Monetary-Fiscal Coordination with International Hegemon*

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January 11, 2026

Abstract

The conventional view holds that active monetary policies require fiscal accommodation, and vice versa. We find a new possibility in international economy: a hegemon country can simultaneously pursue active monetary and fiscal goals, if foreign policymakers are willing to accommodate. For example, the hegemon can tighten monetary policy without domestic fiscal support, if foreign countries align their monetary stance and provide fiscal backing. Backed by foreign surpluses, the hegemon can also run deficits without domestic monetary support. In this regime, external adjustments play a key role in domestic policy coordination, and U.S. policy effectiveness depends critically on its international position.

Keywords: Monetary Policy, International Policy Coordination, Fiscal Dominance

JEL Codes: E52, E63, F33

*We would like to thank Nobuhiro Abe, George Alessandria, George-Marios Angeletos, Andy Atkeson, Yan Bai, Francesco Bianchi, Gaston Chaumont, Jens Christensen, Nicolas Crouzet, Daisuke Ikeda, Diego Känzig, Narayana Kocherlakota, Niklas Kroner, Kevin Lansing, Chen Lian, Emile Marin, Sebastian Merkel (discussant), Thomas Mertens, Dmitry Muhkin, Tim Schmidt-Eisenlohr, Sanjay Singh, Mark Spiegel, Yinxi Xie (discussant), and seminar participants at the Federal Reserve Board, Northwestern University, the Bank of Japan, Rochester Conference in International Macro/Finance, Insightful Minds in International Macro seminar, and San Francisco Fed for helpful comments.

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1 Introduction

Monetary and fiscal policies require coordination to achieve desired outcomes. Leeper (1991) classifies two possible modes of coordination: *monetary dominance* and *fiscal dominance*. In either case, one policy is active, while the other policy gives up independence to accommodate the active policy. However, in practice, monetary and fiscal policies exhibit only limited comovement.

In this paper, we study the monetary-fiscal coordination in an international economy. In addition to standard monetary and fiscal dominance regimes, a third possibility arises: one country, which we refer to as the *hegemon*, may be able to simultaneously pursue active monetary and fiscal policy goals, as long as the other country follows accommodative monetary and fiscal policies. We refer to this mode of policy coordination as *hegemon dominance*, which emphasizes the asymmetry between countries as opposed to the asymmetry between monetary and fiscal policies. We study this novel regime in a tractable New Keynesian model, and report three key results.

First, under hegemon dominance, the hegemon country can pursue an active monetary policy without providing fiscal backing. When this happens, the other country's monetary policy has to take the same stance as the hegemon's monetary policy. To understand this result, first consider the standard *monetary dominance* regime in a closed economy. Suppose the monetary authority raises the nominal interest rate. As Leeper (2021) notes, a higher nominal rate increases households' interest income and, by reducing inflation, increases the real value of the households' nominal assets. Both effects increase the households' real spending power. In order to ensure that the households' expenditure remains feasible under the resource constraint, the fiscal authority needs to raise tax to absorb the excess demand. In this way, an active monetary policy stance requires coordination from the fiscal authority.

While the fiscal adjustment is the only possible response to attain equilibrium in a closed economy, open economy allows for an alternative mechanism. When the home country's nominal interest rate increases without corresponding adjustment in the tax rate, the excess demand can also be absorbed by exchange rate movement. Specifically, the home currency needs to depreciate to lower the home households' real spending power, which offsets the positive effect that the home

monetary policy has on household budget. To achieve the required exchange rate response, the foreign country's monetary authority has to raise rate as well, which generates comovements in home and foreign monetary stances under *hegemon dominance*.

Second, while the hegemon country's fiscal authority can pursue its own policy goal without responding to the active monetary policy, the other country's fiscal authority has to accommodate the monetary stance undertaken by both countries. In fact, the foreign fiscal authority responds in the same way as a passive fiscal authority responds in a closed economy. As the foreign response maintains a consolidated version of the intertemporal government budget condition, the hegemon effectively transfers the responsibility of providing fiscal backing to its monetary policy abroad.

Third, the hegemon country can undertake fiscal expansion without corresponding monetary accommodation required in a closed economy. Instead, the foreign country has to respond by increasing its fiscal surplus and adjusting its own monetary stance accordingly. The foreign country runs a surplus to balance the hegemon's fiscal deficit, leading to an asymmetric distribution of privilege and responsibility in the international monetary order.

Implications for Global Monetary-Fiscal Coordination. These results under hegemon dominance offer a potentially useful perspective for understanding the asymmetric mode of monetary-fiscal coordination between the U.S. and foreign countries. They speak to the following salient features of the U.S. and the global economy.

(1) Disconnect between U.S. Monetary and Fiscal Policies: U.S. monetary and fiscal policies seem disconnected. Contrary to the prediction of either monetary or fiscal dominance, the monetary policy is not strongly influenced by the fiscal condition, and in recent years, U.S. public debt grows steadily regardless of the monetary stance. In Section 2.7, we provide empirical evidence based on *identified* monetary and fiscal policy shocks, which shows that the U.S. fiscal condition does not respond to monetary policy shocks, and vice versa.

Hegemon dominance provides a new way to understand this prolonged disconnect between monetary and fiscal policies, which we interpret as the coexistence of active monetary and fiscal

policies. In prior literature, such coexistence is either ruled out, or only temporary and eventually resolved to either monetary or fiscal dominance (Davig and Leeper, 2007; Bianchi and Ilut, 2017).

(2) Synchronized U.S. and Foreign Monetary Policies: monetary policies tend to comove across countries. Section 2.7 presents empirical evidence, and shows asymmetry in this comovement: while foreign monetary policies respond strongly to U.S. monetary policy shocks, the U.S. monetary policy does not respond significantly to foreign monetary policy shocks.

(3) U.S. Fiscal Expansion and Global Savings Glut: on the fiscal side, while the U.S. government has been running large deficits and accumulating public debt, China, Japan, and other countries have been saving and accumulating large foreign reserves (Bernanke, 2005). This pattern of global imbalances is also consistent with hegemon dominance, under which an increase in U.S. deficits leads to a corresponding increase in foreign surpluses.

(4) Relevance for Recent Policy Debate: Our results speak to the recent debate over the ability of U.S. monetary policy to control inflation. Under monetary dominance, the scale of fiscal adjustment required to accommodate monetary tightening is proportional to the public debt level. A higher debt burden requires more fiscal resources to offset the rise in debt servicing costs. As Leeper (2021) notes, this raises the concern that the U.S. monetary authority faces tighter limits on raising interest rates in the 2020s than it did in the 1980s, when Volcker's disinflation succeeded against a debt/GDP ratio of 25%, compared with nearly 100% today.

By contrast, under hegemon dominance, the fiscal burden is shifted abroad. The hegemon's monetary authority can restrain inflation without imposing heavy domestic tax increases, which suggests a more optimistic outlook for the U.S.'s ability to control inflation.

However, if hegemon dominance erodes, this external buffer will vanish, leading to much higher fiscal pressures at home. In this sense, while the conventional view is concerned about a shift from monetary to fiscal dominance driven by rising public debt, we argue that the challenge may also stem from a weakening U.S. hegemonic role in international policy coordination. From our perspective, *domestic monetary-fiscal coordination has to be understood in the broader context of the international monetary order*.

Generality of the Results. Our finding of additional modes of policy coordination in international economies is a general point, which leads to asymmetries between countries and the emergence of a global hegemon. In our analysis, foreign coordination is modeled by conventional monetary and fiscal policies. However, alternative instruments—tariffs, foreign reserves, liquidity premia, financial regulation, and capital controls—may also enable the hegemon to maintain independent monetary and fiscal policies. For example, active monetary and fiscal policies in the hegemon country may be accommodated by adjustments in home and foreign tariffs or capital controls. In this case, foreign monetary and fiscal policies may not need to be completely passive.

Instead of exhausting all possible modes of coordination enabled by additional policy tools, our objective is to clearly illustrate the key mechanism in a standard modeling framework. In doing so, we highlight the role of external adjustments in shaping the interplay between monetary and fiscal policies, and reveal what has been overlooked by the classic dichotomy between monetary and fiscal dominance obtained in closed economies.

Model Details. We derive our results in a two-country New Keynesian model, which features standard consumption, production, and asset holding decisions. In Section 2, we assume an extreme version of nominal rigidity: prices are fully sticky for one period. This allows us to derive algebraic solutions that characterize monetary, fiscal, and hegemon dominance regimes. We obtain a very stark result: under monetary dominance, the monetary authorities in both countries set their nominal interest rates, while the fiscal authorities have no discretion at all; similarly, under fiscal dominance, the fiscal authorities set their primary surpluses, which determine the nominal interest rates that the monetary authorities have to follow. In both cases, policies are independent between home and foreign countries.

In contrast, under hegemon dominance, the monetary and fiscal authorities in the hegemon country can set their policies independently, which dictate the monetary and fiscal policies that the other country has to follow. This third mode of monetary-fiscal coordination gives rise to the three results we discussed above, which characterize foreign monetary, fiscal, and exchange rate

responses to the hegemon's policies.

We can extend this framework to consider more than two countries. For example, when there are three countries, three policy variables can be set independently. If they are the three countries' monetary policies or fiscal policies, we recover the standard monetary and fiscal dominance regimes in this extension. Alternatively, another regime arises in which the first country pursues independent monetary and fiscal policies, the second country pursues independent monetary policy, while all other policies are passive. By leaving some room for discretionary policies for a "secondary hegemon," this might be a useful way for thinking about the asymmetry between the U.S., other advanced economies like Europe, and emerging markets in the global economy.

In Section 3, we relax the assumption of one-period full stickiness and consider the more realistic Calvo price setting. This allows us to introduce more flexible *policy rules* considered by Leeper (1991). For example, an active monetary policy rule means that the monetary authority can raise the nominal interest rate sufficiently to fight inflation; under monetary dominance, this requires the fiscal authority to systematically adjust government surpluses to stabilize the debt level. However, the fiscal authority can still have some discretion, which we model as exogenous policy shocks to the primary surplus. Similarly, an active fiscal policy rule means that the fiscal authority can set its primary surplus independently of the debt level; under fiscal dominance, this limits the monetary authority's ability to adjust the nominal interest rate in response to inflation, even though the monetary authority can still have some discretion, which we model as exogenous policy shocks to the nominal interest rate.

We again recover the monetary and fiscal dominance regimes, in which policies are set independently between the two countries. We also uncover the hegemon dominance regime, in which the hegemon country's monetary and fiscal authorities are both active, while the other country's monetary and fiscal authorities are both passive. The impulse response patterns to the hegemon's policy shocks are consistent with the simpler setting with one-period full price stickiness, while the Calvo price setting and policy rules generate more realistic and persistent dynamics.

In summary, our paper expands the modes of monetary-fiscal policy coordination by studying

the international dimension. We uncover a new hegemon dominance regime, which sheds new light on the disconnect between monetary and fiscal policies, the global imbalances, and the fiscal situation faced by the U.S.

Literature. Our paper builds on the vast theoretical literature studying the interaction and coordination between monetary and fiscal policies.[1] Leeper (1991) identifies two possible modes of monetary-fiscal coordination: monetary dominance and fiscal dominance. Subsequent works show that the policy regime can switch between these two patterns, and the time-varying policy mix has important macroeconomic consequences (Davig, Leeper, Galí, and Sims, 2006; Sims, 2011; Bianchi and Ilut, 2017; Bianchi and Melosi, 2017; Leeper, Traum, and Walker, 2017; Bianchi and Melosi, 2019; Eusepi and Preston, 2018; Cochrane, 2018; Bocola, Dovis, Chaumont, and Kirpalani, 2025). A recent literature discuss a potential regime shift towards fiscal dominance and inflationary monetary policies due to government debt overhang (Bigio, Caramp, and Silva, 2024; Cram, Kung, Lustig, and Zeke, 2025). Our paper contributes to this literature by studying the international dimension of policy coordination. We identify a new regime in which both monetary and fiscal policies can be (permanently) active in the hegemon country, an outcome that is unattainable in previous works that examine closed economies.

A more recent literature studies mechanisms that equilibrate the intertemporal government budget condition (Reis, 2021; Mian, Straub, and Sufi, 2022; Brunnermeier, Merkel, and Sannikov, 2022; Angeletos, Lian, and Wolf, 2023; Gomez Cram, Kung, and Lustig, 2023; Cieslak, Li, and Pflueger, 2023; Diamond, Landvoigt, and Sánchez, 2024).[2] Our paper proposes a new mechanism based on external adjustment and foreign policy coordination. Relatedly, Jiang et al. (2020, 2024b) show that the U.S. government issues more debt than can be justified by its future primary surpluses. Chen et al. (2022) document that past reserve asset issuers enjoy a similar privilege. Our paper reveals a new, dynamic dimension of the privilege in policy coordination enjoyed by the

[1] Also see Sargent et al. (1981); Aiyagari and Gertler (1985); Sims (1994); Woodford (1995); Cochrane (1998); Loyo (1999); Schmitt-Grohé and Uribe (2000); Woodford (2001); Benhabib et al. (2002); Bassetto (2002); Uribe (2006); Cochrane (2011); Leeper and Zhou (2013); Bassetto and Sargent (2020); Alberola et al. (2021); Jiang (2021); Caramp and Silva (2023).

[2] Also, Dupor (2000); Daniel (2001) study exchange rate determinacy with intertemporal government budgets.

international hegemon.

Another recent literature studies international policy coordination and the role of a global hegemon. Rey (2015); Egorov and Mukhin (2019); Fontanier (2023); De Leo, Gopinath, and Kalemli-Ozcan (2024); Auray, Devereux, and Eyquem (2024); Fornaro and Romei (2024); Jiang, Krishnamurthy, and Lustig (2024a); Guerrieri, Lorenzoni, and Werning (2025) address the monetary dimension, and Farhi and Maggiori (2018); He, Krishnamurthy, and Milbradt (2019); D'Amico, Giavazzi, Guerrieri, Lorenzoni, and Weymuller (2022); Jiang and Richmond (2023); Pflueger and Yared (2024) work on the fiscal dimension.[3] Aizenman, Eldén, Jinjarak, Uddin, and Widholm (2024) find that concerns about the U.S. fiscal condition lower the policy rates in foreign countries, which is consistent with our notion of foreign policy response to U.S. policy shocks. Our paper contributes to this literature by studying how a global hegemon affects the policy coordination in monetary and fiscal domains.

2 Baseline Model

We consider a two-country New Keynesian model. Most ingredients follow Corsetti and Pesenti (2007), and the fiscal part follows Jiang (2022, 2023). This model simplifies the standard New Keynesian framework by assuming that prices are fully sticky for one period, which allows us to derive algebraic solutions that characterize monetary, fiscal, and hegemon dominance regimes in a tractable way. We relax this assumption in Section 3 when we consider the more standard Calvo (1983) price setting.

Throughout this paper, we use uppercase letters to denote prices and nominal quantities, and lowercase letters to denote real quantities. For example, Q and q denote the nominal and real values of government debt, respectively. The only exceptions are π and i, which are reserved for inflation and nominal interest rate in log, and $p_t(h)$, which denotes the nominal price of a specific goods variety.

[3] Also see Acharya, Jiang, Richmond, and Von Thadden (2024); Clayton, Maggiori, and Schreger (2023, 2024); Broner, Martin, Meyer, and Trebesch (2024) on other dimensions.

2.1 Households

There are two countries, home and foreign. Each country contains a unit mass of households, a unit mass of firms, and a government. Home households are indexed by $j \in [0,1]$, and home firms are indexed by $h \in [0,1]$. Foreign households are indexed by $j^* \in [0,1]$, and foreign firms are indexed by $f \in [0,1]$. Each firm produces a unique variety of good, which is an imperfect substitute for other varieties.

The lifetime expected utility of home household j is

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \delta^t \left(\log c_t(j) - \chi \ell_t(j) \right),$$

where $\ell_t(j)$ is the labor effort, $c_t(j)$ is the consumption composed of a Cobb-Douglas basket of home and foreign bundles:

$$c_t(j) = c_{H,t}(j)^{\alpha} c_{F,t}(j)^{1-\alpha},$$

and $c_{H,t}(j)$ and $c_{F,t}(j)$ are constant-elasticity-of-substitution (CES) bundles of home and foreign varieties:

$$c_{H,t}(j) = \left(\int_0^1 c_t(h,j)^{1-1/\rho} dh \right)^{1/(1-1/\rho)}, \qquad c_{F,t}(j) = \left(\int_0^1 c_t(f,j)^{1-1/\rho} df \right)^{1/(1-1/\rho)}.$$

The parameter $\alpha > 1/2$ measures home bias in consumption, and the parameter ρ is the elasticity of substitution across varieties.

Let P_t denote the price of the home consumption basket in the unit of the home currency, and let W_t denote the nominal wage. In period t, the home household j receives wage $W_t \ell_t(j)$ and dividend $D_t(j)$ from home firms, and pays tax $P_t \tau_t(j)$ and consumption $P_t c_t(j)$. The financial markets are complete, so that the household can trade Arrow-Debreu securities denominated in home and foreign numéraires.

2.2 Firms

Each home firm produces a variety h using labor supplied by home households. The production technology is linear in labor input:

$$y_t(h) = z_t \ell_t(h),$$

where $y_t(h)$ is the output of firm h, $\ell_t(h)$ is the labor input, and z_t is a productivity process common to all home firms. Aggregating across home and foreign households, we obtain the following demand function for variety h:

$$y_t(h) = \int_0^1 c_t(h,j)dj + \int_0^1 c_t^*(h,j^*)dj^*.$$

Let $p_t(h)$ and $p_t^*(h)$ denote the home and foreign prices of variety h in local currencies, and let $\mathcal{E}_t$ denote the log nominal exchange rate which is increasing in the strength of the home currency. To produce $y_t(h)$ units of goods, firm h faces a wage cost of $W_t \ell_t(h)$. The firm's nominal revenue is

$$D_t(h) = p_t(h) \int_0^1 c_t(h,j)dj + \exp(-\mathcal{E}_t) p_t^*(h) \int_0^1 c_t^*(h,j^*)dj^* - W_t \ell_t(h).$$

We assume that the firm is entirely owned by domestic households. The firm's objective function is to maximize the present value of this dividend stream.

We consider a simple form of nominal rigidities: firms have to set prices one period in advance. Under this assumption, the firms' profit maximization problem only concerns one period. Take the home firm h as an example,

$$\max_{p_t(h), \exp(-\mathcal{E}_t)p_t^*(h)} \mathbb{E}_{t-1}[M_{t-1,t} D_t(h)],$$

where the firm uses the home households' stochastic discount factor $M_{t-1,t}$ to discount future

dividends. International trade is conducted under *Producer Currency Pricing*: exports are priced and invoiced in the producer's currency, which is also rigid for one period.

2.3 Monetary and Fiscal Policies

In each country, the monetary authority controls the nominal interest rate i_t, and the fiscal authority controls government tax and spending processes. We assume that governments only issue one-period debt in local currency units. The government debt does not default on its notional value, but its real value can vary due to inflation. Let Q_{t+1} denote the quantity of outstanding home government debt that is issued in period t and due in period $t+1$. The government budget condition in nominal terms is

$$Q_t + P_t g_t = P_t \tau_t + Q_{t+1} \exp(-i_t). \tag{1}$$

Let $s_t = \tau_t - g_t$ denote the home real government surplus, and let $m_{t,t+k}$ denote the home households' real stochastic discount factor. Iterate forward the home government's intertemporal budget condition and impose the transversality condition. We obtain the intertemporal government budget condition:

$$\frac{Q_t}{P_t} = \mathbb{E}_t \left[\sum_{k=0}^{\infty} m_{t,t+k} s_{t+k} \right] = \mathbb{E}_t \left[\sum_{k=0}^{\infty} \delta^k \frac{c_t}{c_{t+k}} s_{t+k} \right]. \tag{2}$$

which states that the real market value of government debt is equal to the real present value of government surpluses.

In this section, we assume all shocks are i.i.d., which implies that

$$A = \mathbb{E}_t \left[\sum_{k=1}^{\infty} \delta^k \frac{s_{t+k}}{c_{t+k}} \right]$$

is a constant. This condition implies that the present value of future government surpluses, i.e., $\mathbb{E}_t \left[\sum_{k=1}^{\infty} m_{t,t+k} s_{t+k} \right]$, is equal to the current consumption c_t times the constant A, because fu-

ture surpluses are unpredictable and the only variation in their present value is driven by the real discount rate, which is related to consumption growth. We can write the intertemporal budget condition (2) as[4]

$$\frac{Q_t}{P_t} = s_t + c_t A.$$

2.4 Equilibrium Conditions

This model can be characterized by three pairs of equilibrium conditions. The details of model derivation are presented in Appendix A.1. First, we have the standard bond Euler equations:

$$\begin{aligned} i_t &= \log\left(\frac{1}{P_t c_t}\right) - \log \mathbb{E}_t\left[\delta \frac{1}{P_{t+1} c_{t+1}}\right], \\ i_t^* &= \log\left(\frac{1}{P_t^* c_t^*}\right) - \log \mathbb{E}_t\left[\delta \frac{1}{P_{t+1}^* c_{t+1}^*}\right]; \end{aligned}$$

second, we have the intertemporal government budget conditions:

$$\begin{aligned} \frac{Q_t}{P_t} &= s_t + c_t A, \\ \frac{Q_t^*}{P_t^*} &= s_t^* + c_t^* A^*; \end{aligned}$$

third, we also obtain the following equilibrium conditions based on firm optimization and sticky prices:

$$\log c_t = \kappa_{t-1}^c + \alpha \log\left(P_t c_t\right) + (1-\alpha) \log\left(P_t^* c_t^*\right), \tag{3}$$

$$\log c_t^* = \kappa_{t-1}^{c^*} + (1-\alpha) \log\left(P_t c_t\right) + \alpha \log\left(P_t^* c_t^*\right). \tag{4}$$

[4]By assuming i.i.d. shocks and constant A, we implicitly rule out the possibility that the expectation of future surpluses can adjust in response to policy shocks today. This assumption imposes a strong restriction between the price level P_t and the surplus s_t today in this equation, which is useful for illustrating the key results in the model. We will relax this assumption in Section 3.

Corsetti and Pesenti (2007) interpret the nominal expenditures $P_t c_t$ and $P_t^* c_t^*$ as the home and foreign countries' aggregate demand in this model. When prices are sticky, monetary and fiscal policies affect the aggregate demand, and hence real consumption through Eq. (3) and (4).

We can further substitute out the price levels and obtain the following equation system:

$$
\begin{aligned}
i_t - \Delta \log Q_{t+1} &= \log\left(\frac{s_t + c_t A}{c_t}\right) - \log \mathbb{E}_t\left[\delta \frac{s_{t+1} + c_{t+1} A}{c_{t+1}}\right], \\
i_t^* - \Delta \log Q_{t+1}^* &= \log\left(\frac{s_t^* + c_t^* A^*}{c_t^*}\right) - \log \mathbb{E}_t\left[\delta \frac{s_{t+1}^* + c_{t+1}^* A^*}{c_{t+1}^*}\right], \\
\log c_t &= \kappa_{t-1}^c + \alpha \log\left(\frac{c_t}{s_t + c_t A}\right) + (1-\alpha)\log\left(\frac{c_t^*}{s_t^* + c_t^* A^*}\right), \\
\log c_t^* &= \kappa_{t-1}^{c^*} + (1-\alpha)\log\left(\frac{c_t}{s_t + c_t A}\right) + \alpha \log\left(\frac{c_t^*}{s_t^* + c_t^* A^*}\right),
\end{aligned}
$$

which has 4 equations with 6 unknowns: the nominal interest rates i_t and i_t^*, the government surpluses s_t and s_t^*, and the equilibrium consumption c_t and c_t^*. We assume that the debt growth rates are $\Delta \log Q_{t+1} = \Delta \log Q_{t+1}^* = 0$. This is without loss of generality, because what matters for surprise inflation and real outcomes is the difference between i_t and $\Delta \log Q_{t+1}$. Given the difference, varying $\Delta \log Q_{t+1}$ only creates expected inflation and has no real effects.

From this equation system, we can already see that nominal interest rates and government surpluses cannot both be exogenous policy variables. When the monetary authorities set the nominal interest rates, consumption and government surpluses need to endogenously adjust to satisfy this equation system. Conversely, when the fiscal authorities set the government surpluses, consumption and nominal interest rates need to endogenously adjust. As we will show in the next subsection, these two cases correspond to the monetary dominance and fiscal dominance regimes, respectively.

2.5 Model Characterization

We linearize the equation system around a symmetric steady state with $\bar{i} = \bar{i}^*$, $\bar{s} = \bar{s}^*$, $\bar{c} = \bar{c}^*$, and $A = A^*$. Using the notation $\hat{s}_t = s_t - \bar{s}$ and $\hat{i}_t = i_t - \bar{i}$, we can substitute out consumption and

obtain the following equilibrium relationships.

Proposition 1. *(a) The nominal interest rates and government surpluses are related by*

$$\begin{aligned} \hat{s}_t &= A\bar{c}\hat{i}_t + (1-\alpha)\bar{s}(\hat{i}_t - \hat{i}_t^*), \\ \hat{s}_t^* &= A\bar{c}\hat{i}_t^* + (1-\alpha)\bar{s}^*(\hat{i}_t^* - \hat{i}_t). \end{aligned} \tag{5}$$

(b) Consumption, real exchange rate, and price levels are given by

$$\begin{aligned} \log \hat{c}_t &= -\alpha\hat{i}_t - (1-\alpha)\hat{i}_t^*, \qquad \log \hat{c}_t^* = -(1-\alpha)\hat{i}_t - \alpha\hat{i}_t^*, \\ \hat{e}_t &= (2\alpha - 1)(\hat{i}_t - \hat{i}_t^*), \\ \log \hat{P}_t &= -(1-\alpha)(\hat{i}_t - \hat{i}_t^*), \qquad \log \hat{P}_t^* = (1-\alpha)(\hat{i}_t - \hat{i}_t^*), \end{aligned}$$

where $\log \hat{c}_t = \log c_t - \log \bar{c}$, $\hat{e}_t = e_t - \bar{e}$, *and* $\log \hat{P}_t = \log P_t - \log \bar{P}$ *denote deviations from the steady state.*

The proof is presented in Appendix A.2. Part (a) of the proposition shows that monetary and fiscal policies are tightly connected. Part (b) of the proposition is consistent with the notion that a higher nominal interest rate i_t has tightening effects which lower local consumption and price level, increase the local real interest rate, and appreciate the local currency in real terms. Because of international risk-sharing, local consumption and price level also depend on the foreign nominal interest rate i_t^*.

Monetary and Fiscal Dominance. Let us start with the closed-economy limit: as the home bias parameter α goes to 1, Eq. (5) becomes

$$\hat{s}_t = A\bar{c}\hat{i}_t, \qquad \hat{s}_t^* = A\bar{c}\hat{i}_t^*. \tag{6}$$

This result recovers the insight in Leeper (1991): under monetary dominance, the monetary authorities in both countries set the nominal interest rates i_t and i_t^*, and the fiscal authorities accommodate

the monetary stance by adjusting the primary surpluses s_t and s_t^* according to this equation. Conversely, under fiscal dominance, the fiscal authorities in both countries set the primary surpluses s_t and s_t^*, and the monetary authorities accommodate the fiscal stance by adjusting the nominal interest rates i_t and i_t^*. Both monetary and fiscal dominance regimes are well-defined equilibria in this setting.

Moreover, Eq. (6) imposes a positive relationship between the monetary policy rate and the fiscal surplus. In the language of Leeper (2021), a higher monetary policy rate increases households' interest income and, by reducing inflation, increases the real value of the households' nominal assets. To ensure that the households' expenditure remains feasible, the government needs to raise tax.[5]

Even when we consider the more general case with $\alpha < 1$, Eq. (5) still imposes tight constraints on monetary and fiscal policies. There still exist a monetary dominance regime in which the monetary policy rates i_t and i_t^* are independent policy variables, while the fiscal surpluses s_t and s_t^* are fully determined, and a fiscal dominance regime in which the fiscal surpluses s_t and s_t^* are independent policy variables, while the monetary policy rates i_t and i_t^* are fully determined.

However, given an exogenous increase in the home monetary rate i_t, if the foreign monetary rate i_t^* also increases in response, it alleviates the need for the home fiscal policy to respond. Next, we consider this case explicitly.

Hegemon Dominance. When the home bias parameter $\alpha < 1$, there is a third, overlooked possibility: Eq. (5) can also be balanced by taking the home policies i_t and s_t as exogenous shocks and the foreign policies i_t^* and s_t^* as endogenous variables. This corresponds to the case in which the monetary and fiscal authorities in the home country dictate the policies in the foreign country. In this case, the home country's monetary and fiscal authorities can pursue separate policy goals, while the foreign country's monetary and fiscal policies are both accommodative. We refer to this situation as the *hegemon dominance* regime. Formally, rearranging the system of linearized

[5]This discussion takes the perspective of the households. We can also interpret this result from the government side. Because prices are sticky, a higher nominal interest rate raises the government's real interest expense, which requires the government to increase tax to balance the budget.

equations, we obtain the following result:

Proposition 2. *When the foreign country's monetary and fiscal policies follow the home country's policies, we can express them as*

$$\hat{i}_t^* = \frac{A\bar{c} + (1-\alpha)\bar{s}}{(1-\alpha)\bar{s}}\hat{i}_t - \frac{1}{(1-\alpha)\bar{s}}\hat{s}_t,$$
$$\hat{s}_t^* = \frac{2A\bar{c}(1-\alpha)\bar{s} + A^2\bar{c}^2}{(1-\alpha)\bar{s}}\hat{i}_t - \frac{(1-\alpha)\bar{s} + A\bar{c}}{(1-\alpha)\bar{s}}\hat{s}_t.$$

The proof is presented in Appendix A.3. In this hegemon dominance regime, foreign monetary and fiscal policies are fully determined by the hegemon's policies. To consider its implications, we first consider a home monetary shock in the absence of domestic fiscal accommodation:

Corollary 1. *Suppose the home country pursues a tightening monetary policy (i.e., $\hat{i}_t > 0$) without providing fiscal backing (i.e., $\hat{s}_t = 0$).*

(a) The foreign monetary policy has to tighten as well: $\hat{i}_t^* > 0$.

(b) The foreign fiscal policy has to accommodate the monetary stance: $\hat{s}_t^* > 0$.

(c) The home currency depreciates in real terms: $\hat{e}_t < 0$.

This corollary highlights three properties of the foreign policies. First, $\hat{i}_t^* > 0$ implies that, when the home country pursues a tightening monetary policy without fiscal accommodation, the foreign monetary policy has to take the same tightening stance as well. This response gives rise to a positive correlation between the home and foreign monetary stances. Under hegemon dominance, the foreign country gives up its monetary independence and accommodates the home monetary policy, just like the case of monetary dominance in which the fiscal authority gives up its independence and accommodates the monetary policy in the same country.

To understand why i_t^* has to increase, recall that a higher nominal interest rate i_t in the home country increases home households' real spending power. While monetary dominance restores equilibrium by raising tax in the home country, hegemon dominance does so by adjusting the exchange rate. Specifically, as the foreign nominal interest rate i_t^* increases, the home currency

depreciates and lowers the home households' real spending power in the world numéraire, which offsets the effect of the home monetary policy on the home households' budget. In this way, the exchange rate adjustment accommodates the home monetary stance, while allowing the home country's fiscal authority to pursue a separate policy goal.

Second, $\hat{s}_t^* > 0$ implies that the foreign fiscal policy also responds to the hegemon's monetary shock. Again, it is useful to compare this result with the case of monetary dominance, in which case the home fiscal authority has to increase surplus to accommodate monetary tightening. Under hegemon dominance, the hegemon's fiscal authority is not responding, whereas the foreign fiscal authority responds by increasing its own surplus.

In this sense, the earlier closed-economy results of Leeper (1991) still applies to the world economy as a whole, but the responsibility of providing fiscal backing to the hegemon's monetary policy is now transferred to the foreign fiscal authority, which accommodates the monetary stance undertaken by both countries.

Third, $\hat{e}_t < 0$ implies that the home currency depreciates in real terms, which follows from the fact that the foreign interest rate $\hat{i}_t^*$ increases more than the home interest rate $\hat{i}_t$ in response to the home monetary shock. As we discussed in the first point, this currency depreciation is the key equilibrium force that enforces the home households' budget constraint in the absence of adjustment in the home fiscal policy.

It is also useful to see this point through the lens of the intertemporal government budget condition for the home country. We split the present value into the current surplus and the discounted value of future surpluses:

$$\frac{Q_t}{P_t} = s_t + \mathbb{E}_t \left[\sum_{k=1}^{\infty} m_{t,t+k} s_{t+k} \right] = s_t + c_t A.$$

Under monetary dominance, when the home country pursues a tightening monetary policy (i.e., $\hat{i}_t > 0$), domestic consumption c_t goes down and real rate rises. This lowers the present value of *future* government surpluses. When sticky prices prevent adjustment on the left-hand side of this

equation, *current* home surplus s_t has to increase to balance the budget.

In comparison, under hegemon dominance, the home country pursues a tightening monetary policy (i.e., $\hat{i}_t > 0$) without providing fiscal backing (i.e., $\hat{s}_t = 0$). When this happens, home consumption declines and real rate rises, which also lowers the discounted value of future surpluses on the right-hand side of the equation. In the absence of domestic fiscal accommodation, the price level P_t on the left-hand side has to increase to balance the budget, which is achieved by a foreign currency appreciation weakening the home country's terms of trade.

In sum, under hegemon dominance, implementing home policies $(\hat{i}_t > 0, \hat{s}_t = 0)$ requires accommodation by foreign policies $(\hat{i}^*_t > 0, \hat{s}^*_t > 0)$. These policies jointly determine other outcome variables according to Proposition 1(b): home and foreign real rates both increase (i.e., $\hat{r}_t > 0$ and $\hat{r}^*_t > 0$), and home and foreign consumption both decrease (i.e., $\hat{c}_t < 0$ and $\hat{c}^*_t < 0$), with foreign responses stronger than home responses. As the home currency depreciation affects the terms of trade, home inflation π_t increases and foreign inflation π^*_t decreases.

The required responses in the foreign nominal interest rate and government surplus also load on the home government surplus $\hat{s}_t$ with negative signs. If the home country's fiscal authority is accommodative to the domestic monetary policy to some extent (i.e., $\hat{s}_t > 0$), then, the required responses in foreign monetary and fiscal policies become smaller: they do not have to be as accommodative. In this sense, in response to a home monetary shock, there is a spectrum of policy choices which trade off between accommodative domestic fiscal policy and accommodative foreign monetary and fiscal policies.

Next, we consider a home fiscal shock in the absence of domestic monetary accommodation.

Corollary 2. *Suppose the home country runs a higher deficit (i.e., $\hat{s}_t < 0$) without providing monetary response (i.e., $\hat{i}_t = 0$).*

(a) The foreign country has to run a fiscal surplus: $\hat{s}^*_t > 0$.

(b) The foreign monetary policy has to accommodate the foreign fiscal surplus: $\hat{i}^*_t > 0$.

(c) The home currency depreciates in real terms: $\hat{e}_t < 0$.

The results are similar to the previous results. In particular, the foreign fiscal response—-i.e.,

raising the surplus when the home fiscal authority runs a deficit—further reinforces the notion of the foreign country providing fiscal backing in the hegemon dominance regime.

2.6 More Than Two Countries

Finally, it is straightforward to extend our analysis to more than two countries. Take three countries as an example. We use the superscript ** to denote quantities related to the third country, and assume that the domestic consumption goods have a weight of α in the consumption basket, whereas the other two countries' foreign goods have a weight of $(1-\alpha)/2$. Then, instead of the 4 equations and 6 unknowns obtained in the two-country case, we obtain an equation system with 6 equations and 9 unknowns. The unknowns are the three countries' nominal interest rates (i_t, i_t^*, i_t^{**}), real government surpluses (s_t, s_t^*, s_t^{**}), and consumption (c_t, c_t^*, c_t^{**}). The equations are

$$
\begin{aligned}
i_t - \Delta \log Q_{t+1} &= \log\left(\frac{s_t + c_t A}{c_t}\right) - \log \mathbb{E}_t\left[\delta \frac{s_{t+1} + c_{t+1} A}{c_{t+1}}\right], \\
i_t^* - \Delta \log Q_{t+1}^* &= \log\left(\frac{s_t^* + c_t^* A^*}{c_t^*}\right) - \log \mathbb{E}_t\left[\delta \frac{s_{t+1}^* + c_{t+1}^* A^*}{c_{t+1}^*}\right], \\
i_t^{**} - \Delta \log Q_{t+1}^{**} &= \log\left(\frac{s_t^{**} + c_t^{**} A^{**}}{c_t^{**}}\right) - \log \mathbb{E}_t\left[\delta \frac{s_{t+1}^{**} + c_{t+1}^{**} A^{**}}{c_{t+1}^{**}}\right], \\
\log c_t &= \kappa_{t-1}^{c} + \alpha \log\left(\frac{c_t}{s_t + c_t A}\right) + \frac{1-\alpha}{2} \log\left(\frac{c_t^*}{s_t^* + c_t^* A^*}\right) + \frac{1-\alpha}{2} \log\left(\frac{c_t^{**}}{s_t^{**} + c_t^{**} A^{**}}\right), \\
\log c_t^* &= \kappa_{t-1}^{c^*} + \frac{1-\alpha}{2} \log\left(\frac{c_t}{s_t + c_t A}\right) + \alpha \log\left(\frac{c_t^*}{s_t^* + c_t^* A^*}\right) + \frac{1-\alpha}{2} \log\left(\frac{c_t^{**}}{s_t^{**} + c_t^{**} A^{**}}\right), \\
\log c_t^{**} &= \kappa_{t-1}^{c^{**}} + \frac{1-\alpha}{2} \log\left(\frac{c_t}{s_t + c_t A}\right) + \frac{1-\alpha}{2} \log\left(\frac{c_t^*}{s_t^* + c_t^* A^*}\right) + \alpha \log\left(\frac{c_t^{**}}{s_t^{**} + c_t^{**} A^{**}}\right).
\end{aligned}
$$

The proof is presented in Appendix SA.1. Following the same logic, we find that only three policy variables can be exogenous. If all interest rates (i_t, i_t^*, i_t^{**}) or all government surpluses (s_t, s_t^*, s_t^{**}) are exogenous, we recover the standard monetary and fiscal dominance regimes. Alternatively, another equilibrium regime emerges where the home country's monetary and fiscal policies (i_t, s_t), as well as the first foreign country's monetary policy (i_t^*) are exogenous. In this case, we can think of the home country as the primary hegemon, whereas the first foreign country

is the secondary hegemon.

This may be a useful way to think about policy coordination between the U.S., other developed countries, and emerging markets. The U.S. runs independent monetary and fiscal policies, while other developed countries can still have some discretion in one of their monetary and fiscal policies. Emerging markets are heavily influenced by both the U.S. and other developed countries' policies, and have little room for independent policy choices.

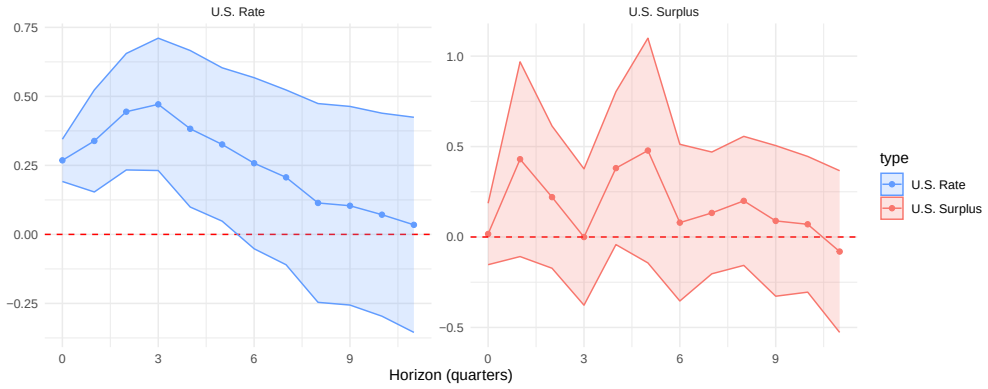
2.7 Empirical Relevance

While our paper focuses on illustrating the theoretical channel in the simplest possible way, it is useful to provide a brief discussion of the empirical relevance of the hegemon dominance regime. In this subsection, we examine (i) the domestic comovement of U.S. monetary and fiscal policies, and (ii) the international comovement of U.S. and foreign monetary policies.

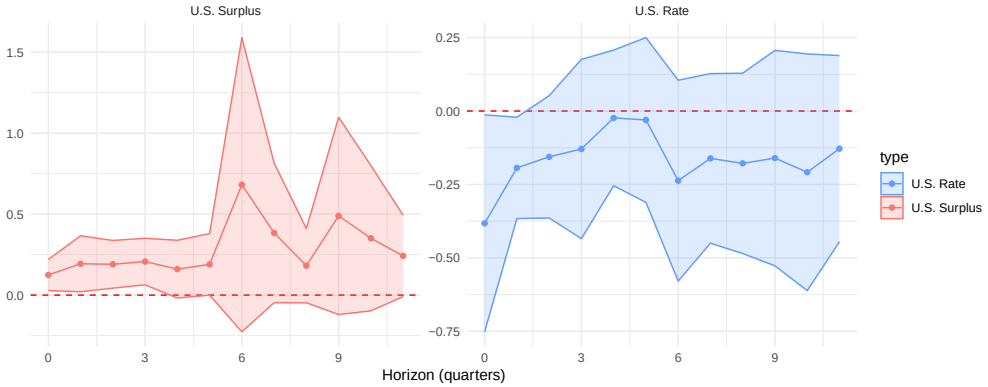
Isolating exogenous policy shocks is crucial because a higher monetary rate could also reflect improving economic fundamentals, which could generate a spurious positive correlation with the fiscal condition. To address this issue, Jarociński and Karadi (2020) decompose monetary policy surprises into two components: one reflecting the Fed's assessment of the economy, and another capturing pure monetary policy shocks. We use the latter component as our policy shock. Appendix B reports robustness results using a different instrument from Miranda-Agrippino and Ricco (2021).

Figure 1(a) plots the local projection responses of the U.S. policy rate and government surplus/GDP ratio to this identified monetary policy shock. It shows that, while the shock increases the U.S. policy rate, it does not have a significant effect on the U.S. government surplus/GDP ratio.

Similarly, we follow Romer and Romer (2010)'s narrative approach which uses tax legislation to identify exogenous shocks to the U.S. fiscal condition. We use the data extended by Jiang and Richmond (2023). Figure 1(b) plots the local projection responses: tax legislation shocks increase the U.S. government surplus/GDP ratio for the next 4 quarters, but do not have a significant impact on the U.S. policy rate. By contrast, under fiscal dominance, monetary policy needs to react



(a) Home Responses to U.S. Monetary Shock



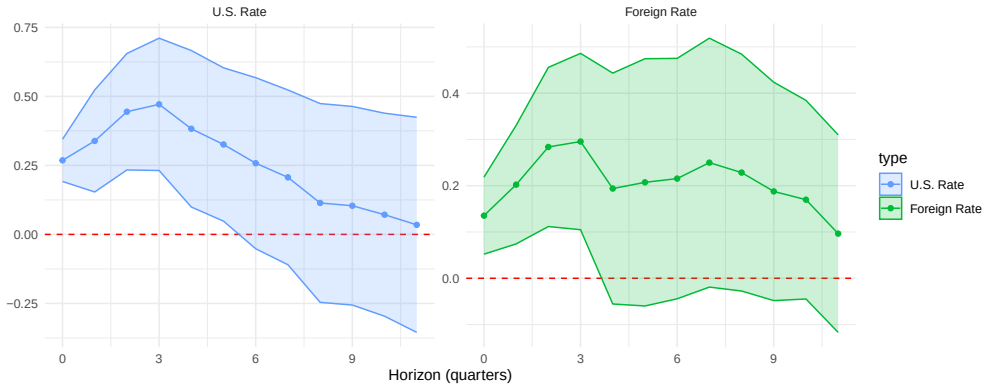
(b) Home Responses to U.S. Fiscal Shock

Figure 1: Empirical U.S. Monetary and Fiscal Responses

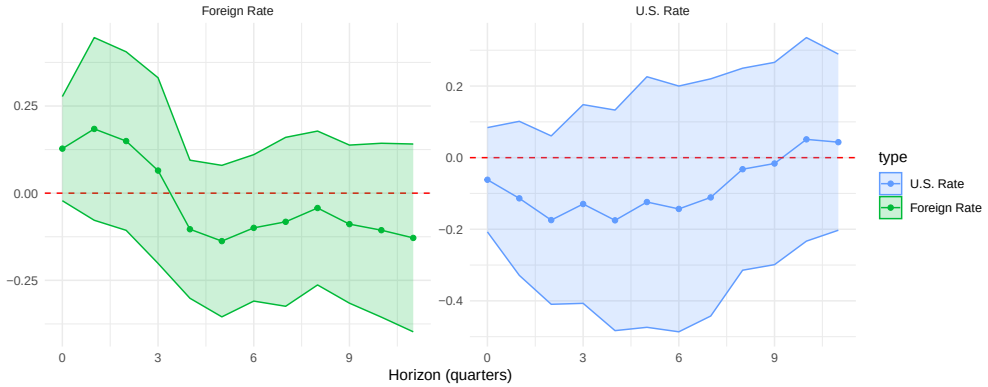
Notes: Panel (a) plots the U.S. monetary and fiscal responses to monetary shocks identified by Jarociński and Karadi (2020), 1990Q1 to 2024Q1. Panel (b) plots the U.S. monetary response to fiscal shocks identified by Romer and Romer (2010), 1980Q1 to 2024Q1. We control for lagged GDP growth, inflation, and the policy variable itself. Shaded areas are 95% confidence intervals. All shocks are standardized to have unit variance.

strongly to changes in the fiscal stance.

We next turn to international comovement in monetary policies. Figure 2(a) plots the response of the U.K. policy rate to the same U.S. monetary policy shock. Appendix Figure B.2 plots a similar figure for the ECB policy rate. In both cases, foreign policy rates rise following a positive U.S. monetary shock. One interpretation is that business cycles are correlated across countries and require similar policy responses. However, the use of identified policy shocks makes it unlikely to be the only channel. Our theoretical framework offers an alternative mechanism based on interna-



(a) U.K. Responses to U.S. Monetary Shock



(b) U.S. Responses to U.K. Monetary Shock

Figure 2: Empirical International Monetary Responses: U.K.

Notes: Panel (a) plots the U.K. monetary response to U.S. monetary rule shocks identified by Jarociński and Karadi (2020), 1990Q1 to 2024Q1. Panel (b) plots the U.S. monetary response to U.K. monetary rule shocks identified by Braun, Miranda-Agrippino, and Saha (2025), 1997Q3 to 2024Q1. We control for lagged GDP growth, inflation, and the policy variable itself. Shaded areas are 95% confidence intervals. All shocks are standardized to have unit variance.

tional policy coordination. It is precisely this coordination between the U.S. and foreign central banks that creates the policy space for the U.S. to pursue discretionary monetary and fiscal policies, which would not be feasible in a closed economy.

Finally, we document an asymmetry in international spillovers. Figure 2(b) plots U.S. monetary responses to U.K. monetary shocks, and Appendix Figure B.2 shows the results for the ECB. Contrary to the strong foreign responses to the U.S. monetary shock, the U.S. policy rate does not respond significantly to foreign monetary shocks. This asymmetry suggests that the U.S. policy

authorities occupy a special position in the global monetary system.

3 Introducing Policy Rules

So far, we have considered a stylized setting in which prices are fully sticky for one period. This setting allows us to derive algebraic solutions and obtain a stark result: the active policies can pursue their own goals, whereas the passive policies are entirely pinned down and have no room for any discretion.

Leeper (1991) considers more realistic monetary and fiscal policy rules that respond systematically to inflation and the real debt level, respectively. For example, the monetary policy can follow a version of the Taylor rule:

$$i_t = \phi_0 + \phi \pi_t + \theta_t, \tag{7}$$

where ϕ describes how it responds to inflation. Similarly, letting $b_{t-1} = Q_t \exp(-i_{t-1})/P_{t-1}$ denote the real market value of government debt outstanding at the end of period $t-1$, the fiscal policy follows

$$s_t = \gamma_0 + \gamma b_{t-1} + \psi_t, \tag{8}$$

where γ describes how it responds to debt level. θ_t and ψ_t are exogenous policy shocks.

In this setting, an active monetary policy means a large ϕ coefficient: the nominal interest rate can respond to inflation more than one-for-one, while a passive monetary policy means that the nominal interest rate cannot respond to inflation as much. An active fiscal policy means a small γ coefficient: the fiscal authority can pursue its own goal without paying attention to the real debt level, while a passive fiscal policy means that the government surplus needs to increase when the debt level is high. In these cases, passive policies can still have exogenous innovations.

This section generalizes our analysis by modifying two assumptions in the baseline setting:

we adopt these more general policy rules, and we replace the assumption of one-period full price stickiness by Calvo (1983) price setting. We develop this generalization in three steps. First, we present a closed-economy case as similar to Leeper (1991) as possible, which introduces the policy rules, and replicate the standard monetary and fiscal dominance regimes found in that paper. Second, we introduce Calvo (1983) price setting which allows for more gradual price adjustments and gives rise to the standard New-Keynesian Phillips curve. Third, we extend the model to an international setting. Doing so helps clarify which assumptions are crucial for the existence of hegemon dominance.

3.1 Leeper (1991) Set-up

We consider a closed economy similar to Leeper (1991). We abstract away from non-interest-bearing money in the set-up because it is not central to our analysis. Leeper (1991) has the same bond Euler equation and government budget condition, reproduced below,

$$i_t = \log\left(\frac{1}{P_t c_t}\right) - \log \mathbb{E}_t\left[\delta \frac{1}{P_{t+1} c_{t+1}}\right], \tag{9}$$

$$q_t = s_t + q_{t+1} \exp(\pi_{t+1} - i_t). \tag{10}$$

However, instead of deriving the equilibrium condition (3) based on production and sticky prices, consumption is assumed to be constant:

$$c_t = \bar{c}. \tag{11}$$

After linearization, we obtain the following equation system.

Proposition 3. *In the one-country economy summarized by the bond Euler equation* (9)*, government budget condition* (10)*, constant consumption* (11)*, and monetary and fiscal rules* (7) *and* (8)*,*

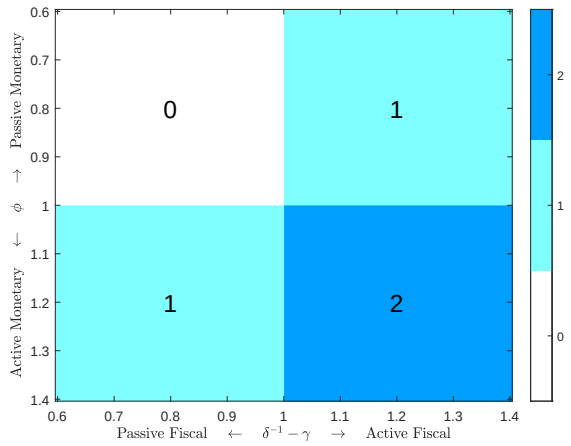


Figure 3: Number of Eigenvalues Outside the Unit Circle in Closed Economy

Note: We report the number of eigenvalues outside the unit circle as we vary the policy rule coefficients ϕ and γ.

the equilibrium dynamics is characterized by

$$\begin{bmatrix} \hat{b}_t \\ \hat{\pi}_t \\ \mathbb{E}_t[\hat{\pi}_{t+1}] \end{bmatrix} = \begin{bmatrix} (\delta^{-1}-\gamma) & \phi\delta^{-1}\bar{q} & -\delta^{-1}\bar{q} \\ 0 & 0 & 1 \\ 0 & 0 & \phi \end{bmatrix} \begin{bmatrix} \hat{b}_{t-1} \\ \hat{\pi}_{t-1} \\ \hat{\pi}_t \end{bmatrix} + \begin{bmatrix} \delta^{-1}\bar{q} & 0 & -\delta^{-1} \\ 0 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} \theta_{t-1} \\ \theta_t \\ \psi_t \end{bmatrix}.$$

The transition matrix has 3 eigenvalues: $\delta^{-1}-\gamma$, 0, ϕ. Since only $\hat{\pi}_{t+1}$ is not predetermined, the system has a unique saddle-path equilibrium if and only if one of the eigenvalues is outside the unit circle (Blanchard and Kahn, 1980).

The proof is presented in Appendix A.4. Based on this result, Figure 3 plots the number of eigenvalues outside the unit circle as we vary ϕ and γ. We find two parametric regions that correspond to stable solutions (Leeper, 1991).

First, if $|\phi| > 1$ and $|\delta^{-1}-\gamma| < 1$, we are in the monetary dominance regime, which corresponds to the bottom-left corner of the figure. In this regime, the monetary policy can respond to inflation with a greater-than-one coefficient ϕ, whereas the fiscal policy has to stabilize the debt level with a large enough coefficient γ.

Second, if $|\phi| < 1$ and $|\delta^{-1}-\gamma| > 1$, we are in the fiscal dominance regime, which corresponds

to the top-right corner of the figure. In this regime, the fiscal authority can pursue its own goal without having to worry about the debt level, while the monetary authority has to give up its inflation-targeting policy.

In this way, Leeper (1991) identifies two separate parametric regions representing different modes of policy coordination. While we can trivially generalize this setting to two countries, it does not allow for the possibility of hegemon dominance. In comparison, our baseline model in the previous section replaces the constant consumption assumption (11) by the aggregate demand equation (3), which links consumption in one country with monetary and fiscal policies in the other country. This is the key ingredient that allows foreign policies to play a role in equilibrium dynamics.

3.2 Introducing New-Keynesian Phillips Curve

Next, we consider a more realistic case in which we replace the constant consumption assumption (11) by the standard New-Keynesian Phillips curve:

$$\hat{\pi}_t = \delta \mathbb{E}_t[\hat{\pi}_{t+1}] + \kappa \log \hat{c}_t, \tag{12}$$

which is derived from a Calvo pricing setting in which only a random fraction $(1-\xi)$ of firms can reset their prices in each period. We still consider a closed economy, but generalize the setting also by assuming that the agents have CRRA utility with risk aversion parameter σ^{-1}. The previous log utility setting can be obtained as a special case by setting $\sigma = 1$. We obtain a very similar result.

Proposition 4. *In the one-country economy summarized by the bond Euler equation* (9)*, government budget condition* (10)*, the Phillips curve* (12)*, and monetary and fiscal rules* (7) *and* (8)*, the*

equilibrium dynamics is characterized by

$$\begin{bmatrix} \hat{b}_t \\ \hat{\pi}_t \\ \mathbb{E}_t[\hat{\pi}_{t+1}] \\ \mathbb{E}_t[\log \hat{c}_{t+1}] \end{bmatrix} = \begin{bmatrix} (\delta^{-1}-\gamma) & \phi\delta^{-1}\bar{q} & -\delta^{-1}\bar{q} & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & \delta^{-1} & -\delta^{-1}\kappa \\ 0 & 0 & \sigma(\phi-\delta^{-1}) & 1+\sigma\delta^{-1}\kappa \end{bmatrix} \begin{bmatrix} \hat{b}_{t-1} \\ \hat{\pi}_{t-1} \\ \hat{\pi}_t \\ \log \hat{c}_t \end{bmatrix} + \begin{bmatrix} \delta^{-1}\bar{q} & 0 & -\delta^{-1} \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & \sigma & 0 \end{bmatrix} \begin{bmatrix} \theta_{t-1} \\ \theta_t \\ \psi_t \end{bmatrix}.$$

Since there are 2 non-predetermined endogenous variables, we need exactly two eigenvalues outside the unit circle to guarantee a unique saddle-path equilibrium, which implies either $|\phi| > 1$ *and* $|\delta^{-1}-\gamma| < 1$*, or* $|\phi| < 1$ *and* $|\delta^{-1}-\gamma| > 1$*.*

The proof is presented in Appendix A.5. In this closed-economy setting, we obtain the same monetary and fiscal dominance regions. This result confirms the generality of Leeper (1991)'s insight, and sets the stage for the international setting we next consider.

3.3 Calvo Pricing in Open Economy

Finally, we extend our analysis to a two-country setting. The set-up is very similar to the baseline model presented in Section 2, except we introduce Calvo pricing and policy rules. This model is also similar to Chari et al. (2002), except we additionally consider the fiscal side of the economy. The details of the model set-up are presented in Supplemental Appendix SA.2.

Like the closed-economy set-up, we obtain microfounded New Keynesian Phillips curves based on firms' optimal pricing decisions. At the level of home or foreign goods, the Phillips curves are very similar to the closed-economy case. For home households, the changes in their price levels of home and foreign goods satisfy

$$\hat{\pi}_{H,t} = \delta\mathbb{E}_t[\hat{\pi}_{H,t+1}] + \frac{(1-\xi)(1-\delta\xi)}{\xi}(\log \widehat{MC}_{H,t} - \log \hat{P}_{H,t}), \tag{13}$$

$$\hat{\pi}^*_{F,t} = \delta\mathbb{E}_t[\hat{\pi}^*_{F,t+1}] + \frac{(1-\xi)(1-\delta\xi)}{\xi}(\log \widehat{MC}^*_{F,t} - \log \hat{P}^*_{F,t}), \tag{14}$$

where MC denotes the nominal marginal cost of production, and π_H and P_H denote the inflation

and price index of the home goods, respectively.

At the aggregate level of home and foreign consumption bundles, the price levels and the Phillips curves additionally depend on the exchange rate. We obtain the following results.

Proposition 5. *In open economy, the home and foreign countries' Phillips curves are given by*

$$\hat{\pi}_t = \delta \mathbb{E}_t[\hat{\pi}_{t+1}] + \delta \frac{1-\alpha}{2\alpha-1} \mathbb{E}_t[\hat{e}_{t+1}] - \eta \frac{1-\alpha}{2\alpha-1} \hat{e}_t + \frac{1-\alpha}{2\alpha-1} \hat{e}_{t-1} + \kappa \log \hat{c}_t - \kappa\sigma \log \hat{z}_t, \tag{15}$$

$$\hat{\pi}^*_t = \delta \mathbb{E}_t[\hat{\pi}^*_{t+1}] - \delta \frac{1-\alpha}{2\alpha-1} \mathbb{E}_t[\hat{e}_{t+1}] + \eta \frac{1-\alpha}{2\alpha-1} \hat{e}_t - \frac{1-\alpha}{2\alpha-1} \hat{e}_{t-1} + \kappa \log \hat{c}^*_t - \kappa\sigma \log \hat{z}^*_t. \tag{16}$$

The proof is presented in Appendix A.6. Similar to the equilibrium conditions (3) and (4) obtained in the baseline model, this proposition shows that the exchange rate adjustment plays a crucial role in transmitting the effects of monetary and fiscal policies across countries.

Moreover, we consider the monetary and fiscal policy rules, which are Eq. (7) and (8) for the home country, and

$$i^*_t = \phi^*_0 + \phi^* \hat{\pi}^*_t + \theta^*_t, \tag{17}$$

$$s^*_t = \gamma^*_0 + \gamma^* b^*_{t-1} + \psi^*_t, \tag{18}$$

for the foreign country. Active monetary policies correspond to $|\phi| > 1$ and $|\phi^*| > 1$, and active fiscal policies correspond to $|\delta^{-1} - \gamma| > 1$ and $|\delta^{-1} - \gamma^*| > 1$. In this set-up, we obtain the following forward-looking linear equation system.

Proposition 6. *In the two-country economy summarized by the domestic bond Euler equation* (9) *and its foreign counterpart, the domestic government budget condition* (10) *and its foreign counterpart, the Phillips curves* (15) *and* (16)*, and monetary and fiscal rules* (7)*,* (17)*,* (8)*, and*

(18)*, the equilibrium dynamics is characterized by*

$$\begin{bmatrix} \hat{b}_t \\ \hat{b}_t^* \\ \hat{\pi}_t \\ \hat{\pi}_t^* \\ \log \hat{c}_t \\ \log \hat{c}_t^* \\ \mathbb{E}_t[\hat{\pi}_{t+1}] \\ \mathbb{E}_t[\hat{\pi}_{t+1}^*] \\ \mathbb{E}_t[\log \hat{c}_{t+1}] \\ \mathbb{E}_t[\log \hat{c}_{t+1}^*] \end{bmatrix} = \Psi \begin{bmatrix} \hat{b}_{t-1} \\ \hat{b}_{t-1}^* \\ \hat{\pi}_{t-1} \\ \hat{\pi}_{t-1}^* \\ \log \hat{c}_{t-1} \\ \log \hat{c}_{t-1}^* \\ \hat{\pi}_t \\ \hat{\pi}_t^* \\ \log \hat{c}_t \\ \log \hat{c}_t^* \end{bmatrix} + \Phi \begin{bmatrix} \theta_{t-1} \\ \theta_{t-1}^* \\ \theta_t \\ \theta_t^* \\ \psi_t \\ \psi_t^* \\ \log \hat{z}_t \\ \log \hat{z}_t^* \end{bmatrix}. \tag{19}$$

Since there are 4 *non-predetermined endogenous variables, we need exactly four eigenvalues outside the unit circle to guarantee a unique saddle-path equilibrium.*

The proof and the definitions of the matrices Ψ and Φ are presented in Appendix A.7. By studying the eigenvalues of the transition matrix Ψ, we can likewise identify the regions of monetary and fiscal dominance.

Active Foreign Monetary Policy and Passive Foreign Fiscal Policy. To begin with, we consider the conventional case in which the foreign country has an active monetary policy and a passive fiscal policy. We study the parameter space of ϕ and γ which characterize the home country's monetary and fiscal policies. Appendix A.8 provides the details of the calibration.

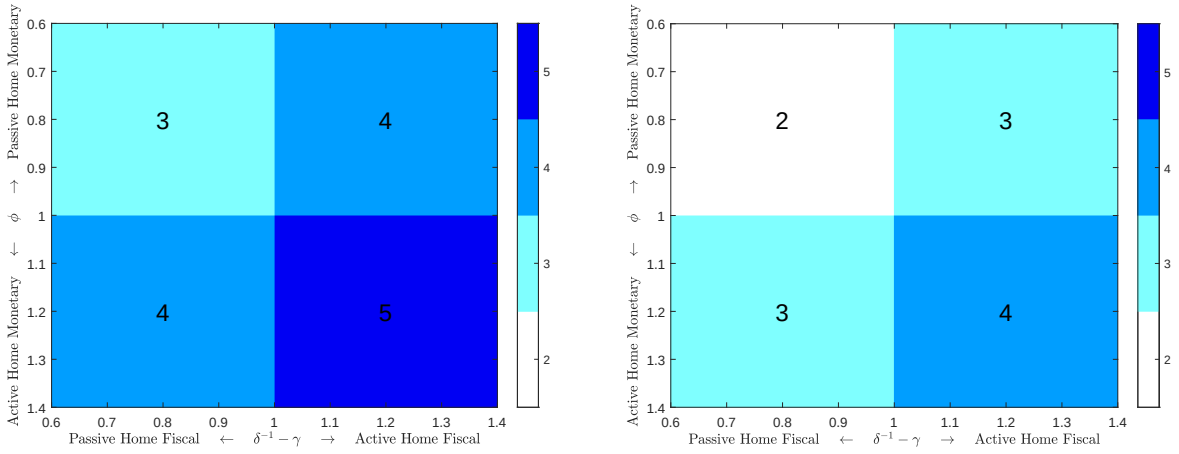
Figure 4(a) plots the number of eigenvalues outside the unit circle as we vary ϕ and γ. We find two separate regions in which this number is 4, which implies a unique equilibrium. Similar to the closed-economy case depicted in Figure 3, the first region requires an active home monetary policy and a passive home fiscal policy (i.e., $|\phi| > 1$ and $|\delta^{-1} - \gamma| < 1$), which corresponds to the bottom-left corner of the figure. The second region requires a passive home monetary policy and

an active home fiscal policy (i.e., $|\phi| < 1$ and $|\delta^{-1} - \gamma| > 1$), which corresponds to the top-right corner of the figure.

Passive Foreign Monetary and Fiscal Policies. We next consider an alternative case in which the foreign country has passive monetary and fiscal policies. We pick $\phi^* = 0.8$ and $\gamma^* = 0.2$. In the closed-economy case, this pair of policy rules does not allow for a unique equilibrium.

Figure 4(b) plots the number of eigenvalues outside the unit circle as we vary ϕ and γ in the open-economy model. When both monetary and fiscal policies are passive in the foreign country, the number of eigenvalues outside the unit circle declines by 1 across the (ϕ, γ) parameter space. As a result, there is only one region consistent with a unique equilibrium, which corresponds to the bottom-right corner of the figure. This region requires $|\phi| > 1$ and $|\delta^{-1} - \gamma| > 1$, which implies that the home country's monetary and fiscal policies are both active: the home monetary policy responds sufficiently to local inflation, whereas the home fiscal policy is not committed to stabilizing the debt level.

In this way, we identify a new hegemon dominance regime in which the home monetary and



(a) Active Foreign Monetary and Passive Fiscal Policies **(b)** Passive Foreign Monetary and Fiscal Policies

Figure 4: Number of Eigenvalues Outside the Unit Circle in Open Economy

Note: We fix the foreign policy rules and report the number of eigenvalues outside the unit circle as we vary the home policy rule coefficients ϕ and γ. In Panel (a), the foreign country has an active monetary policy and a passive fiscal policy. In Panel (b), the foreign country has a passive monetary policy and a passive fiscal policy.

fiscal policies are both active, while the foreign monetary and fiscal policies are both passive. This result generalizes the insight in the baseline setting by allowing for more realistic policy rules.

3.4 Inspecting the Mechanism

In this final section, we examine the model's impulse responses and verify that they are consistent with the algebraic characterization in Proposition 2(a)–(c), derived in the more stylized baseline setting.

Monetary Dominance. To set the stage, we begin with the monetary dominance regime in closed economy specified in Section 3.2. We consider a negative monetary shock θ_t to the nominal interest rate i_t, which can be interpreted as an unexpected decrease in the real rate r_t. Figure 5 reports the impulse responses. Let us consider the pairwise relationships among the real rate r_t, the real consumption c_t, and the inflation π_t, which are governed by the Euler equation, the Phillips curve, and the intertemporal government budget condition.

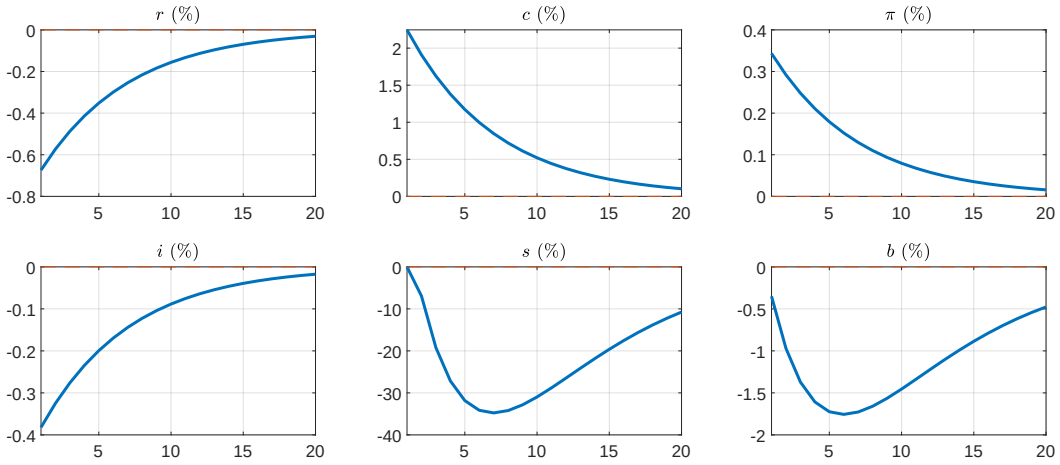


Figure 5: Impulse Responses to a Monetary Shock in the Closed Economy under Monetary Dominance

Note: We plot the impulse responses to a monetary shock θ_t in the closed economy under monetary dominance. The outcome variables include the nominal interest rate i_t, surplus s_t, debt level b_t, consumption c_t, inflation π_t, and real rate r_t.

First, the Euler equation (9) relates the real rate r_t to consumption c_t. A decline in the real rate lowers expected consumption growth, which increases the current consumption.

Second, the Phillips curve (12) relates consumption c_t to inflation π_t. With a positive slope coefficient κ under our calibration, higher consumption translates into higher inflation. This relation reflects the idea that an expansionary monetary shock boosts aggregate demand, increasing both consumption and inflation.

Third, the intertemporal government budget condition (2) relates inflation π_t to the real rate r_t. Holding government surpluses fixed, a lower real rate raises the present value of future surpluses, which requires a decline in the price level. To reconcile the lower real rate with higher inflation, current and future government surpluses s_{t+k} must fall, reducing the present value of surpluses and lowering the real value of debt b_t.

This discussion highlights that fiscal adjustments in government surpluses are essential for equilibrium under monetary dominance. In our calibration, the nominal interest rate i_t falls alongside the real rate following a monetary shock.[6]

Hegemon Dominance. We now examine the impulse responses under the hegemon dominance regime in open economy. In this setting, home monetary and fiscal policies are active ($\phi = 1.8$ and $\gamma = 0$), while foreign monetary and fiscal policies are passive ($\phi^* = 0.2$ and $\gamma^* = 0.2$). Calibration details are provided in Appendix A.8.

We consider a monetary shock to θ_t in the home country, which similarly lowers the home real rate r_t. Figure 6 reports the impulse responses, which are different from the closed-economy case in Figure 5 in important ways. As before, the key to understanding these dynamics lies in the pairwise relationships among the real rate r_t, consumption c_t, and inflation π_t, as captured by the Euler equation, the Phillips curve, and the intertemporal government budget condition.

First, following a negative real rate shock, the Euler equation (9) requires home consumption

[6]Appendix SA.3 provides the algebraic solution for the nominal rate i_t, real rate r_t, consumption c_t, and inflation π_t. We show that a negative monetary shock θ_t unambiguously lowers the real rate r_t while raising consumption c_t and inflation π_t. By contrast, the nominal rate i_t may rise or fall depending on the persistence of the monetary shock, the slope of the Phillips curve, and preferences such as risk aversion and time discounting. We adopt a conventional calibration under which the nominal rate moves in the same direction as the real rate.

c_t to rise, just as in the closed-economy case.

Second, consider the link between the real rate r_t and inflation π_t implied by the intertemporal government budget condition (2). A lower real rate raises the present value of government surpluses, exerting downward pressure on the price level. In the closed economy, this effect was offset by fiscal adjustments in government surpluses s_t, which allowed inflation to increase. In the open economy, however, home fiscal policy is assumed to be active, so surpluses do not adjust. As a result, inflation must fall when the real rate declines, consistent with the lower π_t observed in Figure 6.

Finally, the relationship between inflation π_t and consumption c_t is governed by the open-economy Phillips curve (15), which differs from its closed-economy counterpart (12) by incor-

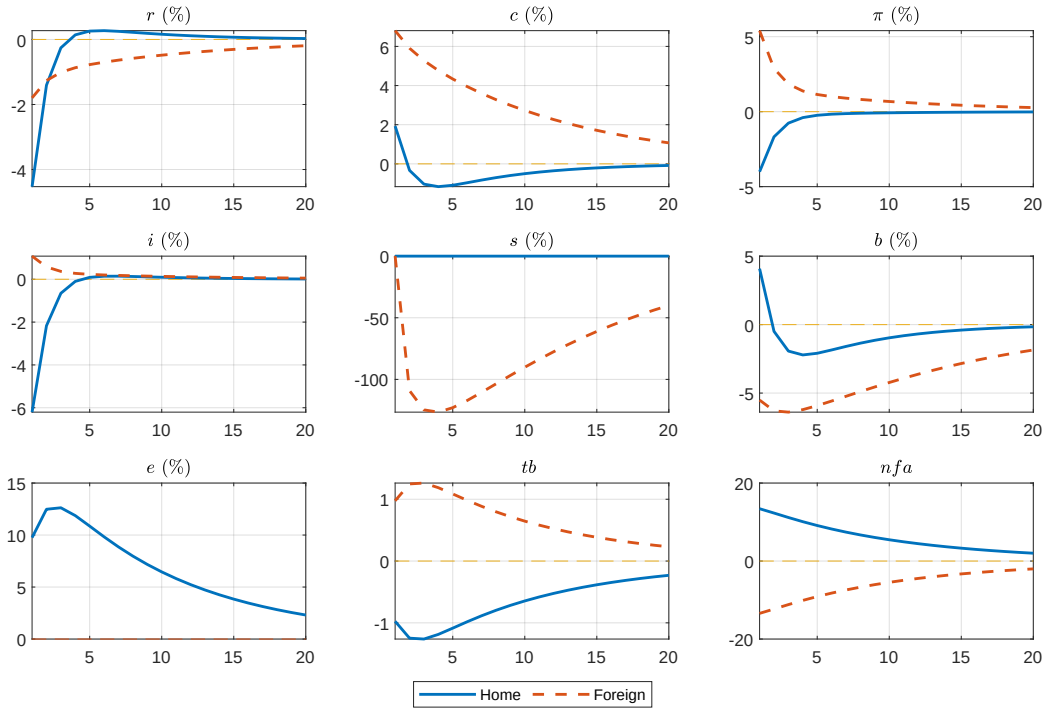


Figure 6: Impulse Responses to a Monetary Shock in the Open Economy under Hegemon Dominance

Note: We plot the impulse responses to a monetary shock θ_t in the open economy under hegemon dominance. The solid blue curve represents the home country, and the dashed red curve represents the foreign country. The outcome variables include the nominal interest rate i_t, surplus s_t, debt level b_t, consumption c_t, inflation π_t, and real rate r_t in both countries, and the real exchange rate e_t.

porating the exchange rate e_t. While higher consumption implies higher inflation in the closed economy, the open economy allows for the opposite outcome as the exchange rate adjusts. In particular, an appreciation of the home currency raises home households' purchasing power and reduces home inflation by making foreign goods cheaper. Thus, under monetary dominance, government surpluses adjust to reconcile the three equilibrium conditions, whereas under hegemon dominance, the adjustment occurs through the exchange rate.

The real appreciation of the home currency requires policy coordination from the foreign country. Specifically, the foreign monetary authority must lower the foreign real rate r_t^* below the home real rate r_t, while the foreign fiscal authority must accommodate these declines in real rates by reducing its fiscal surplus s_t^*. This fiscal response is similar to the response of a passive fiscal policy in the closed economy, which lowers surplus whenever the monetary policy lowers the real rate, except that this fiscal response is done by the foreign, not the home, fiscal authority under hegemon dominance.

Moreover, through the foreign Euler equation, a lower foreign real rate also leads to a higher foreign consumption level c_t^* upon impact. As the open-economy New Keynesian Phillips curves (15) and (16) depend on the exchange rate level e_t, inflation dynamics are shaped by the terms of trade: home inflation loads negatively on the home currency's real exchange rate, as a stronger home currency makes imports cheaper, while foreign inflation loads positively for the opposite reason. This terms of trade channel is the dominating force in the determination of inflation. Consequently, the foreign country experiences higher inflation π_t^* due to the depreciation of its currency, which also drives up the nominal interest rate i_t^* despite the lower monetary response coefficient ϕ^*.[7]

Finally, we report the trade balance tb_t and net foreign assets nfa_t in local currency units in the figure. The trade balance is defined in the usual way as the value of imports minus that of exports, while the net foreign assets are defined as the present value of consumption minus that

[7]It is interesting to note that, in the closed-economy monetary-dominance case depicted by Figure 5, lower inflation is always accompanied by lower consumption in response to the monetary shock θ_t. In the open-economy case, low inflation and high consumption are possible because of the exchange rate adjustment, which makes foreign goods cheaper (hence lower inflation) and home spending power higher (hence higher consumption).

of production. Coordinated monetary and fiscal policies generate an international wealth transfer from the foreign country to the home country during monetary expansions, because a stronger home currency increases the home households' purchasing power and allows them to run persistent trade deficits. Consequently, the home country's trade balance declines while its net foreign assets increase, and vice versa for the foreign country.

In summary, the hegemon dominance regime departs from the closed-economy case in two important ways. First, with an active home fiscal policy, the equilibrium conditions governing inflation, consumption, and the real rate is achieved not through adjustments in government surpluses s_t, but instead through movements in the exchange rate e_t. Second, because open-economy Phillips curves load on the real exchange rate, inflation and nominal interest rates respond in opposite directions across the two countries. This feature allows the home monetary authority to reduce domestic inflation by effectively shifting it abroad.

These results are consistent with the main results from our baseline setting: when the hegemon country lowers its real rate without fiscal adjustment, the foreign policy response ensures that (i) home and foreign real rates r and r^* both decline, while home and foreign consumption levels c and c^* both increase. The foreign real rate and consumption respond more than the home real rate and consumption; (ii) the foreign fiscal authority accommodates the monetary stance by lowering surplus s^*; (iii) the home currency e experiences real appreciation; and (iv) home inflation π declines while foreign inflation π^* increases. These patterns characterize the hegemon dominance regime in both the stylized baseline setting and the richer policy rule environment.

The only substantive difference between the baseline setting and the policy rule setting lies in the behavior of the foreign nominal interest rate i^*. In the baseline, i^* moves in the same direction as the home nominal rate i, whereas under the policy rule it moves in the opposite direction. This difference arises because the foreign policy rule specifies that the nominal rate responds systematically to inflation. Under our calibration, the response coefficient is $\phi^* = 0.2$, which remains positive. If $\phi^* = 0$ so that foreign monetary policy is completely passive with respect to inflation, then the foreign nominal rate i_t^* would not rise. Alternatively, if the foreign monetary author-

ity systematically lowers its nominal rate when the dollar appreciates, which helps mitigate the tightening effect of the dollar cycle, then i_t^* would decline alongside the home nominal rate i_t. Appendix SA.4 provides details of this alternative calibration. In either case, the responses of real rates, consumption, inflation, and the exchange rate remain consistent with our characterization above.

4 Conclusion

In this paper, we study the coordination problem between monetary and fiscal policies in an international setting. We recover the standard monetary and fiscal dominance regimes, in which one policy is active and the other is passive in each country. We also identify a third regime, in which the hegemon country's monetary and fiscal policies are both active, while the other country's policies are both passive. This new mode of policy coordination has novel implications for the transmission of monetary and fiscal policies, and provides a new perspective for understanding the global hegemon in an interconnected world.

A natural follow-up question is how and which equilibrium regime is selected, and which country becomes the hegemon. To answer this question, we need to specify the off-equilibrium strategies for both agents and governments, in line with earlier works on equilibrium selection in closed economy (Kocherlakota and Phelan, 1999; Buiter, 2002; Bassetto, 2002; Niepelt, 2004; Angeletos and Lian, 2023).

For example, Cochrane (2011) argues that a monetary authority can enforce its desired inflation path by threatening explosive inflation off the equilibrium path. Extending this argument to open economy, one might imagine the hegemon being determined by which country can issue more credible threats. Alternatively, the sophisticated policy approach of Atkeson, Chari, and Kehoe (2010) could be extended to the open-economy setting, where equilibrium selection similarly depends on actions both on and off the equilibrium path.

Another promising direction is to examine how the exchange rate adjustment also shapes pol-

icy coordination through valuation effects in the financial market. Specifically, our main mechanism relies on terms-of-trade adjustments in the goods market to enforce resource constraints: when monetary policy raises domestic households' real spending power, we need either higher taxes to absorb the excess demand as in the standard monetary dominance regime (Leeper, 2021), or a real depreciation of the local currency to raise the cost of imports. The exchange rate adjustment also affects the valuation of home and foreign financial assets, shifting the wealth distribution across countries and potentially complements the international trade channel in the hegemon dominance regime. This mechanism is particularly relevant when the U.S. is viewed as the hegemon, given the large spillovers of U.S. monetary policy to global asset prices.

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A Model Appendix

A.1 Derivation of the Baseline Setting

Household's Within-Period Solution Let $p_t(h)$ and $p_t(f)$ denote the home-currency prices of varieties h and f. Let $P_{H,t}$ and $P_{F,t}$ denote the home-currency prices of the home and foreign bundles $c_{H,t}(j)$ and $c_{F,t}(j)$, which can be shown to be the CES indices with elasticity $1/\rho$:

$$P_{H,t} = \left(\int_0^1 p_t(h)^{1-\rho} dh\right)^{1/(1-\rho)}, \qquad P_{F,t} = \left(\int_0^1 p_t(f)^{1-\rho} df\right)^{1/(1-\rho)}.$$

Similarly, let P_t denote the home-currency price of the aggregate consumption basket in the home country. This utility-based CPI can be expressed as

$$P_t = \frac{1}{\alpha^\alpha (1-\alpha)^{1-\alpha}} P_{H,t}^\alpha P_{F,t}^{1-\alpha}.$$

We show that the home household makes the following choices for different goods:

$$c_t(h,j) = \left(\frac{p_t(h)}{P_{H,t}}\right)^{-\rho} c_{H,t}, \qquad c_t(f,j) = \left(\frac{p_t(f)}{P_{F,t}}\right)^{-\rho} c_{F,t},$$

and

$$c_{H,t} = \alpha \frac{P_t}{P_{H,t}} c_t, \qquad c_{F,t} = (1-\alpha)\frac{P_t}{P_{F,t}} c_t.$$

Indeed, home household's cost minimization problem is

$$\min_{c_t(h,j)} \quad \int_0^1 p_t(h) c_t(h,j) dh + \mu_{H,t} \left(c_{H,t}(j) - \left(\int_0^1 c_t(h,j)^{1-1/\rho} dh\right)^{\rho/(\rho-1)} \right).$$

Let $P_{H,t} := \mu_{H,t}$. The first order condition is

$$c_t(h,j) = \left(\frac{p_t(h)}{P_{H,t}}\right)^{-\rho} c_{H,t}.$$

Raise to the power $1-1/\rho$ and integrate by h to obtain

$$c_{H,t}^{1-1/\rho} = \left(\int_0^1 \left(\frac{p_t(h)}{P_{H,t}}\right)^{-(\rho-1)} dh\right) c_{H,t}^{1-1/\rho}, \qquad P_{H,t} = \left(\int_0^1 p_t(h)^{1-\rho} dh\right)^{1/(1-\rho)}.$$

Similarly, we obtain $c_t(f,j) = \left(\frac{p_t(f)}{P_{F,t}}\right)^{-\rho} c_{F,t}$ and $P_{F,t} = \left(\int_0^1 p_t(f)^{1-\rho} df\right)^{1/(1-\rho)}$. Now consider the following cost minimization problem

$$\min_{c_{H,t}(j), c_{F,t}(j)} \left(P_{H,t} c_{H,t}(j) + P_{F,t} c_{F,t}(j)\right) + \mu_t \left(c_t(j) - c_{H,t}(j)^{\alpha} c_{F,t}(j)^{1-\alpha}\right)$$

The first-order conditions are

$$P_{H,t} = \alpha \mu_t c_{H,t}(j)^{\alpha-1} c_{F,t}(j)^{1-\alpha}, \qquad P_{F,t} = (1-\alpha)\mu_t c_{H,t}(j)^{\alpha} c_{F,t}(j)^{-\alpha},$$

which imply

$$\mu_t = \frac{1}{\alpha^{\alpha}(1-\alpha)^{1-\alpha}} P_{H,t}^{\alpha} P_{F,t}^{1-\alpha} \stackrel{\text{def}}{=} P_t.$$

The first-order conditions also imply

$$c_{H,t}(j) = \alpha \frac{P_t}{P_{H,t}} c_t(j), \qquad c_{F,t}(j) = (1-\alpha)\frac{P_t}{P_{F,t}} c_t(j),$$

and hence

$$\frac{P_{H,t} c_{H,t}(j) + P_{F,t} c_{F,t}(j)}{c_t(j)} = P_t,$$

which verifies that the shadow price of the home consumption bundle is the CPI itself.

Intertemporal Solution In period t and state σ_t, home household maximize the lifetime utility subject to the budget constraint

$$\begin{aligned}&\sum_{\sigma_{t+1}} \Omega_t(\sigma_{t+1}, j)\Theta(\sigma_{t+1}|\sigma_t) + \exp(-\mathcal{E}_t)\sum_{\sigma_{t+1}} \Omega_t^*(\sigma_{t+1}, j)\Theta^*(\sigma_{t+1}|\sigma_t)\\ \leq & W_t\ell_t(j) + D_t(j) - P_t\tau_t(j) - P_t c_t(j) + \Omega_{t-1}(\sigma_t, j) + \exp(-\mathcal{E}_t)\Omega_{t-1}^*(\sigma_t, j),\end{aligned}$$

where $\Theta(\sigma_{t+1}|\sigma_t)$ denote the time-t home-currency price for one unit of home currency delivered in period $t+1$ contingent on the state being σ_{t+1}. At time t, home household j holds $\Omega_t(\sigma_{t+1}, j)$ unit of the Arrow-Debreu security that pays off in state σ_{t+1}. $\Theta^*(\sigma_{t+1}|\sigma_t)$ is similarly defined as the time-t foreign-currency price for one unit of foreign currency delivered in period $t+1$ contingent on the state being σ_{t+1}, and $\Omega_t^*(\sigma_{t+1}, j)$ is the quantity of this security held by home household j. The home household's Lagrangian is

$$\begin{aligned}\mathcal{L}(j) = &\max \mathbb{E}_0 \sum_{t=0}^{\infty} \delta^t \left(\log c_t(j) - \chi\ell_t(j)\right)\\ &- \mathbb{E}_0 \sum_{t=0}^{\infty} \delta^t \zeta_t(j)\{\sum_{\sigma_{t+1}} \Omega_t(\sigma_{t+1}, j)\Theta(\sigma_{t+1}|\sigma_t) + \exp(-\mathcal{E}_t)\sum_{\sigma_{t+1}} \Omega_t^*(\sigma_{t+1}, j)\Theta^*(\sigma_{t+1}|\sigma_t)\\ &- W_t\ell_t(j) - D_t(j) + P_t\tau_t(j) + P_t c_t(j) - \Omega_{t-1}(\sigma_t, j) - \exp(-\mathcal{E}_t)\Omega_{t-1}^*(\sigma_t, j)\}\end{aligned}$$

The first-order conditions are

$$\zeta_t(j) = \frac{1}{P_t c_t(j)}, \qquad \Theta(\sigma_{t+1}|\sigma_t) = \delta\mathbb{P}(\sigma_{t+1}|\sigma_t)\frac{P_t c_t(j)}{P_{t+1}c_{t+1}(j)}, \qquad \chi P_t c_t(j) = W_t,$$

We define the home country's nominal SDF as

$$M_{t,t+1} \stackrel{\text{def}}{=} \delta\frac{P_t c_t(j)}{P_{t+1}c_{t+1}(j)},$$

which implies the Euler equation for nominal risk-free rate

$$i_t = \log\left(\frac{1}{P_t c_t}\right) - \log \mathbb{E}_t\left[\delta \frac{1}{P_{t+1} c_{t+1}}\right].$$

Similarly, $i_t^* = \log\left(\frac{1}{P_t^* c_t^*}\right) - \log \mathbb{E}_t\left[\delta \frac{1}{P_{t+1}^* c_{t+1}^*}\right]$.

Optimal Price Setting Based on information available in period $t-1$, the price at home $p_t(h)$ is set to maximize the expected profit from the home market:

$$\max_{p_t(h)} \mathbb{E}_{t-1}\left[M_{t-1,t}\left(p_t(h) - \frac{W_t}{z_t}\right)\left(\frac{p_t(h)}{P_{H,t}}\right)^{-\rho} c_{H,t}\right].$$

The future profit is discounted by the domestic households' SDF $M_{t-1,t}$, as they are the shareholders whose interests the firms maximize.

The first-order condition is

$$0 = \mathbb{E}_{t-1}\left[\delta \frac{P_{t-1} c_{t-1}}{P_t c_t}\left((1-\rho) p_t(h)^{-\rho} + \rho \frac{W_t}{z_t} p_t(h)^{-\rho-1}\right)\left(\frac{1}{P_{H,t}}\right)^{-\rho} \alpha \frac{P_t}{P_{H,t}} c_t\right],$$

which, under symmetry $p_t(h) = P_{H,t}$, implies

$$P_{H,t} = \frac{\rho}{\rho - 1} \mathbb{E}_{t-1}\left[\frac{W_t}{z_t}\right].$$

The home firms also need to set their sale price in the foreign market. Under *Producer Currency Pricing*, the price of the home firms' production sold in the foreign country is set according to

$$\max_{\exp(-\mathcal{E}_t) p_t^*(h)} \mathbb{E}_{t-1}\left[M_{t-1,t}\left(\exp(-\mathcal{E}_t) p_t^*(h) - \frac{W_t}{z_t}\right)\left(\frac{p_t^*(h)}{P_{H,t}^*}\right)^{-\rho} c_{H,t}^*\right],$$

which implies

$$\exp(-\mathcal{E}_t)P^*_{H,t} = \frac{\rho}{\rho-1}\mathbb{E}_{t-1}\left[\frac{W_t}{z_t}\right].$$

The entire price block can be described as

$$P_{H,t} = \exp(-\mathcal{E}_t)P^*_{H,t} = \frac{\rho}{\rho-1}\mathbb{E}_{t-1}\left[\frac{W_t}{z_t}\right], \tag{A.1}$$

$$P^*_{F,t} = \exp(\mathcal{E}_t)P_{F,t} = \frac{\rho}{\rho-1}\mathbb{E}_{t-1}\left[\frac{W^*_t}{z^*_t}\right]. \tag{A.2}$$

Equilibrium The market clearing condition for the home consumption good is

$$z_t\ell_t = \alpha\frac{P_t}{P_{H,t}}(c_t+g_t) + (1-\alpha)\frac{P^*_t}{P^*_{H,t}}(c^*_t+g^*_t) = \frac{P_tc_t}{P_{H,t}}\left(1+\alpha\frac{g_t}{c_t}+(1-\alpha)\frac{g^*_t}{c^*_t}\right) \tag{A.3}$$

Note that households' first order condition w.r.t. labor implies

$$W_t = \chi P_tc_t \tag{A.4}$$

Plug Eq. (A.4) and (A.1) into the market clearing condition to obtain

$$\ell_t = \frac{P_tc_t}{P_{H,t}z_t}\left(1+\alpha\frac{g_t}{c_t}+(1-\alpha)\frac{g^*_t}{c^*_t}\right) = \frac{P_tc_t/z_t}{\mathbb{E}_{t-1}\left[P_tc_t/z_t\right]}\bar{\ell}\left(1+\alpha\frac{g_t}{c_t}+(1-\alpha)\frac{g^*_t}{c^*_t}\right),$$

where $\bar{\ell} = \frac{\rho-1}{\rho\chi}$. Use Eq. (A.3) again,

$$c_t = z_t\ell_t\cdot\frac{P_{H,t}}{P_t}\left(1+\alpha\frac{g_t}{c_t}+(1-\alpha)\frac{g^*_t}{c^*_t}\right)^{-1} = \frac{P_tc_t}{\mathbb{E}_{t-1}\left[P_tc_t/z_t\right]}\bar{\ell}(\alpha^\alpha(1-\alpha)^{1-\alpha})\frac{P^{1-\alpha}_{H,t}}{P^{1-\alpha}_{F,t}}.$$

Use the price setting Eq. (A.1) and (A.2),

$$\frac{P_{H,t}}{P_{F,t}} = \frac{1}{\exp(-\mathcal{E}_t)}\frac{\mathbb{E}_{t-1}\left[W_t/z_t\right]}{\mathbb{E}_{t-1}\left[W^*_t/z^*_t\right]} = \frac{P^*_tc^*_t}{P_tc_t}\frac{\mathbb{E}_{t-1}\left[P_tc_t/z_t\right]}{\mathbb{E}_{t-1}\left[P^*_tc^*_t/z^*_t\right]}.$$

Then

$$c_t = \bar{\ell}\alpha^\alpha(1-\alpha)^{1-\alpha}\frac{(P_t c_t)^\alpha (P_t^* c_t^*)^{1-\alpha}}{(\mathbb{E}_{t-1}[P_t c_t/z_t])^\alpha (\mathbb{E}_{t-1}[P_t^* c_t^*/z_t^*])^{1-\alpha}}.$$

So the equilibrium price levels and consumption can be solved by

$$c_t = \bar{\ell}\alpha^\alpha(1-\alpha)^{1-\alpha}\frac{(P_t c_t)^\alpha (P_t^* c_t^*)^{1-\alpha}}{(\mathbb{E}_{t-1}[P_t c_t/z_t])^\alpha (\mathbb{E}_{t-1}[P_t^* c_t^*/z_t^*])^{1-\alpha}}, \tag{A.5}$$

$$c_t^* = \bar{\ell}\alpha^\alpha(1-\alpha)^{1-\alpha}\frac{(P_t c_t)^{1-\alpha} (P_t^* c_t^*)^{\alpha}}{(\mathbb{E}_{t-1}[P_t c_t/z_t])^{1-\alpha} (\mathbb{E}_{t-1}[P_t^* c_t^*/z_t^*])^{\alpha}}, \tag{A.6}$$

$$P_t = \frac{Q_t}{s_t + c_t \mathbb{E}_t\left[\sum_{k=1}^\infty \delta^k \frac{s_{t+k}}{c_{t+k}}\right]}, \tag{A.7}$$

$$P_t^* = \frac{Q_t^*}{s_t^* + c_t^* \mathbb{E}_t\left[\sum_{k=1}^\infty \delta^k \frac{s_{t+k}^*}{c_{t+k}^*}\right]}, \tag{A.8}$$

which implies

$$\begin{aligned}
\log c_t &= \kappa_{t-1}^c + \alpha \log(P_t c_t) + (1-\alpha)\log(P_t^* c_t^*),\\
\log c_t^* &= \kappa_{t-1}^{c^*} + \alpha \log(P_t^* c_t^*) + (1-\alpha)\log(P_t c_t),\\
-e_t &= \log c_t - \log c_t^* = \kappa_{t-1}^e + (2\alpha-1)(\log(P_t c_t) - \log(P_t^* c_t^*)),
\end{aligned}$$

where

$$\begin{aligned}
\kappa_{t-1}^c &= \log\left(\frac{\bar{\ell}\alpha^\alpha(1-\alpha)^{1-\alpha}}{(\mathbb{E}_{t-1}[P_t c_t/z_t])^\alpha (\mathbb{E}_{t-1}[P_t^* c_t^*/z_t^*])^{1-\alpha}}\right),\\
\kappa_{t-1}^c &= \log\left(\frac{\bar{\ell}\alpha^\alpha(1-\alpha)^{1-\alpha}}{(\mathbb{E}_{t-1}[P_t c_t/z_t])^{1-\alpha} (\mathbb{E}_{t-1}[P_t^* c_t^*/z_t^*])^{\alpha}}\right),
\end{aligned}$$

and $\kappa_{t-1}^e = \kappa_{t-1}^c - \kappa_{t-1}^{c^*}$. Denote

$$A_t = \mathbb{E}_t\left[\sum_{k=1}^\infty \delta^k \frac{s_{t+k}}{c_{t+k}}\right], \qquad A_t^* = \mathbb{E}_t\left[\sum_{k=1}^\infty \delta^k \frac{s_{t+k}^*}{c_{t+k}^*}\right].$$

We show that A_t is a constant if all shocks are i.i.d, i.e., $A_t = A$. Conjecture that c_t and c_t^* are functions of s_t and s_t^* only, hence A_t and A_t^* are constant if surplus shocks are i.i.d. Substitute Eq. (A.7) and (A.8) into (A.5) and (A.6) to obtain

$$c_t = \bar{\ell}\alpha^\alpha(1-\alpha)^{1-\alpha}\frac{(\frac{1}{s_t+c_tA}c_t)^\alpha(\frac{1}{s_t^*+c_t^*A^*}c_t^*)^{1-\alpha}}{(\mathbb{E}_{t-1}[\frac{1}{s_t+c_tA}c_t/z_t])^\alpha(\mathbb{E}_{t-1}[\frac{1}{s_t^*+c_t^*A^*}c_t^*/z_t^*])^{1-\alpha}}$$
$$c_t^* = \bar{\ell}\alpha^\alpha(1-\alpha)^{1-\alpha}\frac{(\frac{1}{s_t+c_tA}c_t)^{1-\alpha}(\frac{1}{s_t^*+c_t^*A^*}c_t^*)^{\alpha}}{(\mathbb{E}_{t-1}[\frac{1}{s_t+c_tA}c_t/z_t])^{1-\alpha}(\mathbb{E}_{t-1}[\frac{1}{s_t^*+c_t^*A^*}c_t^*/z_t^*])^{\alpha}}.$$

By the i.i.d. assumption of s_t, s_t^*, z_t, and z_t^*, the expectation terms $\mathbb{E}_{t-1}[\frac{1}{s_t+c_tA}c_t/z_t]$ and $\mathbb{E}_{t-1}[\frac{1}{s_t^*+c_t^*A^*}c_t^*/z_t^*]$ do not vary across periods. The two equations above can be used to solve c_t and c_t^* as functions of s_t and s_t^*, which confirms the conjecture.

A.2 Proof of Proposition 1

Note that under i.i.d. shocks, assuming $\Delta \log Q_{t+1} = \Delta \log Q_{t+1}^* = 0$, i.e., $Q_{t+1} = Q_{t+1}^* = \bar{Q}$, we obtain

$$\mathbb{E}_t\left[\frac{1}{P_{t+1}c_{t+1}}\right] = \frac{1}{\bar{Q}}\mathbb{E}_t\left[\frac{Q_{t+1}}{P_{t+1}c_{t+1}}\right] = \frac{1}{\bar{Q}}\left(A + \mathbb{E}_t\left[\frac{s_{t+1}}{c_{t+1}}\right]\right),$$

which is a constant. Plug in Euler equation into Eq. (3) to obtain

$$\log c_t = \kappa_{t-1}^c - \alpha\left(i_t + \log \mathbb{E}_t\left[\delta\frac{1}{P_{t+1}c_{t+1}}\right]\right) - (1-\alpha)\left(i_t^* + \log \mathbb{E}_t\left[\delta\frac{1}{P_{t+1}^*c_{t+1}^*}\right]\right),$$

which implies $\log \hat{c}_t = -\alpha\hat{i}_t - (1-\alpha)\hat{i}_t^*$. Similarly, $\log \hat{c}_t^* = -\alpha\hat{i}_t^* - (1-\alpha)\hat{i}_t$, and

$$\hat{e}_t = \log \hat{c}_t^* - \log \hat{c}_t = (2\alpha - 1)(\hat{i}_t - \hat{i}_t^*).$$

By Euler equation,

$$\log P_t = -\log c_t - i_t - \log \mathbb{E}_t \left[\delta \frac{1}{P_{t+1} c_{t+1}} \right],$$

hence $\log \hat{P}_t = -(1-\alpha)(\hat{i}_t - \hat{i}_t^*)$ and $\log \hat{P}_t^* = (1-\alpha)(\hat{i}_t - \hat{i}_t^*)$. Recall

$$\log c_t = \kappa_{t-1}^c + \alpha \log \left(\frac{c_t}{s_t + c_t A} \right) + (1-\alpha) \log \left(\frac{c_t^*}{s_t^* + c_t^* A^*} \right),$$

where we redefine κ_{t-1}^c by adding a constant $\log \bar{Q}$. Linearizing both sides around the symmetric steady state yields

$$\log \hat{c}_t = \alpha \log \hat{c}_t + (1-\alpha) \log \hat{c}_t^* - \alpha \frac{1}{\bar{s} + \bar{c} A} (\hat{s}_t + \bar{c} A \log \hat{c}_t) - (1-\alpha) \frac{1}{\bar{s} + \bar{c} A} (\hat{s}_t^* + \bar{c} A \log \hat{c}_t^*).$$

Plug in $\log \hat{c}_t$ and $\log \hat{c}_t^*$ as functions of $\hat{i}_t$ and $\hat{i}_t^*$ to solve for $\hat{s}_t$ and $\hat{s}_t^*$

$$\hat{s}_t = \frac{(1-\alpha)\bar{s} + \alpha A \bar{c}}{1-2\alpha} \log \hat{c}_t + \frac{-(1-\alpha)\bar{s} + (\alpha - 1) A \bar{c}}{1-2\alpha} \log \hat{c}_t^* = A \bar{c} \hat{i}_t + (1-\alpha)\bar{s}(\hat{i}_t - \hat{i}_t^*),$$

and similarly $\hat{s}_t^* = A \bar{c} \hat{i}_t^* + (1-\alpha)\bar{s}(\hat{i}_t^* - \hat{i}_t)$.

A.3 Proof of Proposition 2

Rearrange Eq. (5) to obtain

$$\begin{aligned}
\hat{i}_t^* &= \frac{A\bar{c} + (1-\alpha)\bar{s}}{(1-\alpha)\bar{s}} \hat{i}_t - \frac{1}{(1-\alpha)\bar{s}} \hat{s}_t, \\
\hat{s}_t^* &= \frac{A^2 \bar{c}^2 + 2A\bar{c}(1-\alpha)\bar{s}}{(1-\alpha)\bar{s}} \hat{i}_t - \frac{A\bar{c} + (1-\alpha)\bar{s}}{(1-\alpha)\bar{s}} \hat{s}_t.
\end{aligned}$$

Let $\hat{i}_t > 0$ and $\hat{s}_t = 0$, we get

$$\hat{i}_t^* = \frac{A\bar{c} + (1-\alpha)\bar{s}}{(1-\alpha)\bar{s}}\hat{i}_t > 0, \qquad \hat{s}_t^* = \frac{A^2\bar{c}^2 + 2A\bar{c}(1-\alpha)\bar{s}}{(1-\alpha)\bar{s}}\hat{i}_t > 0,$$
$$\hat{e}_t = (2\alpha-1)(\hat{i} - \hat{i}_t^*) = -(2\alpha-1)\frac{A\bar{c}}{(1-\alpha)\bar{s}}\hat{i}_t < 0.$$

A.4 Proof of Proposition 3

Since consumption is constant, the Euler equation can be restated as $\exp(-i_t) = \delta\mathbb{E}_t\left[\frac{1}{\exp(\pi_{t+1})}\right]$. Linearize the system to obtain

$$\hat{i}_t = \mathbb{E}_t[\hat{\pi}_{t+1}], \qquad \hat{q}_t = \hat{s}_t + \delta\hat{q}_{t+1} + \delta\bar{q}(\hat{\pi}_{t+1} - \hat{i}_t),$$

where we plugged in $\exp(\bar{\pi} - \bar{i}) = \delta$. Plug in the monetary rule to obtain

$$\mathbb{E}_t[\hat{\pi}_{t+1}] = \phi\hat{\pi}_t + \theta_t. \tag{A.9}$$

Plug the fiscal rule into the intertemporal government budget constraint to obtain

$$\hat{q}_t = \gamma\delta\hat{q}_t + \gamma\delta\bar{q}(\hat{\pi}_t - \hat{i}_{t-1}) + \psi_t + \delta\hat{q}_{t+1} + \delta\bar{q}(\hat{\pi}_{t+1} - \hat{i}_t).$$

Denote $\hat{b}_t = \hat{q}_{t+1} + \bar{q}(\hat{\pi}_{t+1} - \hat{i}_t)$. The system can be summarized by the equation in Proposition 3, which has 3 eigenvalues: $\delta^{-1} - \gamma$, 0, ϕ.

A.5 Proof of Proposition 4

The Euler equation implies

$$\log\hat{c}_t = \mathbb{E}_t[\log\hat{c}_{t+1}] - \sigma(\hat{i}_t - \mathbb{E}_t[\hat{\pi}_{t+1}]), \tag{A.10}$$

which, by plugging in monetary rule and the Phillips curve, can be restated as

$$\log \hat{c}_t = \mathbb{E}_t[\log \hat{c}_{t+1}] - \sigma(\phi\hat{\pi}_t + \theta_t - \delta^{-1}\hat{\pi}_t + \delta^{-1}\kappa \log \hat{c}_t).$$

The system can be summarized by the equation in Proposition 4. The eigenvalues are

$$\begin{aligned} \lambda_1 &= \delta^{-1} - \gamma, \qquad \lambda_2 = 0, \\ \lambda_3, \lambda_4 &= \frac{1 + \delta^{-1} + \sigma\delta^{-1}\kappa}{2} \pm \frac{\sqrt{(1 - \delta^{-1} - \sigma\delta^{-1}\kappa)^2 + 4\sigma\delta^{-1}\kappa(1-\phi)}}{2}. \end{aligned}$$

We focus on the usual case where $\delta < 1$, $\phi \geq 0$ and $\kappa \geq 0$, and that the parameters must satisfy that $\lambda_3, \lambda_4 \in \mathbb{R}$. In this case, $\phi > 1$ indicates active monetary policy. Note that the last two eigenvalues satisfy

$$P(\lambda) = \lambda^2 - (1 + \delta^{-1} + \sigma\delta^{-1}\kappa)\lambda + \delta^{-1} + \sigma\delta^{-1}\kappa\phi = 0,$$

where $P(0) = \delta^{-1} + \sigma\delta^{-1}\kappa\phi > 0$, $P(1) = \sigma\delta^{-1}\kappa(\phi - 1)$. The axis of symmetry is $(1 + \delta^{-1} + \sigma\delta^{-1}\kappa)/2 > 1$, which implies polynomial $P(\lambda)$ has at most one root inside the unit circle. Hence, if $\phi > 1$, i.e., the monetary policy is active, then λ_3 and λ_4 are both outside the unit circle, which requires $|\delta^{-1} - \gamma| < 1$, i.e., passive fiscal policy. If $\phi < 1$, i.e., the monetary policy is passive, then $P(1) < 0$, which implies $\lambda_3 > 1$, $\lambda_4 < 1$. To guarantee the uniqueness of the solution, $|\lambda_1| > 0$ must hold, i.e., $|\delta^{-1} - \gamma| > 1$, i.e., active fiscal policy.

A.6 Proof of Proposition 5

Recall that the price aggregation rule implies

$$\begin{aligned} \log \hat{P}_t &= \alpha \log \hat{P}_{H,t} + (1-\alpha) \log \hat{P}^*_{F,t} - (1-\alpha)\hat{\mathcal{E}}_t, \\ \log \hat{P}^*_t &= (1-\alpha) \log \hat{P}_{H,t} + \alpha \log \hat{P}^*_{F,t} + (1-\alpha)\hat{\mathcal{E}}_t, \end{aligned}$$

which solve for the price level of intermediate goods

$$\log \hat{P}_{H,t} = \log \hat{P}_t + \frac{1-\alpha}{2\alpha-1}(\log \hat{P}_t - \log \hat{P}_t^* + \hat{\mathcal{E}}_t)$$
$$\log \hat{P}_{H,t} = \log \hat{P}_t + \frac{1-\alpha}{2\alpha-1}\hat{e}_t,$$
$$\log \hat{P}_{F,t}^* = \log \hat{P}_t^* - \frac{1-\alpha}{2\alpha-1}\hat{e}_t.$$

Plug into Eq. (13) and (14) to obtain

$$\begin{aligned}
\hat{\pi}_t + \frac{1-\alpha}{2\alpha-1}\Delta\hat{e}_t &= \delta\mathbb{E}_t[\hat{\pi}_{t+1} + \frac{1-\alpha}{2\alpha-1}\Delta\hat{e}_{t+1}] + \frac{(1-\xi)(1-\delta\xi)}{\xi}(\log \widehat{mc}_{H,t} + \log \hat{P}_t - \log \hat{P}_{H,t}) \\
&= \delta\mathbb{E}_t[\hat{\pi}_{t+1} + \frac{1-\alpha}{2\alpha-1}\Delta\hat{e}_{t+1}] + \frac{(1-\xi)(1-\delta\xi)}{\xi}(\log \widehat{mc}_{H,t} - \frac{1-\alpha}{2\alpha-1}\hat{e}_t), \\
\hat{\pi}_t &= \delta\mathbb{E}_t[\hat{\pi}_{t+1}] + \delta\frac{1-\alpha}{2\alpha-1}\mathbb{E}_t[\hat{e}_{t+1}] - \frac{1+\delta\xi^2}{\xi}\frac{1-\alpha}{2\alpha-1}\hat{e}_t + \frac{1-\alpha}{2\alpha-1}\hat{e}_{t-1} \\
&\quad + \frac{(1-\xi)(1-\delta\xi)}{\xi}\log \widehat{mc}_{H,t},
\end{aligned}$$

where $mc_{H,t}$ is real marginal cost of home firms. Under linear technology $y_t(h) = z_t\ell_t(h)$, the real marginal cost gap can be related to output gap, i.e.,

$$mc_{H,t} = \frac{1}{z_t}w_t.$$

Households' first order condition w.r.t. ℓ_t yields the labor supply curve: $c_t^{-\sigma^{-1}}w_t = \chi$. Hence,

$$\log \widehat{mc}_{H,t} = \log \hat{w}_t - \log \hat{z}_t = \sigma^{-1}\log \hat{c}_t - \log \hat{z}_t,$$

which implies open-economy NKPCs:

$$\hat{\pi}_t = \delta\mathbb{E}_t[\hat{\pi}_{t+1}] + \delta\frac{1-\alpha}{2\alpha-1}\mathbb{E}_t[\hat{e}_{t+1}] - \eta\frac{1-\alpha}{2\alpha-1}\hat{e}_t + \frac{1-\alpha}{2\alpha-1}\hat{e}_{t-1} + \kappa\log \hat{c}_t - \kappa\sigma\log \hat{z}_t,$$
$$\hat{\pi}_t^* = \delta\mathbb{E}_t[\hat{\pi}_{t+1}^*] - \delta\frac{1-\alpha}{2\alpha-1}\mathbb{E}_t[\hat{e}_{t+1}] + \eta\frac{1-\alpha}{2\alpha-1}\hat{e}_t - \frac{1-\alpha}{2\alpha-1}\hat{e}_{t-1} + \kappa\log \hat{c}_t^* - \kappa\sigma\log \hat{z}_t^*,$$

where $\kappa \overset{\text{def}}{=} \frac{(1-\xi)(1-\delta\xi)}{\xi}\sigma^{-1}$, $\eta \overset{\text{def}}{=} (1+\delta\xi^2)/\xi$.

A.7 Proof of Proposition 6

The home and foreign government implement the following monetary and fiscal policy rules (7), (17), (8), and (18) subject to the intertemporal government budget constraints

$$\hat{b}_t = (\delta^{-1}-\gamma)\hat{b}_{t-1} - \delta^{-1}\bar{q}(\hat{\pi}_t - \phi\hat{\pi}_{t-1}) + \delta^{-1}\bar{q}\theta_{t-1} - \delta^{-1}\psi_t,$$
$$\hat{b}^*_t = (\delta^{-1}-\gamma^*)\hat{b}^*_{t-1} - \delta^{-1}\bar{q}(\hat{\pi}^*_t - \phi^*\hat{\pi}^*_{t-1}) + \delta^{-1}\bar{q}\theta^*_{t-1} - \delta^{-1}\psi^*_t.$$

Log-linearize the Euler equations to obtain

$$\log\hat{c}_t = \mathbb{E}_t[\log\hat{c}_{t+1}] - \sigma(\hat{i}_t - \mathbb{E}_t[\hat{\pi}_{t+1}]), \tag{A.11}$$
$$\log\hat{c}^*_t = \mathbb{E}_t[\log\hat{c}^*_{t+1}] - \sigma(\hat{i}^*_t - \mathbb{E}_t[\hat{\pi}^*_{t+1}]), \tag{A.12}$$
$$\log\hat{c}_t = \mathbb{E}_t[\log\hat{c}_{t+1}] - \sigma(\hat{i}^*_t - \mathbb{E}_t[\hat{\pi}^*_{t+1}] - \mathbb{E}_t[\Delta\hat{e}_{t+1}]). \tag{A.13}$$

Note that after linearization, one Euler equation becomes redundant. Combining Eq. (A.11) and (A.13) yields the uncovered interest parity (UIP), i.e.,

$$\hat{i}^*_t - \mathbb{E}_t[\hat{\pi}^*_{t+1}] - \mathbb{E}_t[\Delta\hat{e}_{t+1}] = \hat{i}_t - \mathbb{E}_t[\hat{\pi}_{t+1}], \tag{A.14}$$

which is satisfied under complete market $\hat{e}_t = \sigma^{-1}(\log\hat{c}^*_t - \log\hat{c}_t)$.

The equation system can be summarized by Eq. (19), where

$$\Psi = \begin{bmatrix} \delta^{-1}-\gamma & 0 & \delta^{-1}\phi\bar{q} & 0 & 0 & 0 & -\delta^{-1}\bar{q} & 0 & 0 & 0 \\ 0 & \delta^{-1}-\gamma^* & 0 & \delta^{-1}\phi^*\bar{q} & 0 & 0 & 0 & -\delta^{-1}\bar{q} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & \aleph_{11} & \aleph_{12} & \aleph_{13} & \aleph_{14} & \aleph_{15} & \aleph_{16} \\ 0 & 0 & 0 & 0 & \aleph_{21} & \aleph_{22} & \aleph_{23} & \aleph_{24} & \aleph_{25} & \aleph_{26} \\ 0 & 0 & 0 & 0 & \aleph_{31} & \aleph_{32} & \aleph_{33} & \aleph_{34} & \aleph_{35} & \aleph_{36} \\ 0 & 0 & 0 & 0 & \aleph_{41} & \aleph_{42} & \aleph_{43} & \aleph_{44} & \aleph_{45} & \aleph_{46} \end{bmatrix},$$

$\aleph = \delta^{-1}$

$$\begin{bmatrix} (1-\alpha)\sigma^{-1} & -(1-\alpha)\sigma^{-1} & \alpha+(1-\alpha)\delta\phi & (1-\alpha)(1-\delta\phi^*) & (1-\alpha)(\delta-\eta)\sigma^{-1}-\alpha\kappa & -(1-\alpha)(\delta-\eta)\sigma^{-1}-(1-\alpha)\kappa \\ -(1-\alpha)\sigma^{-1} & (1-\alpha)\sigma^{-1} & (1-\alpha)(1-\delta\phi) & \alpha+(1-\alpha)\delta\phi^* & -(1-\alpha)(\delta-\eta)\sigma^{-1}-(1-\alpha)\kappa & (1-\alpha)(\delta-\eta)\sigma^{-1}-\alpha\kappa \\ -(1-\alpha) & 1-\alpha & -\alpha(1-\delta\phi)\sigma & -(1-\alpha)(1-\delta\phi^*)\sigma & \alpha(\delta-\eta+\kappa\sigma)+\eta & (1-\alpha)(\delta-\eta+\kappa\sigma) \\ 1-\alpha & -(1-\alpha) & -(1-\alpha)(1-\delta\phi)\sigma & -\alpha(1-\delta\phi^*)\sigma & (1-\alpha)(\delta-\eta+\kappa\sigma) & \alpha(\delta-\eta+\kappa\sigma)+\eta \end{bmatrix},$$

$$\Phi = \begin{bmatrix} \delta^{-1}\bar{q} & 0 & 0 & 0 & -\delta^{-1} & 0 & 0 & 0 \\ 0 & \delta^{-1}\bar{q} & 0 & 0 & 0 & -\delta^{-1} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1-\alpha & -(1-\alpha) & 0 & 0 & \delta^{-1}\alpha\kappa\sigma & \delta^{-1}(1-\alpha)\kappa\sigma \\ 0 & 0 & -(1-\alpha) & 1-\alpha & 0 & 0 & \delta^{-1}(1-\alpha)\kappa\sigma & \delta^{-1}\alpha\kappa\sigma \\ 0 & 0 & \alpha\sigma & (1-\alpha)\sigma & 0 & 0 & -\delta^{-1}\alpha\kappa\sigma^2 & -\delta^{-1}(1-\alpha)\kappa\sigma^2 \\ 0 & 0 & (1-\alpha)\sigma & \alpha\sigma & 0 & 0 & -\delta^{-1}(1-\alpha)\kappa\sigma^2 & -\delta^{-1}\alpha\kappa\sigma^2 \end{bmatrix}.$$

The equation system can be summarized by Eq. (19). The matrices are given by

$$\Psi = \begin{bmatrix} \mathbf{A} & \mathbf{B} \\ \mathbf{0} & \mathbf{C} \end{bmatrix},$$

where

$$\mathbf{A} = \begin{bmatrix} \delta^{-1} - \gamma & 0 & \delta^{-1}\phi\bar{q} & 0 \\ 0 & \delta^{-1} - \gamma^* & 0 & \delta^{-1}\phi^*\bar{q} \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}, \quad \mathbf{B} = \begin{bmatrix} 0 & 0 & -\delta^{-1}\bar{q} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\delta^{-1}\bar{q} & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \end{bmatrix},$$

$\mathbf{C} = \delta^{-1}$

$$\begin{bmatrix} 0 & 0 & 0 & 0 & \delta & 0 \\ 0 & 0 & 0 & 0 & 0 & \delta \\ (1-\alpha)\sigma^{-1} & -(1-\alpha)\sigma^{-1} & \alpha + (1-\alpha)\delta\phi & (1-\alpha)(1-\delta\phi^*) & (1-\alpha)(\delta-\eta)\sigma^{-1} - \alpha\kappa & -(1-\alpha)(\delta-\eta)\sigma^{-1} - (1-\alpha)\kappa \\ -(1-\alpha)\sigma^{-1} & (1-\alpha)\sigma^{-1} & (1-\alpha)(1-\delta\phi) & \alpha + (1-\alpha)\delta\phi^* & -(1-\alpha)(\delta-\eta)\sigma^{-1} - (1-\alpha)\kappa & (1-\alpha)(\delta-\eta)\sigma^{-1} - \alpha\kappa \\ -(1-\alpha) & 1-\alpha & -\alpha(1-\delta\phi)\sigma & -(1-\alpha)(1-\delta\phi^*)\sigma & \alpha(\delta-\eta+\kappa\sigma) + \eta & (1-\alpha)(\delta-\eta+\kappa\sigma) \\ 1-\alpha & -(1-\alpha) & -(1-\alpha)(1-\delta\phi)\sigma & -\alpha(1-\delta\phi^*)\sigma & (1-\alpha)(\delta-\eta+\kappa\sigma) & \alpha(\delta-\eta+\kappa\sigma) + \eta \end{bmatrix},$$

and

$$\Phi = \begin{bmatrix} \delta^{-1}\bar{q} & 0 & 0 & 0 & -\delta^{-1} & 0 & 0 & 0 \\ 0 & \delta^{-1}\bar{q} & 0 & 0 & 0 & -\delta^{-1} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1-\alpha & -(1-\alpha) & 0 & 0 & \delta^{-1}\alpha\kappa\sigma & \delta^{-1}(1-\alpha)\kappa\sigma \\ 0 & 0 & -(1-\alpha) & 1-\alpha & 0 & 0 & \delta^{-1}(1-\alpha)\kappa\sigma & \delta^{-1}\alpha\kappa\sigma \\ 0 & 0 & \alpha\sigma & (1-\alpha)\sigma & 0 & 0 & -\delta^{-1}\alpha\kappa\sigma^2 & -\delta^{-1}(1-\alpha)\kappa\sigma^2 \\ 0 & 0 & (1-\alpha)\sigma & \alpha\sigma & 0 & 0 & -\delta^{-1}(1-\alpha)\kappa\sigma^2 & -\delta^{-1}\alpha\kappa\sigma^2 \end{bmatrix}.$$

Recall that $\kappa \stackrel{\text{def}}{=} \frac{(1-\xi)(1-\delta\xi)}{\xi}\sigma^{-1}$, $\eta \stackrel{\text{def}}{=} (1+\delta\xi^2)/\xi$, hence

$$\kappa\sigma - \eta = \frac{1 - \xi - \delta\xi + \delta\xi^2}{\xi} - \frac{1 + \delta\xi^2}{\xi} = \frac{-\xi - \delta\xi}{\xi} = -1 - \delta,$$

Table A.1: Parameters

	Notation	Value
Discount rate	δ	0.99
Inverse of constant relative risk aversion	σ	0.50
Home bias	α	0.80
Chance of resetting price	$1-\xi$	0.10
Steady state government bond oustanding	$\bar{q}$	1.00
Home monetary policy	ϕ	1.80
Home fiscal policy	γ	0.00
Foreign monetary policy	ϕ^*	0.20
Foreign fiscal policy	γ^*	0.20
Home monetary policy shock persistence	ρ_1	0.85

that is, $\eta = 1 + \delta + \kappa\sigma$. Substitute η to obtain

$$\mathbf{C} = \delta^{-1}$$

$$\begin{bmatrix} 0 & 0 & 0 & 0 & \delta & 0 \\ 0 & 0 & 0 & 0 & 0 & \delta \\ (1-\alpha)\sigma^{-1} & -(1-\alpha)\sigma^{-1} & \alpha+(1-\alpha)\delta\phi & (1-\alpha)(1-\delta\phi^*) & -\sigma^{-1}[\kappa\sigma+(1-\alpha)] & \sigma^{-1}(1-\alpha) \\ -(1-\alpha)\sigma^{-1} & (1-\alpha)\sigma^{-1} & (1-\alpha)(1-\delta\phi) & \alpha+(1-\alpha)\delta\phi^* & \sigma^{-1}(1-\alpha) & -\sigma^{-1}[\kappa\sigma+(1-\alpha)] \\ -(1-\alpha) & 1-\alpha & -\alpha(1-\delta\phi)\sigma & -(1-\alpha)(1-\delta\phi^*)\sigma & (1-\alpha)+\delta+\kappa\sigma & -(1-\alpha) \\ 1-\alpha & -(1-\alpha) & -(1-\alpha)(1-\delta\phi)\sigma & -\alpha(1-\delta\phi^*)\sigma & -(1-\alpha) & (1-\alpha)+\delta+\kappa\sigma \end{bmatrix}.$$

The characteristic polynomial of Ψ is given by $\det(\Psi - \lambda I) = \det(\mathbf{A} - \lambda I)\det(\mathbf{C} - \lambda I)$. It is easy to see that $\det(\mathbf{A} - \lambda I)$ has roots $\delta^{-1} - \gamma$, $\delta^{-1} - \gamma^*$ and 0.

A.8 Model Calibration

The parameters of the open-economy model in Section 3 are shown in Table A.1. The closed-economy model shares the same parameters.

B Empirical Appendix

B.1 Empirical Specification

We use the standard local projection method (Jordà, 2005) to estimate the impulse responses to the U.S. monetary and fiscal shocks. The linear model is specified as

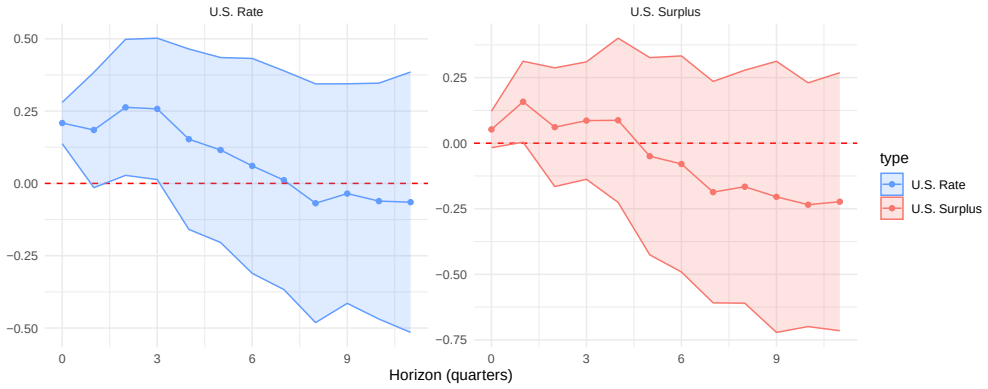
$$x_{t+h} = \alpha_h + \beta_h shock_t + \gamma_h \mathbf{z}_{t-1} + \varepsilon_{t+h}, \quad h = 0, 1, 2, \ldots,$$

where x is the variable of interest (monetary policy rate or government surplus/GDP ratio, both in percentage points), $\mathbf{z}$ is the vector of control variables, including the lagged real GDP growth rate, the lagged inflation rate, and the lagged variable of interest itself. The dependent and control variables pertain to the same country. For example, when we examine how the U.S. interest rate responds to a U.S.monetary or fiscal shock that hits in time t, the dependent variable is the U.S. interest rate in time $t + h$, and the control variables are the lagged U.S. real GDP growth rate, the lagged U.S. inflation rate, and the lagged U.S. interest rate in time $t - 1$. Our sample is quarterly.

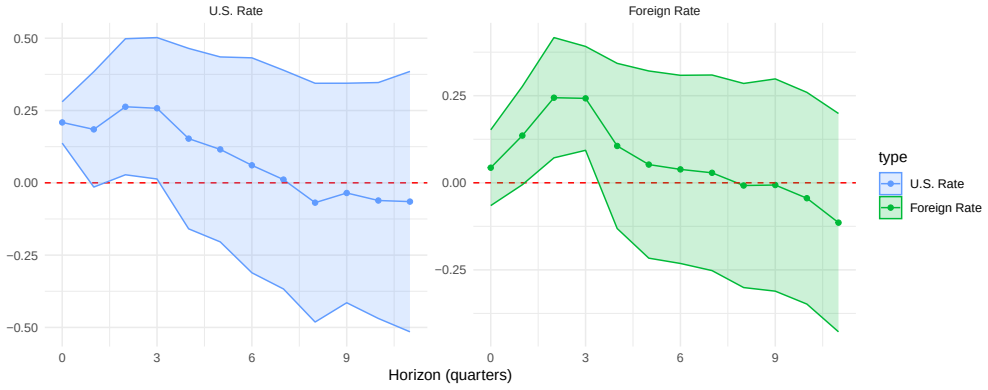
We use identified U.S. monetary shocks from Jarociński and Karadi (2020), which are split from the central bank information (CBI) component of the monetary surprises. We aggregate the monetary shocks to quarterly level. The identified fiscal shock is from Romer and Romer (2010) and extended by Jiang and Richmond (2023). We use the two categories of exogenous fiscal shocks (deficit-driven and long-run), which are not driven by concurrent economic conditions. Instead, the deficit-driven shocks are driven by the government's decision to increase tax and reduce the existing stock of public debt that they inherit from the previous government, while the long-run shocks correspond to situations in which the government thinks the economy is currently doing fine, and implements tax policies that improve efficiency, boost long-run growth, or pursue philosophical goals like a small government. The identified U.K. monetary shock is the Target factor from Braun et al. (2025). The ECB monetary shock is from Badinger and Schiman (2023). In the empirical test for ECB, the control variables correspond to the entire Eurozone area.

B.2 Additional Empirical Results

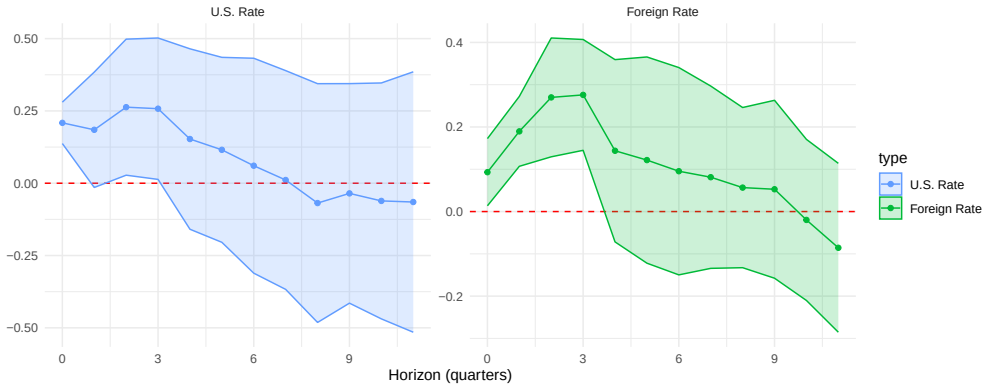
In Figure B.1, we repeat the our empirical exercises using the monetary shock instrument from Miranda-Agrippino and Ricco (2021), which are also cleansed of any influence of central bank information disclosure.



(a) Home Responses to U.S. Monetary Shock



(b) U.K. Responses to U.S. Monetary Shock

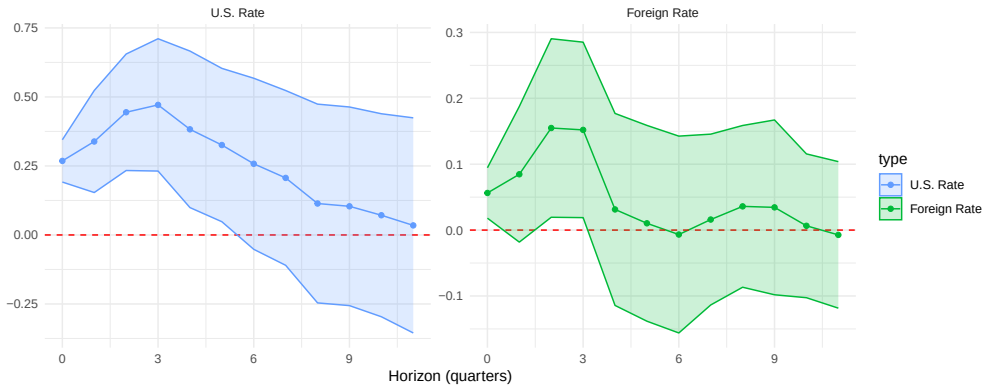


(c) ECB Responses to U.S. Monetary Shock

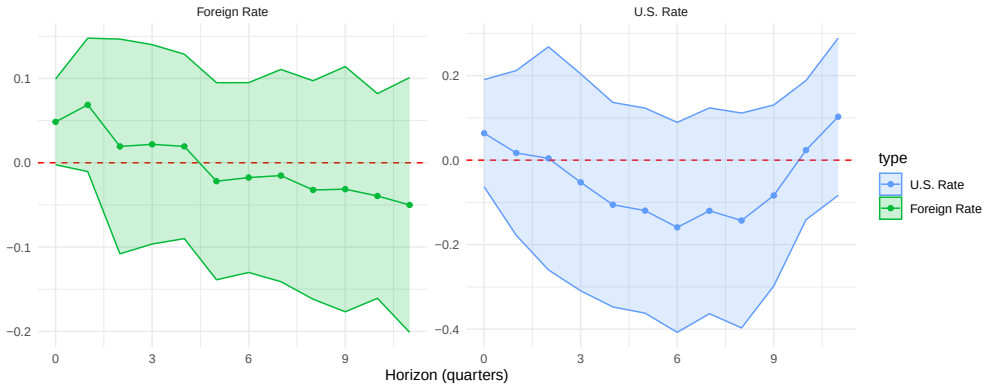
Figure B.1: Empirical Monetary and Fiscal Responses

Notes: Panel (a) plots the U.S. monetary and fiscal responses to U.S. monetary shocks identified by Miranda-Agrippino and Ricco (2021), 1991Q1 to 2009Q4. Panel (b) plots the foreign U.K. monetary response to U.S. monetary rule shocks identified by Miranda-Agrippino and Ricco (2021), 1991Q1 to 2009Q4. Panel (c) plots the ECB monetary responses to U.S. monetary shocks identified by Miranda-Agrippino and Ricco (2021), 1999Q1 to 2009Q4. We control for lagged GDP growth, inflation, and the policy variable itself. Shaded areas are 95% confidence intervals. All shocks are standardized to have unit variance.

Figure B.2 plots the ECB monetary responses to U.S. monetary shocks identified by Jarociński and Karadi (2020) and the U.S. monetary responses to ECB monetary shocks identified by Badinger and Schiman (2023), also confirming our main findings.



(a) ECB Responses to U.S. Monetary Shock



(b) U.S. Responses to ECB Monetary Shock

Figure B.2: Empirical International Monetary Responses: ECB

Notes: Panel (a) plots the ECB monetary response to U.S. monetary rule shocks identified by Jarociński and Karadi (2020), 1990Q1 to 2024Q1. Panel (b) plots the U.S. monetary response to ECB monetary rule shocks identified by Badinger and Schiman (2023), 2000Q1 to 2019Q4. We control for lagged GDP growth, inflation, and the policy variable itself. Shaded areas are 95% confidence intervals. All shocks are standardized to have unit variance.

SA. Supplemental Appendix

SA.1 Three-Country Case

Following the same steps in A.1, we obtain

$$P_t = \frac{1}{\alpha^\alpha \left(\frac{1-\alpha}{2}\right)^{1-\alpha}} P_{H,t}^{\alpha} P_{F^*,t}^{\frac{1-\alpha}{2}} P_{F^{**},t}^{\frac{1-\alpha}{2}}.$$

Households' first order condition .w.r.t labor and firm's optimal price setting rule is similar in A.1.

Hence,

$$\begin{aligned}
\frac{P_{H,t}}{P_{F^*,t}} &= \frac{1}{\exp(-\mathcal{E}_t^*)} \frac{\mathbb{E}_{t-1}[W_t/z_t]}{\mathbb{E}_{t-1}[W_t^*/z_t^*]} = \frac{P_t^* c_t^*}{P_t c_t} \frac{\mathbb{E}_{t-1}[P_t c_t/z_t]}{\mathbb{E}_{t-1}[P_t^* c_t^*/z_t^*]}, \\
\frac{P_{H,t}}{P_{F^{**},t}} &= \frac{1}{\exp(-\mathcal{E}_t^{**})} \frac{\mathbb{E}_{t-1}[W_t/z_t]}{\mathbb{E}_{t-1}[W_t^{**}/z_t^{**}]} = \frac{P_t^{**} c_t^{**}}{P_t c_t} \frac{\mathbb{E}_{t-1}[P_t c_t/z_t]}{\mathbb{E}_{t-1}[P_t^{**} c_t^{**}/z_t^{**}]}.
\end{aligned}$$

Plug into P_t to obtain

$$\begin{aligned}
P_t &= \frac{1}{\alpha^\alpha \left(\frac{1-\alpha}{2}\right)^{1-\alpha}} P_{H,t} \left(\frac{P_t^* c_t^*}{P_t c_t} \frac{\mathbb{E}_{t-1}[P_t c_t/z_t]}{\mathbb{E}_{t-1}[P_t^* c_t^*/z_t^*]}\right)^{-\frac{1-\alpha}{2}} \left(\frac{P_t^{**} c_t^{**}}{P_t c_t} \frac{\mathbb{E}_{t-1}[P_t c_t/z_t]}{\mathbb{E}_{t-1}[P_t^{**} c_t^{**}/z_t^{**}]}\right)^{-\frac{1-\alpha}{2}} \\
&= \bar{\ell}^{-1} \frac{1}{\alpha^\alpha \left(\frac{1-\alpha}{2}\right)^{1-\alpha}} \frac{(\mathbb{E}_{t-1}[P_t c_t/z_t])^\alpha (\mathbb{E}_{t-1}[P_t^* c_t^*/z_t^*])^{\frac{1-\alpha}{2}} (\mathbb{E}_{t-1}[P_t^{**} c_t^{**}/z_t^{**}])^{\frac{1-\alpha}{2}}}{(P_t^* c_t^*)^{\frac{1-\alpha}{2}} (P_t^{**} c_t^{**})^{\frac{1-\alpha}{2}}} (P_t c_t)^{1-\alpha}.
\end{aligned}$$

Multiply both sides by c_t and rearrange the equation to get

$$c_t = \bar{\ell} \alpha^\alpha \left(\frac{1-\alpha}{2}\right)^{1-\alpha} \frac{(P_t c_t)^\alpha (P_t^* c_t^*)^{\frac{1-\alpha}{2}} (P_t^{**} c_t^{**})^{\frac{1-\alpha}{2}}}{(\mathbb{E}_{t-1}[P_t c_t/z_t])^\alpha (\mathbb{E}_{t-1}[P_t^* c_t^*/z_t^*])^{\frac{1-\alpha}{2}} (\mathbb{E}_{t-1}[P_t^{**} c_t^{**}/z_t^{**}])^{\frac{1-\alpha}{2}}},$$

i.e.,

$$\log c_t = \kappa_{t-1}^c + \alpha \log(P_t c_t) + \frac{1-\alpha}{2} \log(P_t^* c_t^*) + \frac{1-\alpha}{2} \log(P_t^{**} c_t^{**}).$$

The intertemporal government budget constraints have the same expression in A.1. Substituting P_t terms by $\bar{Q}/(s_t + c_t A)$ to obtain the equation system.[8]

SA.2 Derivation of the Two-Country Calvo Model

We preserve the assumptions of Calvo pricing and producer currency pricing: in each period, only a fraction $(1-\xi)$ of firms can reset their prices. Firms set the price in their own currency and the law of one price holds (PCP). Denote the log nominal exchange rate as $\mathcal{E}_t$. Following A.1, we obtain the price aggregation rule

$$
\begin{aligned}
P_{H,t} &= \left(\int_0^1 P_{H,t}(j)^{1-\rho} dj \right)^{1/(1-\rho)}, \\
P^*_{F,t} &= \left(\int_0^1 P^*_{F,t}(j)^{1-\rho} dj \right)^{1/(1-\rho)}, \\
P_t &= \frac{1}{\alpha^\alpha (1-\alpha)^{1-\alpha}} P_{H,t}^{\alpha} (P^*_{F,t})^{1-\alpha} \exp(-(1-\alpha)\mathcal{E}_t), \\
P^*_t &= \frac{1}{\alpha^\alpha (1-\alpha)^{1-\alpha}} (P^*_{F,t})^{\alpha} P_{H,t}^{1-\alpha} \exp((1-\alpha)\mathcal{E}_t).
\end{aligned}
$$

Law of one price implies $P^*_{H,t}(j) = \exp(\mathcal{E}_t) P_{H,t}(j)$, $P^*_{F,t}(j) = \exp(\mathcal{E}_t) P_{F,t}(j)$, i.e.,

$$
\frac{P_{H,t}(j)}{P_{H,t}} = \frac{P^*_{H,t}(j)}{P^*_{H,t}}, \quad \frac{P_{F,t}(j)}{P_{F,t}} = \frac{P^*_{F,t}(j)}{P^*_{F,t}}.
$$

Denote the home aggregate purchase (i.e., households' consumption plus government purchase) of home and foreign intermediate good as $y_{H,t}$ and $y_{F,t}$. The demand curves for home intermediate goods are given by

$$
\begin{aligned}
y_{H,t}(j) &= y_{H,t} \left(\frac{P_{H,t}(j)}{P_{H,t}} \right)^{-\rho}, \\
y^*_{H,t}(j) &= y^*_{H,t} \left(\frac{P_{H,t}(j)}{P_{H,t}} \right)^{-\rho}.
\end{aligned}
$$

[8] For notational simplicity, we redefine κ^c_{t-1} by adding an extra constant $\log \bar{Q}$.

Firms take the aggregate demand for home goods $y_{H,t}$ and $y^*_{H,t}$ as given. Home firms that get the change to reset their price at time t maximize the discounted profit over the course of this price contract, i.e.,

$$\max_{P^{\#}_{H,t}} \quad \mathbb{E}_t \left[\sum_{k=0}^{\infty} (\delta\xi)^k \frac{P_t}{P_{t+k}} \left(\frac{c_{t+k}}{c_t} \right)^{-\sigma^{-1}} \left((y_{H,t+k} + y^*_{H,t+k}) P^{\rho}_{H,t+k} (P^{\#}_{H,t})^{1-\rho} - C_H((y_{H,t+k} + y^*_{H,t+k}) P^{\rho}_{H,t+k} (P^{\#}_{H,t})^{-\rho}) \right) \right],$$

where $C_H(.)$ is the nominal cost function and $\delta^{t+k} \frac{P_t}{P_{t+k}} \left(\frac{c_{t+k}}{c_t} \right)^{-\sigma^{-1}}$ is the nominal stochastic discount factor. The first order condition is

$$\mathbb{E}_t \left[\sum_{k=0}^{\infty} (\delta\xi)^k \frac{P_t}{P_{t+k}} \left(\frac{c_{t+k}}{c_t} \right)^{-\sigma^{-1}} \left((1-\rho)(y_{H,t+k} + y^*_{H,t+k}) P^{\rho}_{H,t+k} (P^{\#}_{H,t})^{-\rho} + \rho MC_{H,t+k} (y_{H,t+k} + y^*_{H,t+k}) P^{\rho}_{H,t+k} (P^{\#}_{H,t})^{-\rho-1} \right) \right] = 0,$$

i.e.,

$$P^{\#}_{H,t} = \frac{\rho}{\rho - 1} \frac{\mathbb{E}_t \left[\sum_{k=0}^{\infty} (\delta\xi)^k \frac{P_t}{P_{t+k}} \left(\frac{c_{t+k}}{c_t} \right)^{-\sigma^{-1}} (y_{H,t+k} + y^*_{H,t+k}) P^{\rho}_{H,t+k} MC_{H,t+k} \right]}{\mathbb{E}_t \left[\sum_{k=0}^{\infty} (\delta\xi)^k \frac{P_t}{P_{t+k}} \left(\frac{c_{t+k}}{c_t} \right)^{-\sigma^{-1}} (y_{H,t+k} + y^*_{H,t+k}) P^{\rho}_{H,t+k} \right]}.$$

Log-linearize the first order condition to obtain

$$\hat{P}^{\#}_{H,t} = (1 - \delta\xi) \sum_{k=0}^{\infty} (\delta\xi)^k \mathbb{E}_t [\log \widehat{MC}_{H,t+k}],$$

which can be restated as

$$\hat{P}^{\#}_{H,t} = (1 - \delta\xi) \log \widehat{MC}_{H,t} + \delta\xi \mathbb{E}_t [\hat{P}^{\#}_{H,t+1}].$$

Similarly,

$$\hat{P}^{*\#}_{F,t} = (1 - \delta\xi) \log \widehat{MC}^{*}_{F,t} + \delta\xi \mathbb{E}_t [\hat{P}^{*\#}_{F,t+1}].$$

The aggregate price of intermediate goods follow

$$\hat{P}_{H,t} = (1-\xi)\hat{P}^{\#}_{H,t} + \xi \hat{P}_{H,t-1},$$
$$\hat{P}^{*}_{F,t} = (1-\xi)\hat{P}^{*\#}_{F,t} + \xi \hat{P}^{*}_{F,t-1},$$

which jointly imply

$$\hat{\pi}_{H,t} = \delta \mathbb{E}_t[\hat{\pi}_{H,t+1}] + \frac{(1-\xi)(1-\delta\xi)}{\xi}(\log \widehat{MC}_{H,t} - \log \hat{P}_{H,t}),$$
$$\hat{\pi}^{*}_{F,t} = \delta \mathbb{E}_t[\hat{\pi}^{*}_{F,t+1}] + \frac{(1-\xi)(1-\delta\xi)}{\xi}(\log \widehat{MC}^{*}_{F,t} - \log \hat{P}^{*}_{F,t}),$$

where $\hat{\pi}_{H,t} := \log \hat{P}_{H,t} - \log \hat{P}_{H,t-1}$, $\hat{\pi}^{*}_{F,t} := \log \hat{P}^{*}_{F,t} - \log \hat{P}^{*}_{F,t-1}$.

SA.3 Algebraic Solution of Monetary Dominance in Closed Economy

From Proposition 4, the expected inflation and consumption satisfy

$$\begin{bmatrix} \mathbb{E}_t[\hat{\pi}_{t+1}] \\ \mathbb{E}_t[\log \hat{c}_{t+1}] \end{bmatrix} = \begin{bmatrix} \delta^{-1} & -\delta^{-1}\kappa \\ \sigma(\phi - \delta^{-1}) & 1 + \sigma\delta^{-1}\kappa \end{bmatrix} \begin{bmatrix} \hat{\pi}_t \\ \log \hat{c}_t \end{bmatrix} + \begin{bmatrix} 0 \\ \sigma\theta_t \end{bmatrix}.$$

Diagnolize the transition matrix to obtain

$$\begin{bmatrix} \mathbb{E}_t[\hat{\pi}_{t+1}] \\ \mathbb{E}_t[\log \hat{c}_{t+1}] \end{bmatrix} = V \begin{bmatrix} \lambda_4 & 0 \\ 0 & \lambda_3 \end{bmatrix} V^{-1} \begin{bmatrix} \hat{\pi}_t \\ \log \hat{c}_t \end{bmatrix} + \begin{bmatrix} 0 \\ \sigma\theta_t \end{bmatrix},$$

i.e.,

$$V^{-1} \begin{bmatrix} \mathbb{E}_t[\hat{\pi}_{t+1}] \\ \mathbb{E}_t[\log \hat{c}_{t+1}] \end{bmatrix} = \begin{bmatrix} \lambda_4 & 0 \\ 0 & \lambda_3 \end{bmatrix} V^{-1} \begin{bmatrix} \hat{\pi}_t \\ \log \hat{c}_t \end{bmatrix} + V^{-1} \begin{bmatrix} 0 \\ \sigma\theta_t \end{bmatrix}.$$

Let

$$\begin{bmatrix} \check{\pi}_t \\ \log \check{c}_t \end{bmatrix} := V^{-1} \begin{bmatrix} \hat{\pi}_t \\ \log \hat{c}_t \end{bmatrix}, \quad \begin{bmatrix} \check{\theta}^{\pi}_t \\ \check{\theta}^{c}_t \end{bmatrix} := V^{-1} \begin{bmatrix} 0 \\ \sigma\theta_t \end{bmatrix},$$

We obtain

$$\begin{bmatrix} \mathbb{E}_t[\check{\pi}_{t+1}] \\ \mathbb{E}_t[\log \check{c}_{t+1}] \end{bmatrix} = \begin{bmatrix} \lambda_4 & 0 \\ 0 & \lambda_3 \end{bmatrix} \begin{bmatrix} \check{\pi}_t \\ \log \check{c}_t \end{bmatrix} + \begin{bmatrix} \check{\theta}^{\pi}_t \\ \check{\theta}^{c}_t \end{bmatrix},$$

which implies

$$\begin{bmatrix} \mathbb{E}_t[\check{\pi}_{t+2}] \\ \mathbb{E}_t[\log \check{c}_{t+2}] \end{bmatrix} = \begin{bmatrix} \lambda_4^2 & 0 \\ 0 & \lambda_3^2 \end{bmatrix} \begin{bmatrix} \check{\pi}_t \\ \log \check{c}_t \end{bmatrix} + \begin{bmatrix} \mathbb{E}_t[\check{\theta}^{\pi}_{t+1}] \\ \mathbb{E}_t[\check{\theta}^{c}_{t+1}] \end{bmatrix} + \begin{bmatrix} \lambda_4 & 0 \\ 0 & \lambda_3 \end{bmatrix} \begin{bmatrix} \check{\theta}^{\pi}_t \\ \check{\theta}^{c}_t \end{bmatrix},$$

where

$$\begin{bmatrix} \mathbb{E}_t[\check{\theta}^{\pi}_{t+1}] \\ \mathbb{E}_t[\check{\theta}^{c}_{t+1}] \end{bmatrix} = \rho_1 \begin{bmatrix} \check{\theta}^{\pi}_t \\ \check{\theta}^{c}_t \end{bmatrix}$$

hence

$$\begin{aligned} \begin{bmatrix} \mathbb{E}_t[\check{\pi}_{t+k}] \\ \mathbb{E}_t[\log \check{c}_{t+k}] \end{bmatrix} &= \begin{bmatrix} \lambda_4^k & 0 \\ 0 & \lambda_3^k \end{bmatrix} \begin{bmatrix} \check{\pi}_t \\ \log \check{c}_t \end{bmatrix} + \rho_1^{k-1} \sum_{j=0}^{k-1} \left(\frac{1}{\rho_1}\right)^j \begin{bmatrix} \lambda_4^j & 0 \\ 0 & \lambda_3^j \end{bmatrix} \begin{bmatrix} \check{\theta}^{\pi}_t \\ \check{\theta}^{c}_t \end{bmatrix} \\ &= \begin{bmatrix} \lambda_4^k & 0 \\ 0 & \lambda_3^k \end{bmatrix} \begin{bmatrix} \check{\pi}_t \\ \log \check{c}_t \end{bmatrix} + \rho_1^{k-1} \begin{bmatrix} \frac{1-\left(\frac{\lambda_4}{\rho_1}\right)^k}{1-\frac{\lambda_4}{\rho_1}} & 0 \\ 0 & \frac{1-\left(\frac{\lambda_3}{\rho_1}\right)^k}{1-\frac{\lambda_3}{\rho_1}} \end{bmatrix} \begin{bmatrix} \check{\theta}^{\pi}_t \\ \check{\theta}^{c}_t \end{bmatrix} \\ &= \begin{bmatrix} \lambda_4^k & 0 \\ 0 & \lambda_3^k \end{bmatrix} \begin{bmatrix} \check{\pi}_t \\ \log \check{c}_t \end{bmatrix} + \begin{bmatrix} \frac{\rho_1^k-\lambda_4^k}{\rho_1-\lambda_4} & 0 \\ 0 & \frac{\rho_1^k-\lambda_3^k}{\rho_1-\lambda_3} \end{bmatrix} \begin{bmatrix} \check{\theta}^{\pi}_t \\ \check{\theta}^{c}_t \end{bmatrix}. \end{aligned}$$

We require that expected consumption and inflation do not explode exponentially, hence

$$\begin{bmatrix} \check{\pi}_t \\ \log \check{c}_t \end{bmatrix} = \begin{bmatrix} \frac{1}{\rho_1 - \lambda_4} & 0 \\ 0 & \frac{1}{\rho_1 - \lambda_3} \end{bmatrix} \begin{bmatrix} \check{\theta}_t^{\pi} \\ \check{\theta}_t^{c} \end{bmatrix}.$$

Multiply both sides by V to recover $\hat{\pi}_t$ and $\log \hat{c}_t$, i.e.,

$$\begin{bmatrix} \hat{\pi}_t \\ \log \hat{c}_t \end{bmatrix} = V \begin{bmatrix} \frac{1}{\rho_1 - \lambda_4} & 0 \\ 0 & \frac{1}{\rho_1 - \lambda_3} \end{bmatrix} V^{-1} \begin{bmatrix} 0 \\ \sigma\theta_t \end{bmatrix},$$

which simplifies to

$$\begin{aligned} \hat{\pi}_t &= -\frac{\kappa\sigma}{1 + \kappa\phi\sigma - \rho_1(1 + \delta - \delta\rho_1 + \kappa\sigma)}\theta_t, \\ \log \hat{c}_t &= -\frac{(1 - \delta\rho_1)\sigma}{1 + \kappa\phi\sigma - \rho_1(1 + \delta - \delta\rho_1 + \kappa\sigma)}\theta_t. \end{aligned}$$

The nominal rate is given by

$$\hat{i}_t = \phi\hat{\pi}_t + \theta_t = \frac{1 - \rho_1(1 + \delta - \delta\rho_1 + \kappa\sigma)}{1 + \kappa\phi\sigma - \rho_1(1 + \delta - \delta\rho_1 + \kappa\sigma)}\theta_t.$$

According to the NKPC, the expected inflation is given by

$$\mathbb{E}_t[\hat{\pi}_{t+1}] = \delta^{-1}\hat{\pi}_t - \delta^{-1}\kappa \log \hat{c}_t = -\frac{\kappa\sigma\rho_1}{1 + \kappa\phi\sigma - \rho_1(1 + \delta - \delta\rho_1 + \kappa\sigma)}\theta_t,$$

and the real rate is

$$\hat{r}_t = \hat{i}_t - \mathbb{E}_t[\hat{\pi}_{t+1}] = \frac{(1 - \rho_1)(1 - \rho_1\delta)}{1 + \kappa\phi\sigma - \rho_1(1 + \delta - \delta\rho_1 + \kappa\sigma)}\theta_t.$$

Real government can be solved "backwardly" from the stable difference equation

$$\hat{b}_t = (\delta^{-1} - \gamma)\hat{b}_{t-1} - \delta^{-1}\bar{q}(\hat{\pi}_t - \hat{i}_{t-1}) - \delta^{-1}\psi_t,$$

and the real surplus is pinned down by fiscal policy

$$\hat{s}_t = \gamma\hat{b}_{t-1} + \psi_t.$$

SA.4 Alternative Specification

We consider the alternative foreign monetary policy rule with direct response to exchange rate, i.e.,

$$i_t^* = \phi_0^* + \phi^*\pi_t + \chi^e e_t + \theta_t^*,$$

where we calibrate $\chi^e = -2$. In this case, the foreign monetary authority lowers the nominal interest rate when the dollar appreciates. Other parameters are inherited from Table A.1. The impulse responses are shown in Figure SA.1.

In this specification, we obtain qualitatively identical results as in the baseline setting: when the home country lowers the nominal interest rate i without changing its government surplus s, the foreign nominal interest rate i^* also declines while the foreign government surplus s^* decreases. The real rates r and r^* decrease in both countries, the dollar strengthens in real terms, and the consumption c and c^* increase in both countries. Moreover, inflation π goes down in the home country and π^* up in the foreign country.

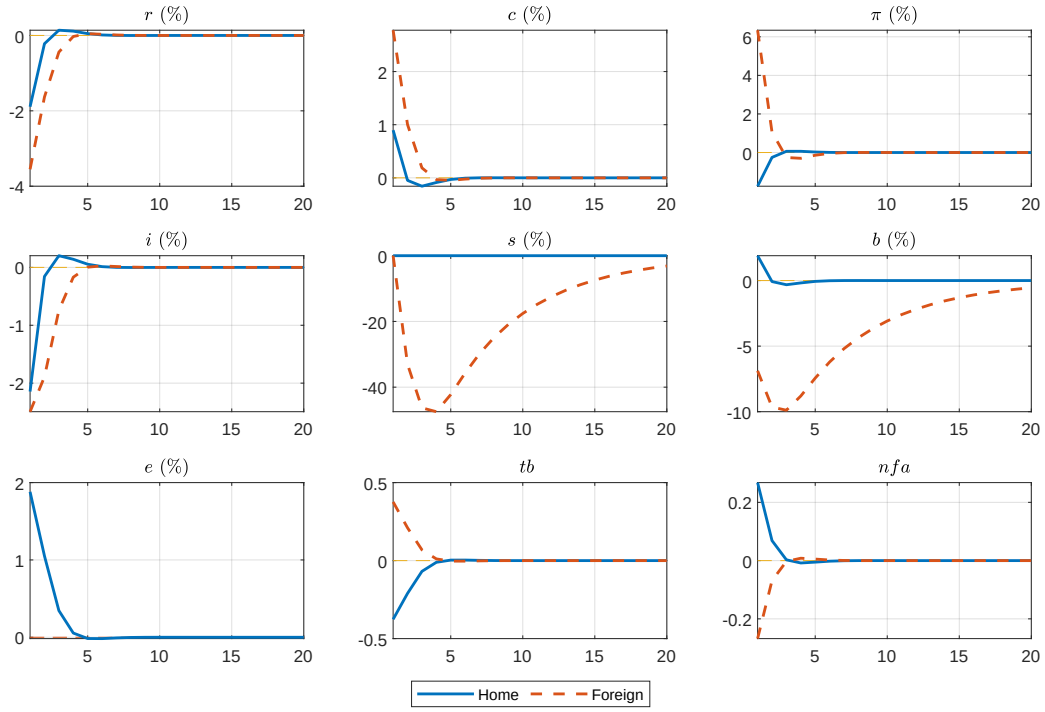


Figure SA.1: Impulse Responses to a Monetary Shock in the Open Economy under Hegemon Dominance: Alternative Specification.

Note: We plot the impulse responses to a monetary shock θ_t in the open economy under hegemon dominance. The solid blue curve represents the home country, and the dashed red curve represents the foreign country. The outcome variables include the nominal interest rate i_t, surplus s_t, debt level b_t, consumption c_t, inflation π_t, and real rate r_t in both countries, and the real exchange rate e_t.