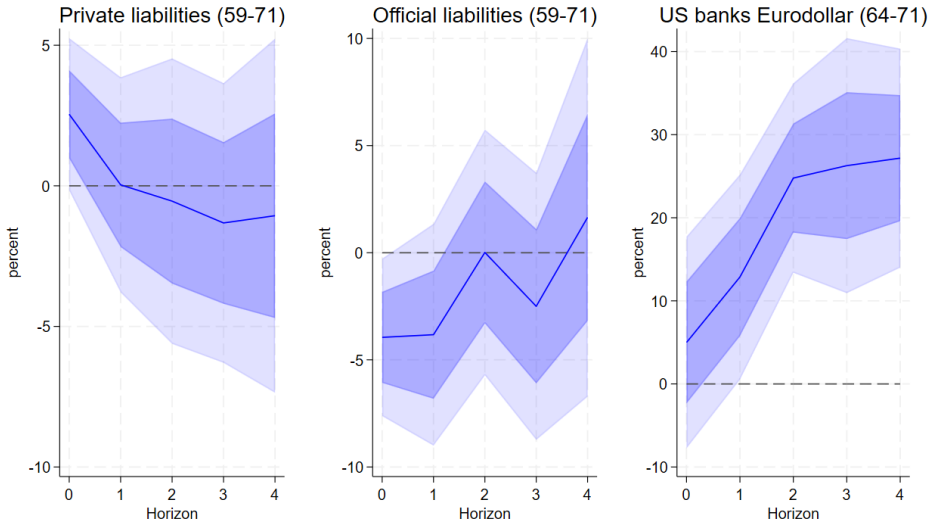
Note: responses to a discount rate surprises of +1pp. Estimation based on Local projections including U.S. inflation, production growth, unemployment rate, commercial bank loans 12-month growth, and 12-month growth in stock market prices. Local projections include 2 lags, monthly dummies, and a trend. The Eurodollar rate is the rate on 3-month Eurodollar Deposits in London. The estimation period starts in 1960 and end in 1971. Error bands, based on Newey and West standard errors, correspond to the 68% and 90% confidence intervals.

Figure 9: Response of Short-Term Liabilities to Foreigners Reported by Banks in the United States (1948-1958).



Note: Responses to a discount rate surprises of +1pp. Estimation based on Local projections including inflation, production growth, unemployment rate. Local projections include 2 lags, monthly dummies, and a trend. Error bands, based on Newey and West standard errors, correspond to the 68% and 90% confidence intervals.

Figure 10: Response of Short-Term Liabilities to Foreigners Reported by Banks in the United States (1959-1971).



Note: Responses to a discount rate surprises of +1pp. Estimation based on Local projections including inflation, production growth, unemployment rate. Local projections include 2 lags, monthly dummies, and a trend. Error bands, based on Newey and West standard errors, correspond to the 68% and 90% confidence intervals.

6 The impact of US monetary policy on other countries

After examining the international impact of U.S. monetary policy on Eurodollar rates and a subset of U.S. capital flows, we now investigate how interest rates, as well as macroeconomic and financial variables, responded in foreign countries. Unfortunately, our sample is limited to Japan, Canada, and the most economically advanced European countries of the period due to two - interrelated - reasons. First, our choice reflects data limitations: financial series—and money market rates and stock market indices in particular—are rarely available for other countries during this period (the two markets did not exist or were not sufficiently liquid in other countries). Second, we focus on countries that were financially relatively well integrated during the second half of the Bretton Woods era, that is, those that had abolished foreign exchange controls while maintaining only limited forms of capital controls. These two characteristics are strongly correlated with overall financial and economic development, which explains why we restrict our analysis to this subset of countries.[26]

[26]Our sample thus includes 15 countries: Austria, Belgium, Canada, Denmark, France, Germany, Italy, Japan, the Netherlands, Norway, Portugal, Sweden (from 1966), Spain, Switzerland, and the United Kingdom.

6 .1 Data

We use monthly data on exchange rates, central bank policy rates, money market rates, equity prices, industrial production, and consumer prices. These data were collected from various primary and secondary sources and were first presented and used in Bazot et al. [2024]. Examining the response of money market rates is central to our analysis, but it limits the number of countries for which data are available. Owing to strict financial regulation and market segmentation, several countries lacked a liquid interbank market during the 1950s and 1960s, even when they had well-developed credit institutions (such as Italy or Sweden). In these cases, the published interbank rate—when available—did not vary monthly or according to market mechanisms, but was instead determined by the central bank's discount rate or the regulated rate on Treasury bills.

Data on bank credit were compiled by Monnet and Puy [2019] from the IMF's printed volumes of the *International Financial Statistics*. These series cover only credit from commercial banks, which in some countries represented only a small share of total credit [Degorce, 2023]. They therefore capture the segment of the credit market least affected by direct state intervention and more affected by the money market and central bank rates. Many countries nevertheless continued to regulate commercial bank deposit and some lending rates. Because the data from Monnet and Puy [2019] are quarterly, we construct monthly series using quadratic interpolation. This is the only series in our analysis whose original frequency was not monthly.

6 .2 Before and after the return to convertibility

We now test whether the return to currency convertibility in advanced economies (Europe and Japan) unleashed international monetary policy spillovers. We estimate standard local projections in which variables respond contemporaneously and at several horizons to an exogenous U.S. monetary policy shock. The sample is divided into two subperiods: the pre-convertibility phase (1948–1958) and the convertibility phase (1959–1971). For both subperiods, we have sufficient observations to estimate the responses of the exchange rate, the central bank policy rate (discount rate), industrial production, credit, and inflation. We compute the responses of money market rates and equity prices only for the post-1958 period in order to retain a balanced and sufficiently large panel of countries in the first phase.

As expected, Figure 11 shows no significant response of any variable during the pre-convertibility period. With current account controls in place, financial arbitrage was impossible. The exchange rate did not move and central banks had no need to adjust their policy rates.[27]

[27] To maintain a four-panel figure, we do not display the response of credit during the pre-convertibility period, which is also insignificant.

The situation was markedly different after the return to convertibility, as shown in Figure 12. The official exchange rate remained fixed, indicating that an increase in the U.S. interest rate did not undermine the credibility of the peg to the U.S. dollar in other economies. The absence of response of the exchange rate was also achieved through widespread foreign exchange interventions [Monnet and Puy, 2020, Naef, 2021, Bazot et al., 2024]. However, foreign interest rates rose significantly, albeit with a lag: the money market rate increased by roughly 70 basis points after four months, while the central bank discount rate rose by about 40 basis points after six months. This pattern suggests that the rise in money market rates put pressure on central banks, which were compelled to adjust their policy rates, even if only partially.

The magnitude of these responses should be assessed in light of two benchmarks. First, as shown in the previous section, U.S. money market and Eurodollar rates reacted by more than 100 basis points to a 100 basis-point shock to the U.S. discount rate. Second, as shown in Bazot et al. [2022], interest rates in advanced economies responded by 24 basis points to Bank of England rate increases under the pre-World War I gold standard, often viewed as the paradigmatic case of a fixed exchange rate regime with financial openness. In their case, the maximum response (of 24 bp) is reached after two months; in ours, the maximum response (of 40 bp) is reached after five months, suggesting a slightly lower speed of adjustment. Obstfeld et al. [2005] and Morys [2013], based on estimates less comparable to the one offered in this paper, show pass-through rates of 52 basis points and 26 basis points, respectively. Thus, while the standard trilemma or Mundell–Fleming framework [Mundell, 1963, Obstfeld and Taylor, 2004] would predict a one-for-one (100 basis-point) response, historical fixed-exchange-rate regimes with financial openness have consistently produced smaller reactions. Our results show clearly that the second half of the Bretton Woods system did not show a stronger autonomy of domestic interest rates than during the classical gold standard, a result that will surprise those who still see the Bretton Woods system as an era isolated from international finance.

Taken together, these results and comparisons indicate that although capital controls and other financial frictions dampened the response of foreign money market rates relative to the Eurodollar rate, there were nonetheless significant financial spillovers from U.S. monetary tightening during the second half of the Bretton Woods era. Contemporary observers were therefore correct in arguing that the return to convertibility and the rise of Eurodollar markets had constrained the autonomy of national monetary policies.

6 .3 The disconnect between interest rates and other domestic variables

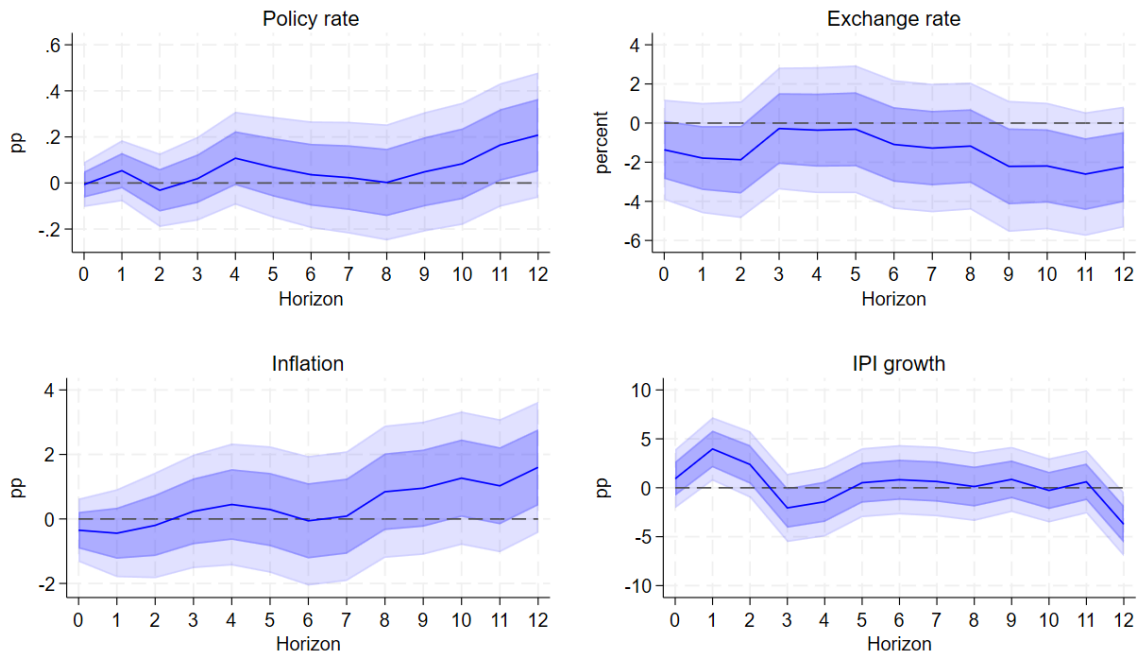
Interestingly, interest rates were not the only financial variables to respond. As shown in Figure 13, credit reacted with a delay of about six months—that is, after the increase in money market and policy rates had peaked. We interpret this lagged reaction as evidence that commercial banks, facing higher funding costs from money or central bank borrowing, subsequently reduced both their lending and their investment in securities. Note that the sample underlying Figure 13, which includes equity prices, contains slightly fewer observations than that in Figure 12, although the responses of other variables remain consistent across samples.

By contrast, neither Figure 12 nor Figure 13 shows any significant response of industrial production or inflation. This absence of real effects is consistent with the mechanisms discussed in Section 2 : credit markets remained heavily segmented by regulated lending and deposit rates and by subsidized loans granted through specialized credit institutions. Unfortunately, reliable monthly data on subsidized ("public") credit [see Degorce, 2023] are available for too few countries to test directly, in a panel framework, whether public credit offset the decline in commercial bank lending. In the French case, Monnet [2018a] documents that fluctuations in the two were largely disconnected, as flows of public credit were directed toward industrial policy priority sectors. Last, equity prices do not react, consistent with the presence of capital controls and domestic market segmentation.

Overall, these results depict a partial decoupling: on one hand, certain financial variables — especially money market rates— became increasingly sensitive to international conditions in the 1960s amid growing financial openness; on the other hand, other sources of financing remained under state control and, ultimately, macroeconomic outcomes were insulated. A clear implication is that domestic financial liberalization, by enhancing the role of market finance and interest rates, would eliminate this decoupling. Such reforms were fully implemented only after the Bretton Woods era but were already being debated in the late 1960s and initiated in several countries around 1970–1971 [Hodgman, 1973, Monnet, 2018a]. Given the growing international integration of money and equity markets, it was evident that domestic financial liberalization would undermine monetary policy autonomy if exchange rates remained fixed.

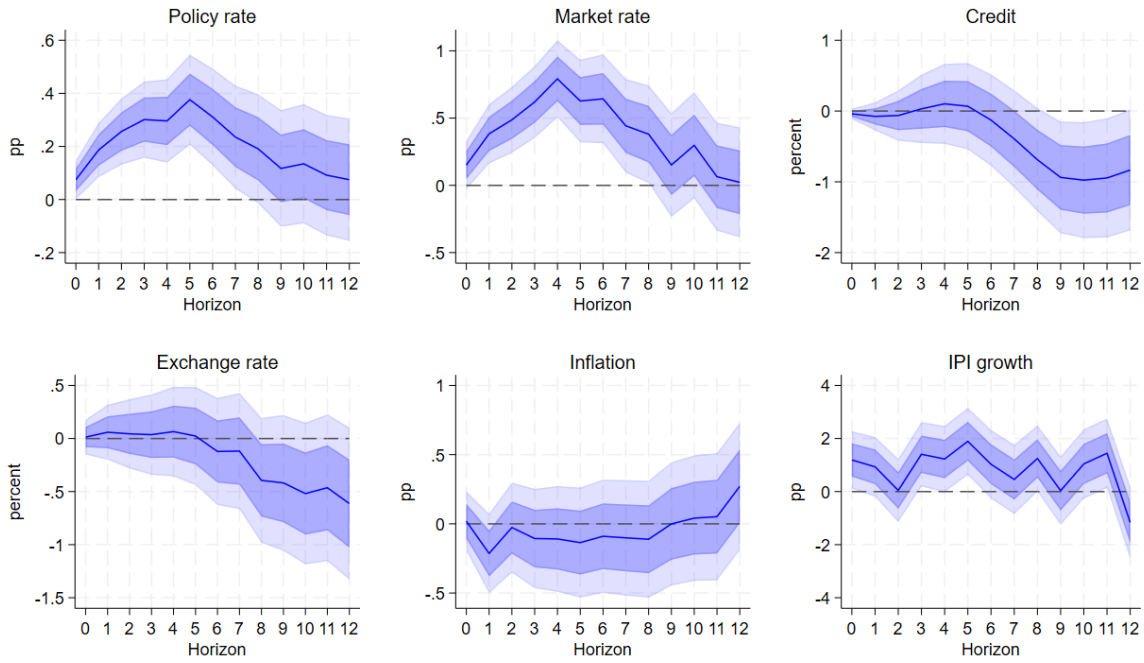
Our results provide no evidence that U.S. monetary policy shocks directly drove inflation in other countries. While this may appear inconsistent with contemporary claims that inflation was "imported" from the United States through fixed exchange rates [e.g., Emminger, 1977], it is important to note that U.S. inflation was likely influenced by many other factors beyond monetary policy. Our findings should therefore not be interpreted as a refutation of that argument, but rather as a qualification of it.

Figure 11: Responses of macro variables and interest rates to a 100bp shock on the Fed discount rate. 1948-1958



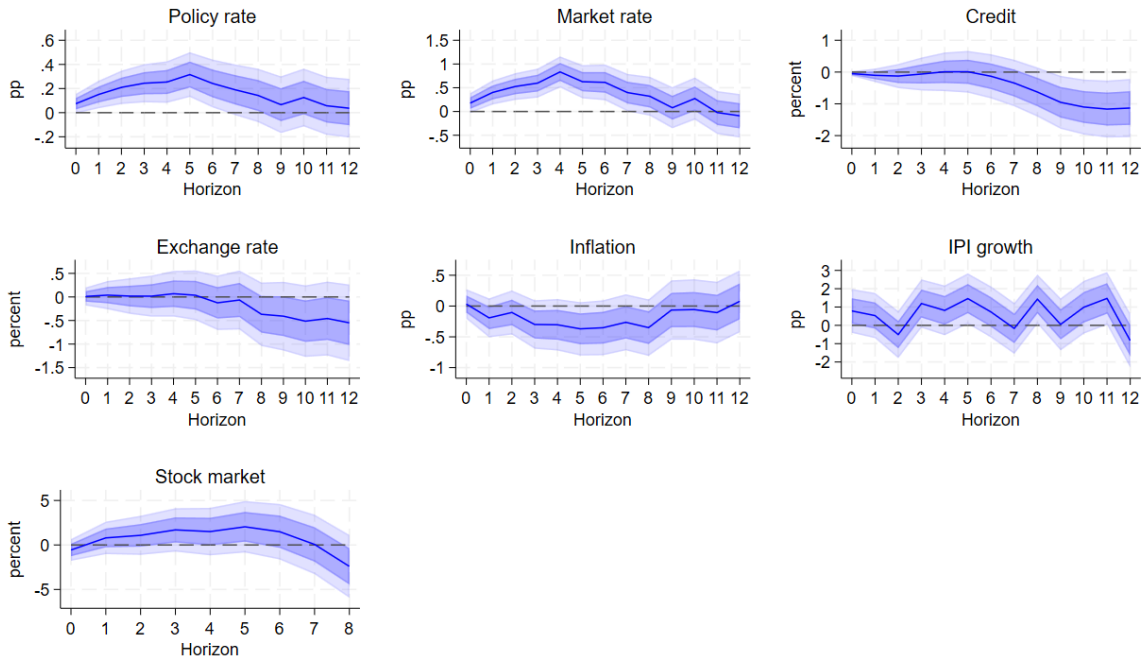
Note: Responses to a +1 percentage point discount rate shock. Estimates are based on Panel Local Projections including 4 lags, monthly dummies, and a linear trend. Current and lagged values (up to 4 lags) of U.S. prices, industrial production, and stock market variables are included as controls. The estimation period runs from 1948 to 1958. Shaded areas correspond to the 68% and 90% confidence intervals.

Figure 12: Responses of macro variables and interest rates to a 100bp shock on the Fed discount rate. 1959-1971



Note: Responses to a +1 percentage point discount rate shock. Estimates are based on Panel Local Projections including 4 lags, monthly dummies, and a linear trend. Current and lagged values (up to 4 lags) of U.S. prices, industrial production, and stock market variables are included as controls. The estimation period runs from 1959 to 1971. Shaded areas correspond to the 68% and 90% confidence intervals.

Figure 13: Responses of macro variables, interest rates and equity prices to a 100bp shock on the Fed discount rate. 1959-1971.



Note: Responses to a +1 percentage point discount rate shock. Estimates are based on Panel Local Projections including 4 lags, monthly dummies, and a linear trend. Current and lagged values (up to 4 lags) of U.S. prices, industrial production, and stock market variables are included as controls. The estimation period runs from 1959 to 1971. Shaded areas correspond to the 68% and 90% confidence intervals.

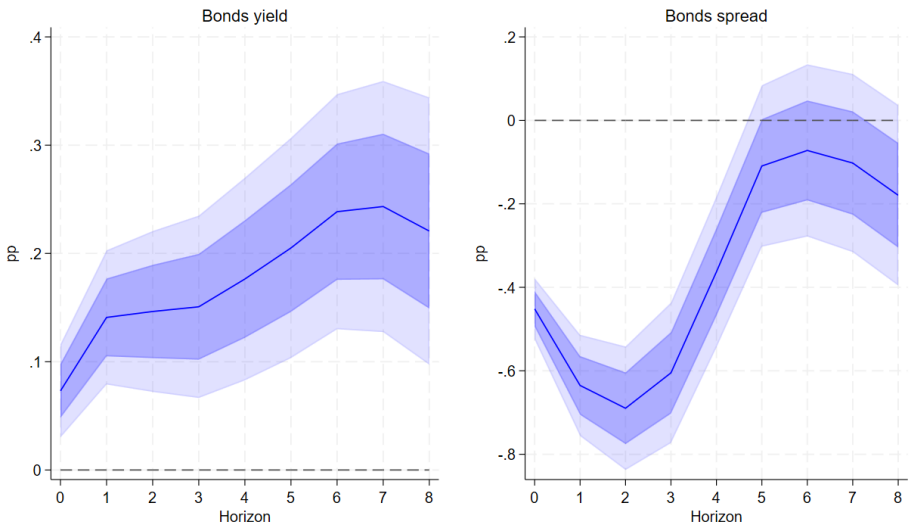
6 .4 The Impact on Sovereign Bond Yields

Last, we examine the response of foreign long-term sovereign bond yields (with maturities of ten years or more) to U.S. monetary policy shocks. Regarding the era of post-1990 globalization, research has shown that under floating exchange rates and with central banks providing abundant liquidity, short-term money market rates respond much less than long-term yields to U.S. monetary policy shocks [Degasperi et al., 2023, Bazot et al., 2024]. Moreover, because U.S. government debt enjoys a privileged status in global financial markets, an increase in the U.S. policy rate raises the risk premium on other countries' sovereign debt [Kalemli-Özcan, 2019].

We find the opposite pattern during the Bretton Woods period, as shown in Figure 14. Focusing on the post-1958 phase—since, as with other variables, no significant reactions are observed before then—we find that the response of foreign long-term bond yields (left panel) is markedly smaller than that of short-term money market rates (Figure 12). In contrast, the U.S. sovereign bond yield rises much more sharply, so that the spread between foreign yield and the US yield strongly decreases after a U.S. monetary policy tightening. Two months after the shock, the difference is as large as 70 bps.

Compared with the immediate and stronger response of short-term rates, this provides additional evidence that domestic financial regulation—complemented with capital controls—played a central role in dampening the transmission of U.S. monetary policy shocks under Bretton Woods. The literature has emphasized that a defining feature of strong state intervention in credit markets during this era was the objective of influencing government borrowing costs—or, in other words, of conducting "financial repression" [Reinhart and Sbrancia, 2015]. Governments pursued this objective primarily through two mechanisms: (i) by requiring banks to hold government securities through mandatory "liquidity ratios," which obligated them to invest a fixed share of their assets in domestic public debt [Monnet and Vari, 2023]; and (ii) by maintaining a large portion of public debt as non-marketable—typically about half of total debt outside the United States during this period—through direct loans from either central banks or specialized credit institutions [Abbas et al., 2014].

Figure 14: Responses of foreign long-term sovereign bond yield and spread vias-a-vis the US yield, 1959-1971



Note: Responses to a +1 percentage point discount rate shock. Estimates are based on Panel Local Projections including market rate, policy rate, exchange rate, production and prices. All estimations include 4 lags, monthly dummies, and a linear trend. Current and lagged values (up to 4 lags) of U.S. prices, industrial production, and stock market variables are included as controls. The estimation period runs from 1959 to 1971. Shaded areas correspond to the 68% and 90% confidence intervals.

7 Conclusion

This paper has revisited the international monetary policy transmission under the Bretton Woods system by constructing the first monthly series of exogenous U.S. monetary policy shocks for 1948–1971, derived from daily surprises in the Federal Reserve discount rate. Combined with newly digitized macro-financial data, this approach provides the first causal evidence that U.S. monetary policy affected the U.S economy during the Bretton Woods era and generated conventional domestic effects on output, inflation, and unemployment. It further shows that, once current account convertibility was restored after 1958, U.S. tightening shocks propagated across borders through Eurodollar deposits and money market rates.

The results suggest that Bretton Woods offered only temporary monetary autonomy. Contrary to the conventional view that capital controls fully insulated national policies, we find that the return to currency convertibility and the development of the Eurodollar market were sufficient to re-establish cross-border interest-rate arbitrage and to constrain domestic monetary independence. At the same time, the absence of real-economy responses abroad indicates that domestic financial regulation was the main insulating mechanism: extensive credit controls, stringent banking regulation and subsidized public lending muted the transmission of interest rate changes to aggregate demand and sovereign bond yields. Consistent with earlier results based on the study of French mone-

tary policy Monnet [2014, 2018b], these findings challenge the traditional interpretation of the Bretton Woods trilemma by showing that money market rates were already strongly connected in the 1960s but that domestic credit controls, rather than capital controls, were the key factor for policy autonomy.

For non-U.S. countries, the disconnect between the positive response of interest rates to international shocks and the insignificant response of the main macroeconomic variables also sheds light on contemporary debates. Indeed, contemporaries were well aware of this disconnect and explicitly considered its implications for domestic macroeconomic policy [Argy, 1971, Hodgman, 1973, Monnet, 2018b]. As Milton Gilbert, head of the Monetary and Economic Department of the BIS, wrote in 1962:

> "[I]t [is possible] to assign the interest rate to the external side and to find ways of managing the rate of credit expansion without relying wholly on interest rates."

(quoted in Monnet, 2018b, p. 4). This possibility, however, would become much less potent with domestic financial liberalization, which ensured a more effective pass-through of interest-rate changes to the rest of the economy.

More broadly, our evidence challenges the standard narrative about the transition from Bretton Woods to financial globalization. By documenting that monetary spillovers reappeared well before the 1970s—although confined to financial variables—the paper emphasizes that the liberalization of domestic credit markets, rather than the dismantling of capital controls, was the decisive change that eventually restored full international monetary transmission. In OECD countries, which are the focus of our analysis, domestic financial liberalization generally began in the early 1970s and was fully achieved only in the 1980-1990s [Abiad et al., 2010]. It sought to give market-determined interest rates a greater role in both credit allocation and monetary policy, and to unify credit conditions within a country, diminishing state intervention in credit allocation and the setting of lending and deposit rates. It was also associated with full liberalization of the capital account, including long-term assets [Bakker and Chapple, 2003]. This movement really began at the end or after the end of the Bretton Woods system, usually more than a decade after the abolishment of foreign exchange controls and the rise of the Eurodollar market Monnet [2018a]. Notable examples include the 1971 *Competition and Credit Control* reform package in the United Kingdom Hodgman [1973].

Our reinterpretation is consistent with the work of scholars who have previously emphasized the role of international money markets in the demise of the Bretton Woods system of fixed exchange rates [Strange, 1972, 1976, Helleiner, 1996, Bordo et al., 2019, McCauley and Schenk, 2020]. This literature portrays Bretton Woods not as a uniquely stable era, but as a transitional regime in which partial openness, offshore markets, and domestic regulation jointly shaped the limits of monetary sovereignty. Bretton Woods

was considered by many (including White and Keynes) but not by all participants as a principled decision against capital flows and in favour of monetary autonomy[Helleiner, 1996]. Our work shows that the minority opinion at Bretton Woods proved more consequential as early as the 1960s. They aimed at restoring trade through the removal of foreign exchange-controls while recognizing the need to guard, for as long as required, against volatile capital flows. This gradual approach also explains why the capital account liberalisations pursued by some OECD countries in the 1960s were not seen as going against the Bretton Woods principles. It was the next step.

In fact, in his seminal article written shortly after the 1958 restoration of current account convertibility in most advanced economies, Mundell [1963] clearly understood that the removal of foreign-exchange controls, rather than the elimination of all forms of capital controls, was sufficient to constrain monetary policy autonomy. The very first paragraph of his article states:

> "The world is still a closed economy, but its regions and countries are becoming increasingly open. The trend, which has been manifested in both freer movement of goods and increased mobility of capital, has been stimulated by the dismantling of trade and exchange controls in Europe [...]. The international economic climate has changed in the direction of financial integration and this has important implications for economic policy." (Mundell, 1963, p. 475)

A broader question raised by this research concerns the extent to which an economy can combine a certain degree of financial openness (with tolerance for offshore markets and the integration of domestic money markets into global financial circuits) while maintaining firm control over internal macroeconomic variables through restrictive banking regulations and sustained state intervention in credit allocation and development. This challenge is particularly acute because, as the development of the Eurodollar market in the 1960s illustrates, the coexistence of current account convertibility with tight domestic banking regulation tends to foster the emergence of offshore financial markets. As several observers have noted, contemporary China finds itself in a comparable situation [Frankel, 2012, McCauley et al., 2021, Eichengreen et al., 2024]: it has considerably relaxed capital controls and permitted the flourishing of an offshore market in Hong Kong, while simultaneously seeking to preserve extensive state involvement in the financial system, the allocation of credit, and the conduct of monetary policy.

The experience of the Bretton Woods era does not imply any historical inevitability. Rather, it demonstrates both that it is possible to sustain, for a time, a degree of separation between the international integration of monetary and offshore markets and the domestic control of credit and macroeconomic management—and that such an arrangement inevitably generates tensions that are difficult to reconcile over the long run.

As we have shown, the issue is more complex than one of capital controls alone, and involves considering how domestic banking regulation and credit policies, including what is now referred to as macroprudential policy, can provide some room for manoeuvre in an environment of financial openness.

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Appendix A The discount rate(s) of the Federal Reserve System under Bretton Woods

A.1 The discount rate as the main policy rate of the Fed. Further evidence

Figure A2 provides a clear illustration of how the institutional framework described in Section 2 translated into policy communication in practice (see also next section on the difference between discount rates of the regional Reserve banks). The figure reproduces the statement released by the Board of Governors on December 6, 1965, following the approval of discount-rate increases by the Federal Reserve Banks of New York and Chicago. The wording of the announcement highlights several features that support the use of the New York discount rate as a policy indicator.

First, the statement illustrates the 'bellwether' role of the New York Fed. Although the announcement describes the Board of Governors as approving actions taken by the directors of the New York and Chicago Reserve Banks only, it is clearly endorsed as a policy action of the Federal Reserve System as a whole. Second, the statement confirms the signaling function of the discount rate itself. The increase is presented as a measure intended to influence credit expansion and economic conditions through the cost of borrowing from the Federal Reserve, indicating that the discount rate served as the principal rate communicating the policy stance.[28] Third, the announcement explicitly identifies price stability as the objective of the action, describing the increase as reinforcing efforts to maintain price stability and to prevent inflationary pressures. In this sense, the discount rate indeed functioned as a public signal of macroeconomic policy objectives.

A.2 Difference between New York discount rate changes and others

The institutional role of the Federal Reserve Bank of New York (FRBNY) as a primary signal-caller, of "bellwether" for national monetary policy is clearly evidenced by its discount rate activity between 1948 and 1971. During this period, the FRBNY adjusted its discount rate 39 times, functioning as the "first mover" or a co-leader in 25 of those instances. This high frequency of leadership, representing nearly two-thirds of all rate adjustments, underscores the New York Fed's central position in the Federal Reserve System. In these cases, the FRBNY either initiated the policy shift or moved simultaneously with the earliest participating districts, effectively setting the pace for the rest of the

[28] The December 1965 action was described as "two complementary actions" and was accompanied by a simultaneous change in the maximum rates that member banks were permitted to pay depositors under Regulation Q, effective the same day [Federal Reserve Bank of New York, 1965].

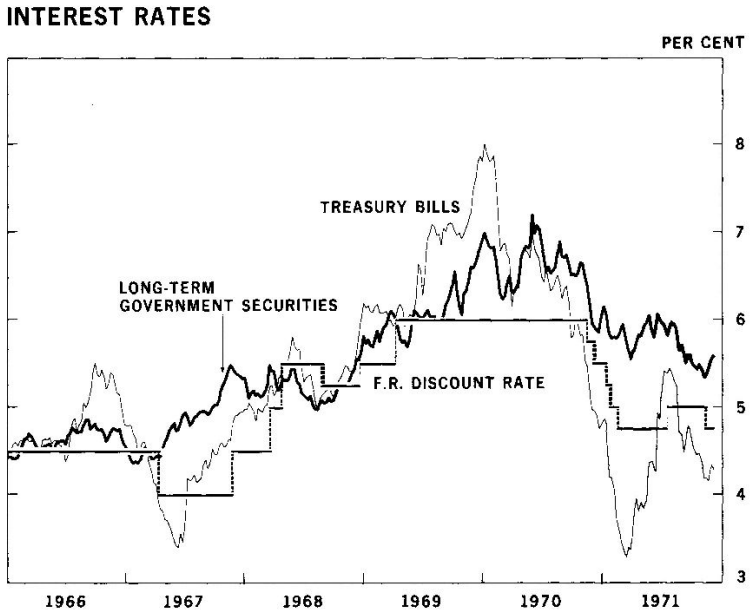


Figure A1: Main U.S. interest rates, according to the Federal Reserve Bulletin

Source: Federal Reserve Bulletin, December 1971, p. 1049, section "National Summary of Business Conditions."

The following statement was released by the Board of Governors of the Federal Reserve System on December 6, 1965:

The Federal Reserve announced today two complementary actions to reinforce efforts to maintain price stability, and thus to foster balance in the economy's continued growth and strength in the dollar's international standing.

The actions, intended not to cut back on the present pace of credit flows but to dampen mounting demands on banks for still further credit extensions that might add to inflationary pressures, were as follows:

1. The Board of Governors in Washington approved actions by the directors of the Federal Reserve Banks of New York and Chicago increasing the discount rates of those banks from 4 to 4½ per cent, effective December 6, 1965. The discount rate is the interest rate charged member banks for borrowing from their District Reserve Banks.

Figure A2: **Board of Governors statement reproduced in the *Federal Reserve Bank of New York Monthly Review* (December 1965).**

Source: Federal Reserve Bank of New York [1965].

Changes in official discount rates since 1969.

Country and date of change	Official discount rate in %	Country and date of change	Official discount rate in %	Country and date of change	Official discount rate in %
Austria		**Germany**		**Portugal**	
26th October 1967	3¾	12th May 1967	3	1st September 1965	3
11th September 1969	4¾	18th April 1969	4	*25th April 1970*	3½
22nd January 1970	5	20th June 1969	5	*6th February 1971*	3¾
Belgium		11th September 1969	6		
19th December 1968	4½	*9th March 1970*	7½		
6th March 1969	5	*16th July 1970*	7	**Spain**	
10th April 1969	5½	*18th November 1970*	6¼	27th November 1967	4¼
29th May 1969	6	*3rd December 1970*	6	22nd July 1969	5½
3rd July 1969	7	*1st April 1971*	5	*23rd March 1970*	6½
18th September 1969	7½			*22nd January 1971*	6¼
22nd October 1970	7	**Greece**		*5th April 1971*	6
10th December 1970	6½	25th June 1968	6		
25th March 1971	6	1st February 1969	5½	**Sweden**	
Canada		1st July 1969	6	11th October 1968	5
18th December 1968	6½	15th September 1969	6½	28th February 1969	6
3rd March 1969	7			11th July 1969	7
11th June 1969	7½			*19th March 1971*	6¼
16th July 1969	8	**Italy**		*23rd April 1971*	6
12th May 1970	7½	7th June 1968	3½		
1st June 1970	7	14th August 1969	4		
1st September 1970	6½	*9th March 1970*	5½	**Switzerland**	
12th November 1970	6	*5th April 1971*	5	10th July 1967	3
15th February 1971	5¾			15th September 1969	3¾
24th February 1971	5¼	**Japan**			
Denmark		7th August 1968	5.84		
29th August 1968	6	1st September 1969	6.25	**United Kingdom**	
31st March 1969	7	*28th October 1970*	6	19th September 1968	7
12th May 1969	9	*20th January 1971*	5¾	27th February 1969	8
20th January 1971	8	*8th May 1971*	5½	*5th March 1970*	7½
15th April 1971	7½			*15th April 1970*	7
Finland				*1st April 1971*	6
28th April 1962	7	**Netherlands**			
1st June 1971	8½	20th December 1968	5		
France		9th April 1969	5½	**United States**	
13th November 1968	6	4th August 1969	6	18th December 1968	5½
14th June 1969	7	*5th April 1971*	5½	4th April 1969	6
9th October 1969	8			*13th November 1970*	5¾
27th August 1970	7½			*4th December 1970*	5½
20th October 1970	7	**Norway**		*8th January 1971*	5¼
8th January 1971	6½	14th February 1955	3½	*22nd January 1971*	5
13th May 1971	6¾	27th September 1969	4½	*19th February 1971*	4¾

Figure A3: Main policy rates of central banks, according to the Bank for International Settlements

Source: Annual Report of the Bank for International Settlements, 1971, p. 49.

country.

When the New York Fed did not lead a rate change, it demonstrated a strong tendency toward rapid alignment with the first-moving districts. In nine instances, the FRBNY adjusted its rate within the same week as the initial change, typically lagging by only one to seven days. This pattern suggests a high degree of consensus among Federal Reserve Bank directors during periods of economic transition. These minor delays were especially observed in years such as 1954, 1955, and again in early 1971.

Significant delays of more than a week were rare, occurring only five times throughout the period. In these specific episodes, the New York Fed lagged the first mover by more than a week, with delays stretching to as long as fourteen days. These instances of "lagging" often coincided with periods of complex economic signaling, such as in August 1957 or August 1968, where the FRBNY may have been more cautious in confirming the sustainability of a rate hike or cut.[29]

The additional observations from 1971 reinforce this pattern of rapid convergence. In January 1971, the FRBNY adjusted its rate on January 22, following initial moves on January 19, while in February 1971 it moved on February 19, only six days after the main cluster of districts adjusted on February 13. Similarly, in July 1971, the New York Fed moved in the first wave of changes on July 16, alongside several major districts. These episodes illustrate that, even toward the end of the Bretton Woods period, the FRBNY continued to play a central coordinating role, either leading or closely following the national policy shift.

Beyond the timing of these moves, the FRBNY occasionally operated in an environment of temporary cross-district rate dispersion. Notable discrepancies occurred in the mid-1950s; in August 1955, New York moved to 2.0% alongside several districts, while others (such as Cleveland) briefly moved to 2.25%. Similarly, in April 1956, New York set its rate at 2.75%, while Minneapolis and San Francisco adopted a higher rate of 3.0%.[30] These differences, however, were short-lived and reflect the staggered and decentralized implementation of a largely unified national policy rather than persistent disagreement across districts.

[29] 1957 Aug: moved 10 days after the first change (Aug 13 vs. Aug 23).
1958 Sep: moved 8 days after the first change (Sept 4 vs. Sept 12).
1959 May: moved 11 days later (May 18 vs. May 29).
1960 June: moved 7 days later (June 3 vs. June 10).
1968 Aug: moved 14 days later (Aug 16 vs. Aug 30).

[30] Aug. 1955: New York moved to 2.0% while some districts (e.g., Cleveland) moved earlier to 2.25%.
Apr. 1956: New York moved to 2.75% while Minneapolis and San Francisco moved to 3.0%.

Table A1: Changes in Federal Reserve Bank Discount Rates on Loans to Member Banks, grouped by effective date (1948–1970)

Effective date	Banks changing	New rate (%)
1948-01-12	NY, Cle, Atl, StL, Min, Dal, SF	1.25
1948-01-14	Bos	1.25
1948-01-19	Phi, Ric, Chi, KC	1.25
1948-08-13	Bos, NY, Cle, Ric, Atl, Chi, KC, Dal, SF	1.5
1948-08-19	StL	1.5
1948-08-23	Phi, Min	1.5
1950-08-21	Bos, NY, Min	1.75
1950-08-23	StL	1.75
1950-08-24	Atl, SF	1.75
1950-08-25	Phi, Cle, Ric, Chi, KC, Dal	1.75
1953-01-16	Bos, NY, Phi, Cle, Ric, Atl, Chi, StL, Min, Dal, SF	2
1953-01-20	KC	2
1954-02-05	Bos, NY, Phi, Chi, StL, Min, SF	1.75
1954-02-12	Cle, Ric, Atl, KC	1.75
1954-02-15	Dal	1.75
1954-04-14	Bos, Chi, SF	1.5
1954-04-16	NY, KC	1.5
1954-04-23	Phi, Cle, Ric, StL, Min, Dal	1.5
1954-04-27	Atl	1.5
1954-05-21	Bos	1.5
1954-09-23	SF	1.5
1955-04-14	KC	1.75
1955-04-15	Bos, NY, Phi, Cle, Ric, Atl, Chi, StL, Min, Dal	1.75
1955-04-22	SF	1.75
1955-05-23	Bos	1.75
1955-08-04	Bos, Cle, Chi, StL	2
1955-08-05	NY, Phi, Ric, Atl, Min, KC, Dal, SF	2
1955-09-02	Phi	2.25
1955-09-09	NY, Ric, Chi, StL, Min, KC, Dal, SF	2.25
1955-09-12	Atl	2.25
1955-09-13	Bos	2.25
1955-11-17	Chi	2.5
1955-11-18	Bos, NY, Phi, Cle, Ric, Atl, Min, KC, Dal, SF	2.5
1955-11-21	StL	2.5

1956-04-13	Bos, NY, Phi, Cle, Ric, Atl, Chi, StL, KC, Dal	2.75
1956-04-13	Min, SF	3
1956-08-24	Bos, NY, Phi, Cle, Ric, Atl, Chi, StL, Min, KC, Dal, SF	3
1957-08-13	Bos	3.5
1957-08-23	NY, Phi, Cle, Ric, Atl, Chi, StL, Min, KC, Dal, SF	3.5
1957-11-15	NY, Ric, StL	3
1957-11-19	Bos, Atl	3
1957-11-22	Phi, Cle, Chi, Min, KC, Dal	3
1957-11-29	SF	3
1957-12-02	SF	3
1958-01-22	Phi	2.75
1958-01-24	Bos, NY, Cle, Ric, Chi, StL, Min, KC, Dal, SF	2.75
1958-01-28	Atl	2.75
1958-02-07	Min	2.5
1958-02-14	Dal	2.5
1958-02-28	SF	2.5
1958-03-07	NY, Phi, Chi	2.25
1958-03-11	Bos	2.25
1958-03-14	Cle, Atl, StL, KC, Dal, SF	2.25
1958-03-21	Ric, Min	2.25
1958-04-18	Bos, NY, Chi, StL, Min, KC, SF	1.75
1958-04-22	Phi, Dal	1.75
1958-04-25	Cle, Ric, Atl	1.75
1958-05-01	Bos	1.75
1958-05-09	Dal	1.75
1958-08-15	SF	2
1958-08-26	Dal	2
1958-09-04	Bos	2
1958-09-05	Min, KC, Dal	2
1958-09-12	NY, Cle, Ric, Atl, Chi, StL	2
1958-09-19	Phi	2
1958-10-23	SF	2.5
1958-10-24	NY, Phi, Cle, Ric, Atl, Chi, StL, Min, KC, Dal	2.5
1958-11-07	Bos, NY	2.5
1959-03-06	NY, Phi, Chi	3
1959-03-10	Bos	3
1959-03-12	Dal	3
1959-03-13	Ric, StL, KC, SF	3
1959-03-16	Cle, Atl, Min	3

1959-05-18	Bos	3.5
1959-05-29	NY, Phi, Cle, Ric, Atl, Chi, StL, Min, KC, Dal, SF	3.5
1959-06-02	Bos	3.5
1959-09-11	NY, Phi, Ric, Chi, StL, Min, KC, Dal, SF	4
1959-09-14	Bos, Cle, Atl	4
1960-06-03	Bos, Phi, SF	3.5
1960-06-10	NY, Cle, Ric, Chi, StL, Min, KC, Dal	3.5
1960-06-13	Atl	3.5
1960-08-12	Bos, NY, Phi, Cle, Ric, Atl, Min, KC, SF	3
1960-08-15	Dal	3
1960-08-19	Chi, StL	3
1960-09-09	Bos	3
1963-07-17	Bos, NY, Cle, Ric, StL, Min, Dal	3.5
1963-07-19	Phi, Atl, Chi, KC	3.5
1963-07-26	SF	3.5
1964-11-24	Bos, NY, Phi, Cle, Ric, Atl, Chi, StL, Min	4
1964-11-27	KC, Dal	4
1964-11-30	SF	4
1965-12-06	Bos, NY, Chi	4.5
1965-12-10	Cle, Ric, Atl, StL, Min, KC, Dal, SF	4.5
1965-12-13	Phi	4.5
1967-04-07	Bos, NY, StL	4
1967-04-10	Atl	4
1967-04-14	Phi, Cle, Ric, Chi, Min, KC, Dal, SF	4
1967-11-20	Bos, NY, Cle, Atl, Chi, StL, Min, SF	4.5
1967-11-21	Phi, Ric, KC	4.5
1967-11-22	Dal	4.5
1968-03-15	All districts	5
1968-04-19	NY, Phi, Cle, Chi, Min	5.5
1968-04-22	Bos	5.5
1968-04-23	Atl, StL	5.5
1968-04-26	Ric, KC, Dal, SF	5.5
1968-08-16	Min	5.25
1968-08-19	KC	5.25
1968-08-23	Bos	5.25
1968-08-30	NY, Phi, Cle, Ric, Atl, Chi, StL, Dal, SF	5.25
1968-12-18	Bos, NY, Phi, Cle, Atl, Chi, StL, Min, Dal, SF	5.5
1968-12-20	Ric, KC	5.5
1969-04-04	NY, Phi, Cle, Ric, Atl, Chi, StL, Min, KC, Dal, SF	6

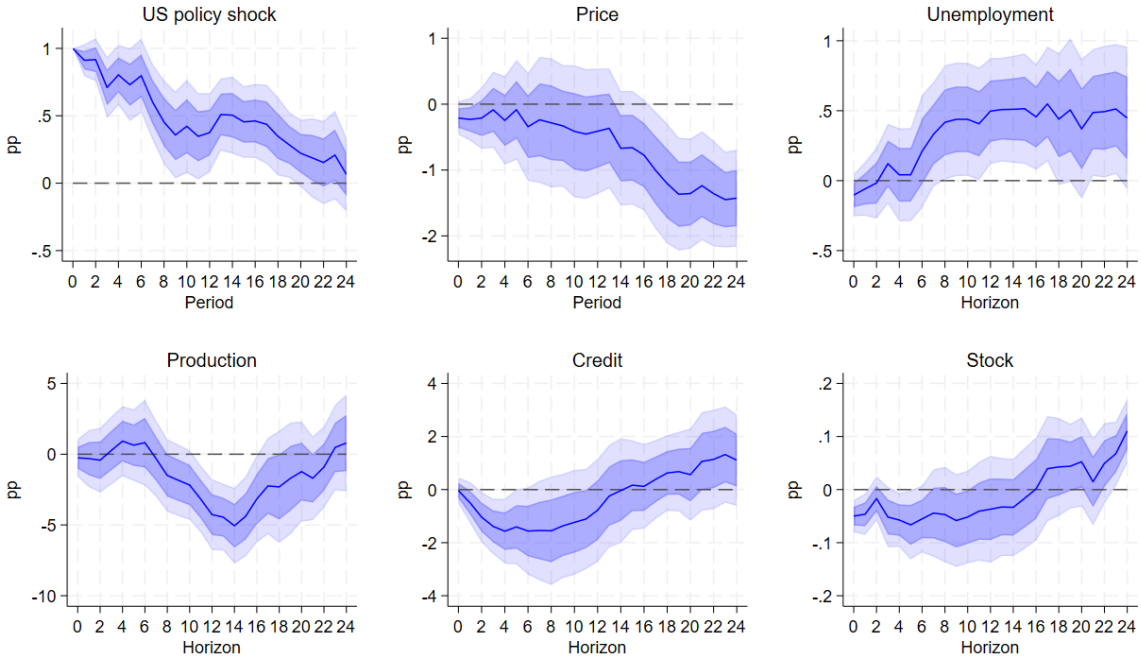
1969-04-08	Bos	6
1970-11-11	Ric, Chi, StL, Min, KC, Dal	5.75
1970-11-13	Bos, NY, Cle, Atl, SF	5.75
1970-11-16	Phi	5.75
1970-12-01	Bos, NY, Cle, Chi, StL, SF	5.5
1970-12-04	Phi	5.5
1970-12-10	KC	5.5
1970-12-11	Ric, Atl, Min	5.5
1970-12-13	Dal	5.5
1971-01-19	Bos, Phi, Cle, Atl, Min, Dal	5
1971-01-21	Chi	5
1971-01-22	NY, SF	5
1971-01-29	Ric, StL, KC	5
1971-02-13	Bos, Phi, Cle, Ric, Atl, Chi, StL, Min, KC, Dal, SF	4.75
1971-02-19	NY	4.75
1971-07-16	NY, Phi, StL, SF	5
1971-07-19	Bos, Atl, Min	5
1971-07-23	Cle, Ric, Chi, KC, Dal	5

Notes: Bos = Boston; NY = New York; Phi = Philadelphia; Cle = Cleveland; Ric = Richmond; Atl = Atlanta; Chi = Chicago; StL = St. Louis; Min = Minneapolis; KC = Kansas City; Dal = Dallas; SF = San Francisco. *Sources:* Board of Governors of the Federal Reserve System (1976), *Banking and Monetary Statistics, 1941–1970*, Table 12.1, p. 667; and *Federal Reserve Bulletin*, February, March, and August 1971, Table A.9. Discount rates correspond to advances and discounts under Sections 13 and 13a. Effective dates indicate when new rates became operative at each Federal Reserve Bank.

Appendix B Robustness checks

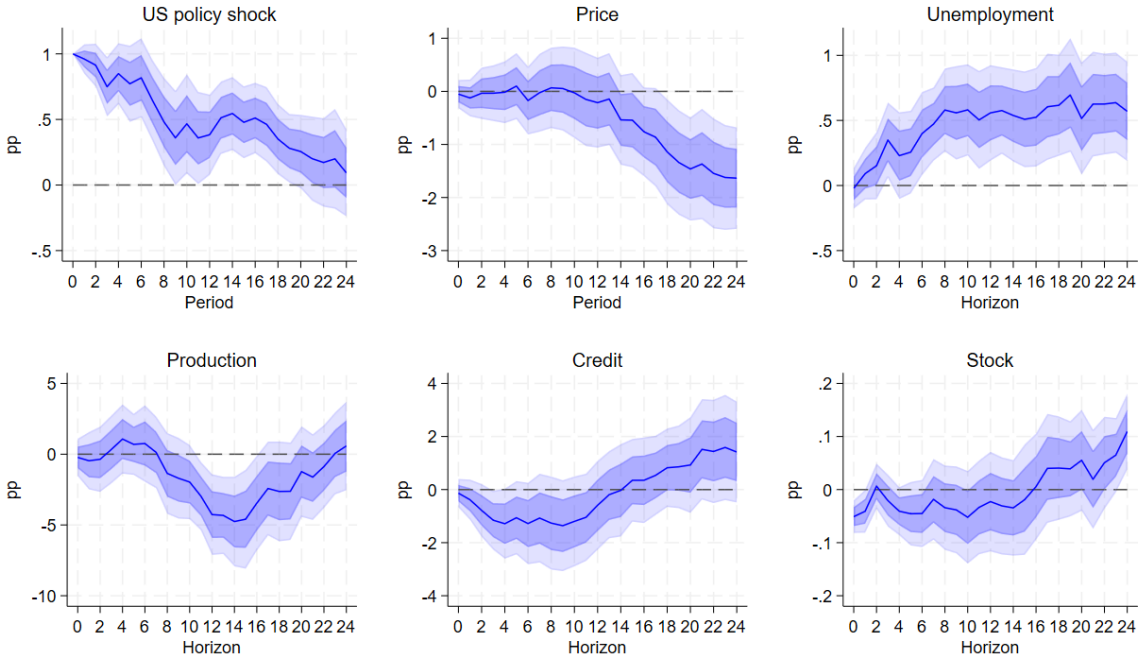
B.1 Domestic effects of U.S. monetary policy shocks. Robustness to different numbers of lags in the estimation.

Figure B1: Domestic responses to an exogenous monetary policy shock, 1948-1971. United States. 2 lags.



Note: responses to a discount rate surprises of +1pp. Estimation based on Local projections including 2 lags, monthly dummies, and a trend. The sample starts in 1948 and ends in 1971. Error bands, based on Newey and West standard errors, correspond to the 68% and 90% confidence intervals.

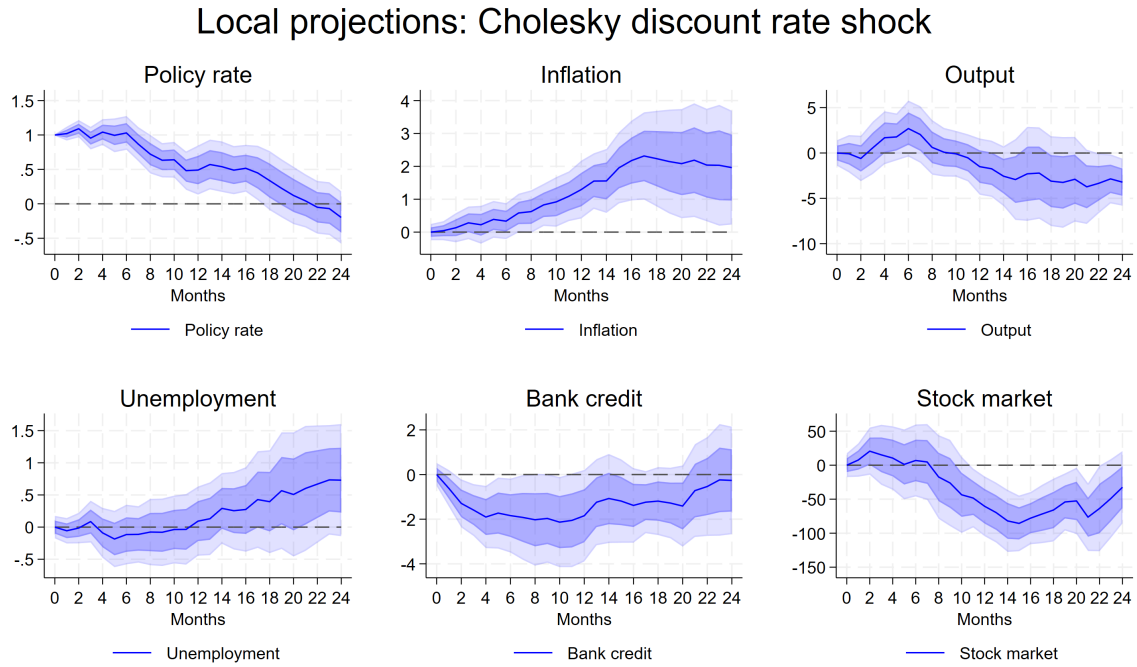
Figure B2: Domestic responses to an exogenous monetary policy shock, 1948-1971. United States. 6 lags.



Note: responses to a discount rate surprises of +1pp. Estimation based on Local projections including 6 lags, monthly dummies, and a trend. The sample starts in 1948 and ends in 1971. Error bands, based on Newey and West standard errors, correspond to the 68% and 90% confidence intervals.

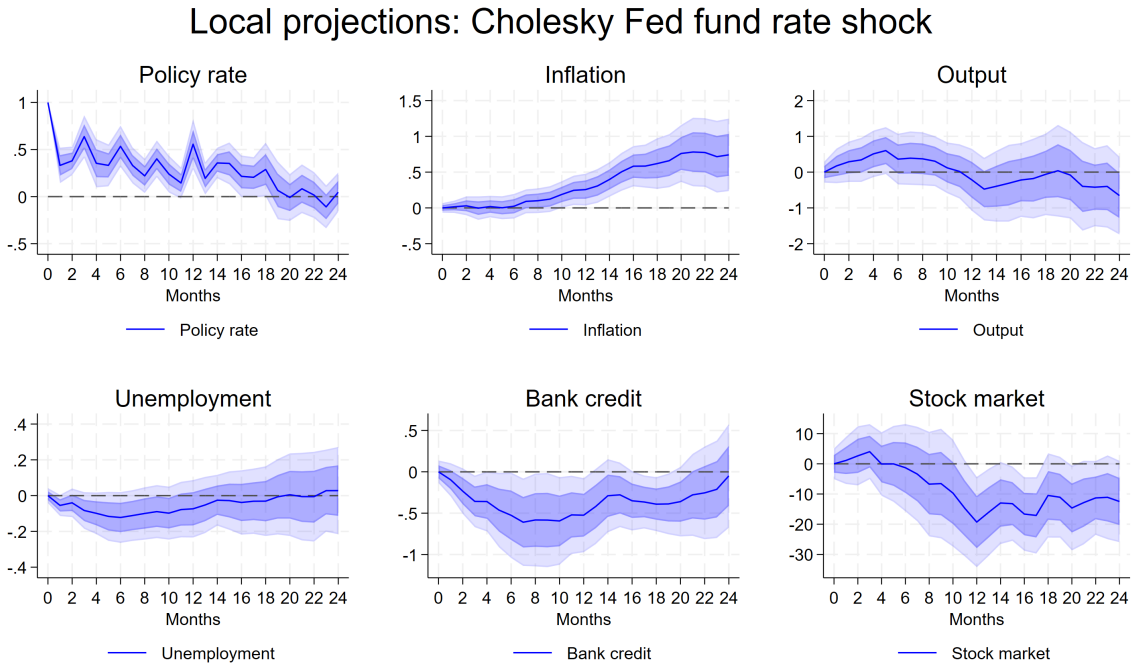
B.2 Domestic effects of U.S. monetary policy shocks. Cholesky identification for discount rate, fed funds rates and our exogenous shock.

Figure B3: Domestic responses to an exogenous monetary policy shock, 1948-1971. United States. Cholesky decomposition with discount rate.



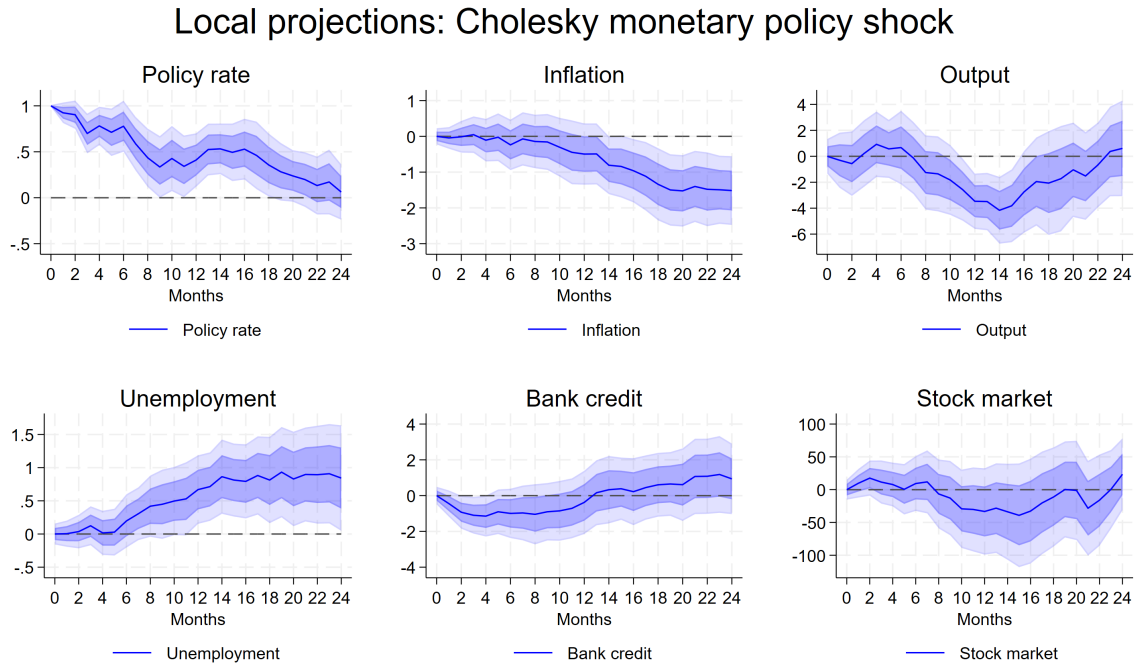
Note: responses to a discount rate increase of +1pp. Cholesky decomposition with the discount rate ordered last. Estimation based on Local projections including 3 lags, monthly dummies, and a trend. The sample starts in 1948 and ends in 1971. Error bands, based on Newey and West standard errors, correspond to the 68% and 90% confidence intervals.

Figure B4: Domestic responses to an exogenous monetary policy shock, 1948-1971. United States. Cholesky decomposition with fed funds rate.



Note: responses to a fed funds rate increase of +1pp. Cholesky decomposition with the fed funds rate ordered last. Estimation based on Local projections including 3 lags, monthly dummies, and a trend. The sample starts in 1948 and ends in 1971. Error bands, based on Newey and West standard errors, correspond to the 68% and 90% confidence intervals.

Figure B5: Domestic responses to an exogenous monetary policy shock, 1948-1971. United States. Cholesky decomposition with fed funds rate.



Note: responses to a monetary policy shock increase of +1pp. Cholesky decomposition with our monetary policy shock ordered last. Estimation based on Local projections including 3 lags, monthly dummies, and a trend. The sample starts in 1948 and ends in 1971. Error bands, based on Newey and West standard errors, correspond to the 68% and 90% confidence intervals.