# Monetary policy and exchange rate regimes under dominant currency paradigm

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January 31, 2024

*(Preliminary draft)*

**Abstract**

This paper revisits the traditional Taylor rule for the monetary policy under the dominant currency paradigm. Starting from empirical evidence for open economies, it proposes a new hybrid monetary rule able to characterize regimes with different degrees of monetary autonomy. We integrate it into the theoretical framework of Gopinath et al. (2020) and seek to identify an optimal degree of monetary autonomy / exchange rate flexibility that ensures the best stabilization of national variables in the case of adverse foreign monetary shocks. Contrary to the traditional trilemma, we find that this optimal situation corresponds to an intermediate regime with "partial" central bank autonomy and "managed" exchange rate. The adoption of such a regime can explain the high sensitivity of many countries' interest rates to the US rates.

*JEL classification*: F02, F37

*Keywords*: Monetary autonomy, exchange rate regimes, revisited Taylor rule, dominant currency paradigm.

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# 1. Introduction

With the rise of digitalization and crypto-currencies, the increasing volume of international capital flows poses new challenges. Addressing the impact of these expanding international flows on the exchange rate, monetary policy, and the real economy requires careful consideration and thoughtful policy design.

While the traditional models suggest that a flexible regime provides monetary policy autonomy, the broad adoption of intermediate exchange rate regimes, called "soft pegs," challenges this perspective by introducing a middle-ground equilibrium with managed exchange rates, controlled integration, and partial monetary autonomy. For instance, in the case of an open economy with a fixed exchange rate regime, capital controls can help regain monetary autonomy, as demonstrated by Farhi and Werning (2012) and Schmitt-Grohé and Uribe (2012). The recent Dominant Currency Paradigm (DCP) suggests, nevertheless, that the monetary policy of open economies is driven by the policy of a dominant currency issuer, such as the Fed (US dollar) and the ECB (Euro) (Casas et al., 2016; Gopinath et al., 2020; Georgiadis et al., 2021). This could lead to a dilemma rather than a trilemma, as argued by Rey (2015). Indeed, if countries' trade, debt, and financial transactions are denominated in a dominant currency (US dollar, euro), they become more dependent on the monetary policy of the dominant issuer. This dependence may be detrimental for (large and small) non-dominant countries in times of biding uncertainty/crisis (i.e., the COVID-19 crisis), as the depreciation of their currency vis-à-vis the dominant currency can negatively impact their economy and increase their vulnerability to global shocks. Consequently, central banks may have incentives when designing their monetary policy to adopt an exchange rate stability target besides the traditional inflation and output stabilization objectives.

Against this background, this paper explores the Trilemma perspectives in a New Keynesian Dynamic and Stochastic General Equilibrium framework that incorporates the dominant currency paradigm. We aim to identify the optimal degree of monetary autonomy needed to stabilize national variables during adverse foreign shocks. To achieve this, we develop an alternative model for the middle-ground equilibrium framework. Specifically, we introduce an augmented Taylor rule (Mohanty and Klau, 2004; Levieuge, 2006) into the Trilemma perspective to characterize the middle-ground regimes. Further, we integrate the rule into the theoretical DCP framework of Gopinath et al. (2020). In our modeling setting, we obtain an optimal solution that supposes a middle-ground regime with "partial" central bank autonomy and a "managed" exchange rate, which differs from the traditional Trilemma's outcomes. Nonetheless, this optimal degree of monetary autonomy depends on the model's structural parameters. This implies that each country has its own optimal "intermediate" monetary and exchange rate regime, which justifies domestic interest rates' sensitivity to US federal rates, as put forward in the previous empirical literature.

Thus, our contribution to the literature is twofold. First, we propose a new augmented Taylor rule for the monetary policy in open economies that allows intermediate regimes. The latter were not sufficiently present in the Trilemma framework. Second, by implementing this rule in a simple theoretical DSGE model including DCP (Gopinath et al., 2020), we show how this rule can be used to determine the optimal degree of monetary autonomy for a given country, depending on its structural features.

The rest of the paper is structured as follows. Section 2 summarizes the main findings of the theoretical literature related to the dominant currency paradigm. Section 3 introduces a modified Taylor rule able to identify intermediate monetary regimes. Section 4 elaborates on the remaining components of the modeling framework. In Section 5, we detail the calibrations and present the main results. Section 6 provides a robustness analysis by considering interest rate inertia in the monetary rule. The last section concludes and suggests perspectives for further research.

## 2. Literature review

The increase in financial integration across countries has led to more volatility in cross-border capital flows and sudden-stop crises. This has spurred discussions about the effectiveness of exchange rate policies, monetary policy autonomy, and capital controls' relevance. The literature has extensively examined the nexus between monetary autonomy and exchange rate regimes in open economies. Several theoretical modeling approaches have been developed, but their predictions remain mixed.

Farhi and Werning (2012) and Schmitt-Grohé and Uribe (2012) suggest that implementing capital controls can be effective in restoring monetary control in fixed exchange rate regimes while, in flexible exchange rate regimes, as monetary policy is or can be considered autonomous, there is no need to limit international capital mobility. Nevertheless, Devereux and Yetman (2014) argues that capital controls can isolate countries from external shocks, enabling natural interest rates to vary across economies and maintaining the autonomy of monetary policy in a flexible exchange rate regime. The author reveals that shocks leading to a liquidity trap can spread through financial markets to other countries, regardless of their exchange rate regime. Davis and Presno (2017) address this in a dynamic general equilibrium model where nominal rigidities and credit frictions give rise to welfare-reducing distortions. They acknowledge that capital controls can help restore monetary autonomy under a flexible exchange rate regime, allowing central banks to focus less on the foreign interest rate and continue to pursue their objectives.

The recent and emerging literature on US dollar hegemony has shed new light on the drivers of spillovers and their impact on exchange rate policies and monetary autonomy. Several scholars document that the prominence of the US dollar affects the transmission of various shocks to local economies, the choice of exchange rate regime, monetary policies, the exposure to global financial shocks, and the global stability of the international financial system (Gopinath, 2015; Casas et al., 2016; Gopinath, 2017; Gourinchas, 2021; Georgiadis and Schumann, 2019; Egorov and Mukhin, 2019). **?** reveals that the dollar's dominance in financial transactions and trade invoicing amplifies the spillovers of US monetary policy, suggesting that the flexible exchange rate regime is not as effective under the Dominant Currency Paradigm (DCP) as in the Mundell-Flemming model. Mccauley et al. (2015) and Ito and McCauley (2019) find that the higher the extent of export invoicing in the US dollar, the higher the co-movement of the local currency with the dollar, and the higher the economy's dollar share of official reserves. As a result, economies in DCP tend to achieve less macro stabilization and experience larger movements in their exchange rate. While remaining optimal, inflation targeting loses its effectiveness and does not achieve efficient external adjustment. Using a 3-country New Keynesian Dynamic Stochastic General Equilibrium (NK DSGE) model, Casas et al. (2016) shows that the inflation-output trade-off in response to a monetary policy shock is seriously impaired under DCP compared to the usual case of Producer-Currency Pricing (PCP). The output gap fluctuates with shocks, and this gap increases with the economy's openness. Monetary policy shocks in the dominant currency country also have strong spillovers to the rest of the world, while the converse is not true: the dominant currency country is largely insulated from the inflationary consequences of fluctuations in its currency, which are absorbed instead into prices and trade in the rest of the world. Egorov and Mukhin (2019) introduce the DCP in the context of an open economy model with nominal rigidities and input-output linkages between firms. They point out that optimal cooperative policy generates gains for non-U.S. countries but losses for the U.S. In light of the findings of Farhi and Werning (2016), Egorov and Mukhin (2019) show that capital controls cannot insulate countries from foreign spillovers. In this context, inflation targeting remains optimal for non-US economies. However, it induces a "leaning against the wind" policy and leads the countries to defend a partial peg to the dollar. In the same context, Georgiadis and Mösle (2019) conduct a novel study with ECB's macroeconomic model for the global economy. They incorporate the "Dominant Currency Pricing" (DCP) into the ECB's macroeconomic model for the global economy (ECB-Global). Their findings are consistent with those of the existing literature.

Gopinath et al. (2020) propose an intuitive 3-country open economy DSGE model and compare domestic and foreign (dominant country) monetary shock transmission under the three main currency pricing scenarios: Dominant Currency Pricing (DCP), Producer-Currency Pricing (PCP), and Local-Currency Pricing (LCP). In line with Casas et al. (2016), they show that the inflation-output trade-off in response to monetary policy shocks worsens under DCP compared to PCP. Moreover, the monetary policy shocks in the dominant currency country have strong international spillovers and a strong impact on global trade. On the contrary, monetary policy shocks in a non-dominant currency country induce only weak spillovers and have a limited impact on world trade.

We extend the Gopinath et al. (2020) DCP analysis to understand how the currency pricing scenario affects the traditional Trilemma for non-dominant economies. The research question we aim to answer to is the following: what would be the best monetary/exchange rate regimes to ensure macroeconomic stability in non-dominant economies?

We thus develop a theoretical framework for the analysis of intermediate monetary/exchange rate regimes in open economies.

# 3. A revisited monetary rule for non-dominant open economies

In this section, a novel monetary policy rule designed for non-dominant economies is introduced based on the traditional Taylor rule. First proposed by (Taylor, 1993), the standard Taylor rule suggests that an independent monetary policy plays a crucial role in stabilizing domestic inflation and output:

$$i_t = i^* + \phi_M(\pi_t - \pi^*) + \phi_Y \tilde{y}_t, \tag{1}$$

where $i^*$ is the natural (long-run equilibrium) nominal interest rate. $\pi_t$ denotes current domestic inflation and $\pi^*$ the central bank's inflation target. $\tilde{y}_t$ defines the domestic output gap. $\phi_M$ and $\phi_Y$ are the stabilizing coefficients of the monetary policy and the output gap, respectively, with $\phi_M > 1$ and $\phi_Y > 0$. The rule indicates that policymakers set and adjust their policy rate only in response to output and inflation gaps. However, the empirical literature provides compelling evidence indicating that foreign monetary policy exerts a substantial influence on domestic interest rates. Moreover, it suggests that effective management of the exchange rate can serve as a protective measure against external shocks. Ball (1999), Svensson (2000), Gerlach and Smets (2000), and Levieuge (2006) argue that monetary authorities in an open economy do not have a neutral stance towards exchange rate. These authors posit that the optimal monetary instrument should be defined as a combination of interest rate and exchange rate rather than relying solely on the interest rate. Hence, the Taylor rule has been revised to include the exchange rate (or exchange rate dynamics). This led to the introduction of Monetary Conditions Index (MCI)-Ball-based rules (Levieuge, 2006) which includes the exchange rate dynamic:[1]

$$i_t = i^* + \phi_M(\pi_t - \pi^*) + \phi_Y \tilde{y}_t + \phi_s \Delta\xi_{FH,t}$$

where $0 \leq \rho_m < 1$ is the interest rate smoothing coefficient. $\xi_{FH}$ measures domestic currency per unit of foreign currency. From an empirical point of view, this second form of the Taylor rule appears to be more realistic. It illustrates the potential combinations of stabilizing domestic variables and utilizing the exchange rate channel.

As shown in the literature (WE NEED TO ADD REF), financial integration and the global value chain have created a system of interdependence between countries. Moreover, the recent crises (i.e., GFC, COVID-19, and post-COVID crisis) confirm that policymakers react to foreign and domestic variables. Indeed, several studies document that the interest rate in non-dominant economies is influenced by foreign (dominant) monetary policy (Hofmann and Takats, 2015; Han and Wei, 2018; Georgiadis and Zhu, 2019). Against this background, we propose a new look at the monetary policy rule specification.

The UIP condition suggests that the exchange rate dynamics are driven by capital flow move-

[1] An interest rate smoothing coefficient is also often integrated to the rule to describe the inertia in the monetary policy decision-making process: $i_t = \rho_m(i_{t-1}) + (1-\rho_m)[i^* + \phi_M(\pi_t - \pi^*) + \phi_Y \tilde{y}_t + \phi_s \Delta\xi_{FH,t}]$

ments and international interest rate differentials. Following this, we define the basic monetary policy rule as:[2]

$$i_{H,t} = \rho_{mD} i_{D,t} + (1 - \rho_{mD})[i^* + \phi_M(\pi_{H,t} - \pi^*_H) + \phi_Y \tilde{y}_{H,t}] \tag{2}$$

where H denotes the home (non-dominant) country and D is the dominant currency country. $0 \leq \rho_{mD} \leq 1$ measures the sensitivity of the domestic interest rate to the dominant's monetary policy ($i_{D,t}$). $\rho_{mD}$ represents the degree of monetary dependence on the dominant country. Depending on the value of $\rho_{mD}$, the monetary policy rule as described in equation 2 identifies the different monetary/exchange rate regimes:

- if $\rho_{mD} = 1$, equation 2 becomes $i_{H,t} = i_{D,t}$. This case refers to the UIP condition for a fixed exchange rate. As suggested in the Mundell-Fleming model, an open economy in a fixed exchange rate regime has to forgo its monetary autonomy.
- if $\rho_{mD} = 0$, then the domestic interest rate in the non-dominant country depends only on national variables. This case corresponds to the flexible exchange rate regime's configuration in the Mundell-Fleming model. The exchange rate is flexible and adjusts to the interest rates differential in the UIP condition, while the monetary policy is autonomous.
- if $0 < \rho_{mD} < 1$, the domestic interest rate reacts to shifts in the dominant economy's monetary policy. This case corresponds to an intermediate regime with limited monetary autonomy and partial exchange rate flexibility.

Unlike previous specifications, this simple rule (eq 2) encompasses a broader framework that allows for more flexibility in the conduct of monetary policy. It allows for the identification of different monetary/exchange rate regimes. Additionally, it can be utilized to establish the optimal monetary or exchange rate policy that can help stabilize domestic aggregates.

In the upcoming section, an evaluation is conducted to gauge the effectiveness of our rule in countries with non-dominant currencies. Our analysis examines the optimal monetary and exchange rate regimes and explores their sensitivity to the stabilization preferences of the central bank.

# 4. The model setup

We set up a three-country New Keynesian DSGE model based on the theoretical framework developed in (Gopinath et al., 2020). The model considers three symmetric open economies - a home country ($H$), a Dominant Issuer ($D$), and the rest of the world ($R$). We assume that the dominant issuer is the US [3].

[2] By taking into account the interest rate smoothing coefficient, it would become: $i_{H,t} = \rho_{mD} i_{D,t} + (1 - \rho_{mD})[\rho_m i_{H,t-1} + (1 - \rho_m)(i^* + \phi_M(\pi_{H,t} - \pi^*_H) + \phi_Y \tilde{y}_{H,t})]$. This case will be explicitly considered in the last section of the paper.

[3] Despite a decreasing share, the US Dollar remains the dominant currency in trade and finance since the Bretton-Woods.

The model features households that work, save, and consume domestic and foreign tradable goods and firms that produce goods and sell to domestic households and abroad. We assume complete international markets, with only riskless bonds. We focus on the Dominant Currency Paradigm (DCP) configuration, where all trade transactions between the three economies $H, R$, and $D$ are denominated in the dominant currency (i.e., the US dollar). We denote $\xi_{\$H\ (resp.R)}$ the price of a US dollar in terms of currency H (resp. R). $\xi_{HR}$ is the nominal bilateral exchange rate between the rest of the world R and the economy H.

### *4.1. Households*

Following Gopinath et al. (2020), we assume a continuum of symmetric households indexed by $h \in [0, 1]$, each supplier of a specialized variety of labor $N_{H,t}(h)$ at a wage $W_{H,t}(h)$. In each period $(t)$, a household $h$ consumes a bundle of domestic and foreign goods $C_{H,t}(h)$. The utility function period-by-period is written in terms of household's consumption $C$ and labor $N$:

$$U(C_{H,t}, N_{H,t}) = \frac{1}{1-\sigma_c} C_{H,t}^{1-\sigma_c} - \frac{\kappa}{1+\varphi} N_{H,t}^{1+\varphi},$$

where $\sigma_c > 0$ is the parameter of risk aversion associated with the household's consumption, $\varphi > 0$ is the inverse of the Frisch elasticity of labor supply, and $\kappa$ scales the disutility of labor. Following Kimball (1995), we assume that households' consumption $(C_{H,t})$ is an aggregator of a bundle (many varieties) of domestic and foreign goods. The domestic consumption $(C_H)$ given by:

$$\sum_i \frac{1}{|\Omega_i|} \int_{w \in \Omega_i} \gamma_{iH} \Upsilon(\frac{|\Omega_i| C_{iH,t}(w)}{\gamma_{iH} C_{H,t}}) dw = 1,$$

where $C_{iH,t}(w)$ denotes domestic households' consumption of variety "$w$" produced in country $i\,(i \in H, R, D)$ at time $t$. $\gamma_{iH}$ (with $\sum_i \gamma_{iH} = 1$) is a set of preference weights that captures home consumption bias in country H. $|\Omega_i|$ measures the bundle of goods produced in the country $i\,(i \in H, R, D)$. The function $\Upsilon(.)$ denotes a concave and increasing function: $\Upsilon(1) = 1$, $\Upsilon'(x) > 0$ and $\Upsilon''(x) < 0$, for all $x > 0$. Households in each country seek to maximize their lifetime utility subject to a budget constraint. A representative household in country H has the following expected lifetime utility:

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t U(C_{H,t}, N_{H,t}),$$

where $\mathbb{E}_0$ denotes the expectation operator, calculating the utility of the household based on the information available at time $t$. We assume households can trade domestic bonds $(B_H)$, denominated in domestic currency, and risk-free international bonds denominated in US dollars $(B_H^{\$})$. Households own all domestic firms and receive their profits $\Pi_t$ in home currency. Hence, their resources are composed of wages, dollar debt holdings traded at time $t$, and profits. Households' per period resource constraint in home currency is expressed as:

$$P_{H,t}C_{H,t} + \xi_{\$H,t}(1 + i^{\$}_{H,t-1})B^{\$}_{H,t} + B_{H,t} = W_{H,t}(h)N_{H,t}(h) + \Pi_{H,t} + \xi_{\$H,t}B^{\$}_{H,t+1} + \sum_{s'} Q_{H,t}B_{H,t+1}(s'),$$

where $B^{\$}_{H,t}$ denotes international dollar bond traded at time t-1, at interest rate $i^{\$}_{H,t-1}$. At each period $t$, households spend their resources on consumption of goods and services $C_{H,t}$, domestic and international-dollar bonds. $P_{H,t}$ denotes the price index for the domestic consumption aggregator $C_{H,t}$. $i^{\$}_{H,t-1}$ is the US dollar nominal interest rate. $\xi_{\$H}$ measures domestic currency per unit of dollar. An increase in $\xi_{\$H}$ indicates a domestic currency depreciation against the US dollar. In line with Gopinath et al. (2020), we assume that households have access to a full set of domestic state-contingent securities (in $j$ currency) that are traded domestically and in zero net supply: $Q_{H,t}(s)$ is the period-t price of the security that pays one unit of home currency in period $t+1$ and state $s \in S$, and $B_{H,t+1}(s)$ the corresponding holdings. Households' resources are thus constituted of their nominal wage $W_{H,t}$, profits $\Pi_{H,t}$ from ownership of retail firms, and debt holdings.

Further, we assume that $i$ will denote only a foreign economy, $i \in R, D$. By solving the maximization problem of households, we derive their demand function as follows:

$$C_{iH,t}(w) = \gamma_{iH}\psi(D_{H,t}\frac{P_{iH,t}(w)}{P_{H,t}})C_{H,t},$$

where $P_{iH,t}(w)$ is the price of a variety $w$ produced in the country $i$ and sold in the domestic economy in currency $(H)$. $P_{iH,t}(w)$ satisfies $\sum_i \int_{\Omega_i} P_{iH,t}(w)C_{iH,t}(w) = P_{H,t}C_{H,t}$.

The Euler equation for international and domestic bonds issued from the intertemporal maximization of households' utility is given by:

$$C^{-\sigma_c}_{H,t} = \beta(1 + i^{\$}_{H,t})\mathbb{E}_t[C^{-\sigma_c}_{H,t+1}\frac{P_{H,t}}{P_{H,t+1}}\frac{\xi_{\$H,t+1}}{\xi_{\$H,t}}]$$
$$C^{-\sigma_c}_{H,t} = \beta(1 + i_{H,t})\mathbb{E}_t[C^{-\sigma_c}_{H,t+1}\frac{P_{H,t}}{P_{H,t+1}}]$$

where $(1 + i_{H,t}) = (\sum_{s' \in S} Q_{H,t}(s'))^{-1}$ is the inverse of the price of a nominally risk-free home currency bond at time $t$ that delivers one unit of H currency in every state of the world in period $t+1$. Through the two equations, we get the Uncovered Interest Parity (UIP) which describes the relationship between domestic and foreign dominant interest rates:

$$\frac{(1 + i^{\$}_{H,t})}{(1 + i_{H,t})} = \mathbb{E}_t(\frac{\xi_{\$H,t+1}}{\xi_{\$H,t}}) \tag{3}$$

Households are subject to *a Calvo* friction when setting wages in home currency. In any given period, they may adjust their wage with probability $1-\delta_w$ or otherwise maintain the previous-period nominal wage. The first-order condition for the choice of the optimal wage is given by:

$$\mathbb{E}_t \sum_{s=t} \delta^{s-t} \Theta_{H,t,s} N_{H,s} W_{H,s}^{\vartheta(1+\varphi)} [P_{H,s} C_{H,s}^{\sigma} N_{H,s}^{\varphi} \kappa \frac{\vartheta}{\vartheta - 1} - \frac{\bar{W}_{H,t}(h)^{1+\vartheta\varphi}}{W_{H,s}^{\vartheta\varphi}}] = 0$$

where $\vartheta > 1$ is the elasticity of labor demand and $W_{H,t}$ denotes the aggregate nominal wage in country H. $\bar{W}_{H,t}(h)$ gives the optimal nominal reset wage in $H$ in period $t$. $\Theta_{H,t,s} = \beta^{s-t} \frac{C_{H,s}^{-\sigma_c}}{C_{H,t}^{-\sigma_c}} \frac{P_{H,t}}{P_{H,s}}$ represents the stochastic discount factor between periods t and s.

### *4.2. Firms*

In the domestic economy, each firm is a monopolist supplier of a variety $w$, which is sold to domestic households and exported abroad. For simplicity, we assume that firms manage production using a combination of labor ($L$) and intermediate inputs ($X$):

$$Y_{H,t} = e^{a_{H,t}} L_{H,t}^{1-\alpha} X_{H,t}^{\alpha}$$

where $\alpha$ and $1 - \alpha$ represent the shares of intermediate goods and labor in total output. $a_{H,t}$ denotes the aggregate productivity shock in H. The intermediate input in the final output, $X_{H,t}$, has the same form as the consumption aggregator:

$$\sum_i \frac{1}{|\Omega_i|} \int_{w \in \Omega_i} \gamma_{iH} \Upsilon(\frac{|\Omega_i| X_{iH,t}(w)}{\gamma_{iH} X_{H,t}}) dw = 1,$$

where $X_{iH,t}$ represents the import by firms in the domestic economy H of a variety $w$ (of intermediate input) produced in country $i$ at time $t$. Output produced in economy $H$ can be exported for consumption or as an intermediate input in each country $i$, and the demand for individual domestic varieties (both for consumption and as intermediate input) takes a form similar to that households' demand function.

Firms earn revenue by selling in the domestic market and exporting to $i \in R, D$. All trade transactions between the countries are set in the dominant currency (US dollar). We assume that firms' price setting in domestic and international markets is subject to Calvo friction. They may adjust their prices with a constant probability of $1 - \delta_p$. The optimality condition for price setting for domestic sales (in home currency) and exports (in the dominant currency (US dollar)) is given by:

$$\mathbb{E}_t \sum_{s=t} \delta^{s-t} \Theta_{H,t,s} Y_{Hi,s|t}^{\$}(w) (\sigma_{Hi,s}^{\$}(w) - 1)(\xi_{cH,s} \bar{P}_{Hi,t}^{\$}(w) - \frac{\sigma_{Hi,s}^{\$}(w)}{\sigma_{Hi,s}^{\$}(w) - 1} MC_{H,s}) = 0$$

with $\sigma^{\$}_{Hi,s}$ the elasticity of demand and $Y^{\$}_{Hi,s|t}$ the quantity sold in country $i$ at time $t \leq s$. The markets are assumed to be segmented, and firms' price-setting decisions can vary by destination. We denote $P^{\$}_{Hi,t}(w)$ the price of a variety $w$ produced in the domestic economy $H$, and exported to the country $i$. Hence, domestic firms' nominal profit is given by:

$$\Pi_{H,t}(w) = \sum_i \xi_{\$H,t} P^{\$}_{Hi,t}(w) Y^{\$}_{Hi,t}(w) - MC_{H,t} Y_{H,t}(w)$$

The demand for a domestic variety $w$ from country $H$ in the country $i$ is defined as both a consumption demand and an intermediary input demand: $Y^{\$}_{Hi,t}(w) = C^{\$}_{Hi,t}(w) + X^{\$}_{Hi,t}(w)$. And $Y_{H,t}(w) = \sum_i Y^{\$}_{Hi,t}(w)$ represents the total demand for domestic variety $w$. $MC_{H,t}$represents firms' nominal marginal costs:

$$MC_{H,t}(w) = \frac{1}{\alpha^{\alpha}(1-\alpha)^{1-\alpha}} \frac{W^{1-\alpha}_{H,t} P^{\alpha}_{H,t}}{e^{a_{H,t}}}$$

### *4.3. Monetary policy, exchange rate, and market clearing*

Following the monetary rule introduced in section 3, the domestic nominal interest rate is given by equation 4:

$$i_{H,t} - i^* = \rho_{mD}(i_{D,t} - i^*) + (1-\rho_{mD})(\phi_M \pi_{H,t} + \phi_Y \tilde{y}_{H,t}) + \epsilon_{H,t} \tag{4}$$

According to the rule (equation 4), the monetary authority takes into account not only the domestic macroeconomic conditions (i.e., inflation and output gap) but also the foreign (dominant) monetary policy. $\phi_M$ captures the sensitivity of policy rates to domestic price inflation, and $\phi_Y$ gives the sensitivity to the output gap $\tilde{y}_{H,t}$. The targeted nominal interest rate ($i^*$) is the steady-state international borrowing rate (same for all three economies). $\rho_{mD}$ is the inertia in domestic policy rates stabilization vis-à-vis $D$'s monetary policy (US monetary policy in our model). $\epsilon_{H,t}$ follows an AR(1) process and denotes shocks to the domestic interest rates.

The monetary authority in country $R$ follows an interest rate rule similar to equation 4. The dominant currency issuer's interest rate is exogenous and affects domestic monetary policy. It follows a traditional Taylor rule, defined as in Gopinath et al. (2020), with a domestic stabilization objective:

$$i_{D,t} = i^* + \phi^D_M \pi_{D,t} + \phi^D_Y \tilde{y}_{D,t} + \epsilon_{D,t}$$

Within this framework, a simulated external monetary shock is introduced in the dominant economy to analyze its spillover effects on non-dominant countries.

Table 1: Baseline model calibration

| Parameter | Value | Parameter | Value |
|---|---|---|---|
| **Household Preference** | | **Demand** | |
| Discount factor ($\beta$) | 0.99 | Elasticity ($\sigma$) | 2.00 |
| Risk aversion ($\sigma_c$) | 2.00 | Super-elasticity ($\epsilon$) | 1.00 |
| Frisch elasticity of N ($\varphi^{-1}$) | 0.50 | Home-bias ($\gamma$) | 0.70 |
| Disutility of Labor ($\kappa$) | 1.00 | **Rigidities** | |
| Labor demand elasticity ($\vartheta$) | 4.00 | Wage ($\delta_w$) | 0.85 |
| Steady-state net foreign assets ($\bar{B}^{\$}$) | 0 | Price ($\delta_p$) | 0.75 |
| **Production** | | **Monetary Rule** | |
| Intermediate share ($\alpha$) | 2/3 | Inflation sensitivity ($\phi_M$ and $\phi_M^D$) | 1.50 |
| Productivity (a) | 1.00 | Output gap sensitivity ($\phi_Y$ and $\phi_Y^D$) | 0.50/4 |
| | | Shock persistence ($\rho_\epsilon$) | 0.50 |
| | | Steady-state interest rate ($i^*$) | $(1/\beta) - 1$ |

**Source**: Gopinath et al. (2020)

The market-clearing conditions require:

- $Y_{i,t}(\omega) = \sum_j [C_{ij,t}(\omega) + X_{ij,t}(\omega)]$, for goods market
- $N_{i,t} = L_{i,t}$, for labor market,
- $B_{i,t}(s') = 0$, for $s' \in S$
- and $\sum_j B^{\$}_{j,t} = 0$, for bond markets.

## 5. Calibration and main results

In the baseline simulation, we calibrate the parameters characterizing the dominant economy ($D$) and the rest of the world ($R$) as Gopinath et al. (2020), and set the home economy ($H$) to represent a large open emerging economy, with trade and financial linkages to $D$ and $R$. The dominant economy $D$ is large with trivial spillover from $H$ and $R$.

We calibrate the parameters governing household preferences and firms' production following estimates from Gopinath et al. (2020). Similarly, the demand and rigidities' parameters are set following Gopinath et al. (2020). Table 1 reports the parameters' values. As noted earlier, the monetary policy, as specified in equation 4, accommodates different exchange rate regimes. In our baseline scenario, we assume the non-dominant economy operates under a flexible exchange rate regime: $\rho_{mD} = 0$. We then explore the impact of a monetary shock in the dominant currency country on non-dominant economies under different monetary and exchange rate regimes. Firstly, we consider a fixed exchange regime and non-autonomous monetary policy setup with $\rho_{mD} = 1$ (Table 2). Secondly, we analyze the spillover effects of the dominant economy's monetary policy under soft exchange rate regimes. First, we consider an ad-hoc calibration of $\rho_{mD} = 0.5$. Next, we optimize $\rho_{mD}$, $\phi_M$, and $\phi_Y$ to stabilize the national variables in the non-dominant economies.

Table 2: Model calibration

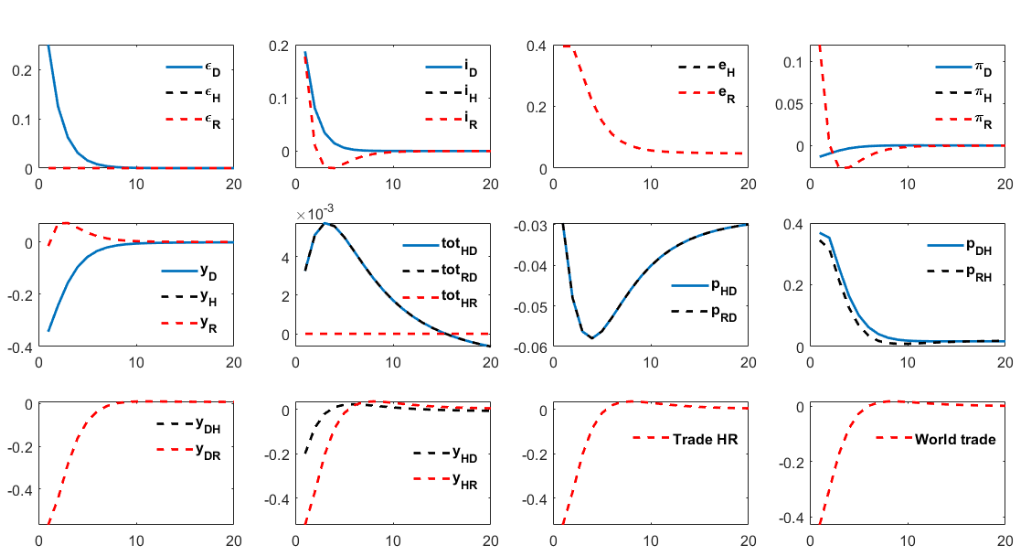
| Exchange rate regimes | $\rho_{mD}$ |
|---|---|
| Flexible (Gopinath et al., 2020) | 0 |
| Fixed exchange rate regime | 1 |
| Soft exchange rate regime | 0.5 |

### 5.1. *Simulations and results*

This section examines the impact of a monetary policy tightening in the dominant economy $D$ (the U.S.) on non-dominant economies $R$ and $H$ under the dominant currency paradigm proposed by Gopinath et al. (2020) in different exchange rate regimes. Recall that $R$ and $H$ are symmetric. This implies that they are affected the same way by shock in the dominant economy. All trade transactions between $R$, $H$, and $D$ are set in the dominant currency (US dollar) with dollar debt holding. We further introduce a 25 basis point monetary policy tightening in the system (Gopinath et al., 2020).

We begin by considering that the non-dominant economies are in a pure flexible exchange rate regime (Figure 1). Figure 1 shows responses in $R$, $H$, and $D$ to a monetary policy tightening in $D$.

Figure 1: Spillovers under flexible exchange rate regime



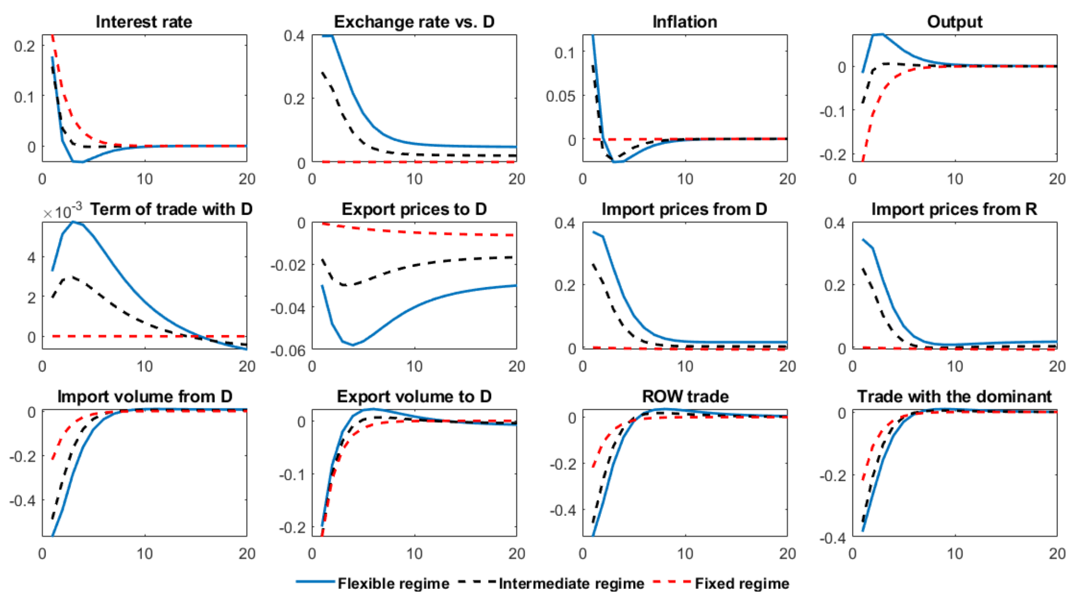

This figure shows the response of key variables to a 25 basis point tightening in $D$. $\epsilon$ denotes the monetary policy shock (nulle in $R$ and $D$). $i_j, e_j, \pi_j, y_j$ denote the interest rate, exchange rate, inflation, and domestic output in the country $j$. "tot" refers to the term of trade between the economies. $P_{jk,\{j,k\}\in\{D,R,H\})}$ denotes import prices in $j$. $y_{jk}$ represents economy $j$'s export volume. "Trade HR" refers to trade volume between $H$ and $R$. "World trade" represents the total export volume in the system. Authors calculations.

The monetary policy tightening in the dominant economy $D$ triggers a fall in its domestic consumption and output and the appreciation of its currency relative to all the others (i.e., $R$ and

$H$). Nonetheless, the impact of the shock was larger for all the variables in the non-dominant economies, reflecting high pass-through into import prices. Indeed, import prices in $R$ and $H$ increase, driven by the depreciation of their currency against the dominant, making imported goods more expensive. Conversely, export prices rose in the $D$. Export between $H$ and $R$ fall, reflecting exchange rate pass-through effect and expenditure switching. Exports of $H$ (resp. $R$) to $R$ (resp. $H$) are denominated in the US dollar and are also affected by the appreciation. This also has an expenditure-switching effect. Consumers and business will switch their expenditures from imported goods to relatively cheaper domestic goods. As a result, domestic demand will increase, adding to the inflationary pressures. Recall that in the flexible exchange rate regime, the Taylor rule (equation 4) does not include the dominant economy's monetary policy. Nonetheless, it allows the domestic interest rate to mitigate increasing inflation. The simulation highlights a monetary policy tightening in $H$ and $R$ as central bankers try to curb the inflationary pressure. Consequently, the domestic output drops in the two non-dominant economies. Nevertheless, the tightening of monetary policy rates in countries $R$ and $H$ is less pronounced than that of the Fed, whose output declines significantly.

Despite the depreciation of their currencies relative to the dominant currency, the non-dominant economies do not benefit from a rise in their exports to $D$. Conversely, their exports decrease, driven by the decline of the US global demand.

Figure 2: Spillovers under different exchange rate regimes




Authors calculations.

Figure 2 compares the effects of the Federal Reserve's monetary tightening on various economic factors in a home economy ($H$) under different exchange rate regimes (flexible exchange rate, fixed exchange rate, and intermediate regime). Under the fixed exchange rate regime, policymakers cannot stabilize domestic variables and are committed to foreign monetary policy. To reflect this, we set $\rho_{mD} = 1$ in the monetary rule (equation 4). In response to the monetary policy tightening in $D$, policymakers in $H$ also raise their policy rates by 25 basis points, and their exchange rate relative to the dominant remains unchanged (Figure 2). This prevents inflation from increasing in $H$ but depresses the real activity. The terms of trade and import/export prices remain stable. The decline in international trade is less significant than it would have been if the exchange rate had been flexible. Similarly, the decline in bilateral trade between $H$ and $R$ is lower compared to the baseline flexible exchange rate configuration.

The soft exchange rate regimes imply exchange rate management and restricted monetary autonomy. The regime can be characterized by $\rho_{mD} = 0.5$. This calibration suggests that a 1% monetary policy tightening in the dominant economy will trigger a 0.5% increase in the domestic interest rate. The impact of the dominant country's monetary tightening is qualitatively similar to the baseline "flexible exchange rate" configuration, but the adjustments are smaller. In this configuration, the exchange rate is more or less rigid, and the depreciation of the domestic currency against the dominant is limited. Consequently, import prices rise less in non-dominant countries compared to the baseline scenario. The expenditure switching effect is lower. Demand for domestic goods is more stable and the equilibrium in the domestic goods market is preserved without inflationary pressures. This reduces domestic monetary policy tightening compared to the alternative monetary regimes. Figure 2 also indicates that choosing an intermediate regime could help the non-dominant country control export prices' dynamics and limit the contraction in export volume.

The results show that monetary authorities react to foreign shocks regardless of the regime, but the choice of the monetary regime affects the trade-off between output and inflation stabilization. The flexible exchange rate regime fails to ensure complete monetary autonomy, as the contraction of the dominant country's policy leads to a (lesser) tightening in the non-dominant country through the dominant currency appreciation. In the intermediate exchange rate regime, the pass-through is weaker, resulting in slight adjustments in inflation and output and a less-than-proportional response from the monetary authority.

The next section investigates the optimal monetary regime for non-dominant currency countries to ensure better national macroeconomic stability under DCP.

### *5.2. Optimal monetary regime for non-dominant economy*

To take into account the macroeconomic stability objective, we introduce the following loss function that the central bank seeks to minimize:

$$Ł_{CB} = \gamma_y var(y) + \gamma_\pi var(\pi),$$

where $var(y)$ is the variance of output, and $var(\pi)$ the variance of inflation. and $\gamma_y$ and $\gamma_\pi$ capture the central bank's preference for stabilizing output and inflation. We then explore the optimal coefficients $\rho_{mD}$, $\phi_M$, and $\phi_Y$ for the monetary policy rule (eq 4) which minimizes the central bank's loss-function. We fix the coefficient for the importance of the inflation stabilization objective for the central bank ($\gamma_\pi$) to 1.5. We consider 3 scenarios for the coefficient corresponding to the importance given by the central bank to the output-gap stabilization $\gamma_y$. It is set equal to 0, 0.5, and 1, to capture different relative preferences for stabilization of the central bank. However, we keep in mind that the main objective of a central bank remains inflation stabilization. Table 3 presents the optimization results for the three values of $\gamma_y$:

Table 3: Optimal regime and central bank's stabilization preferences

| | $\gamma_\pi = 1.5$ & $\gamma_y = 1$ | $\gamma_\pi = 1.5$ & $\gamma_y = 0.5$ | $\gamma_\pi = 1.5$ & $\gamma_y = 0$ |
|---|---|---|---|
| Dominant economy's MP ($\rho_{mD}$) | 0.52 | 0.72 | 0.99 |
| Inflation ($\phi_M$) | 1.48 | 1.61 | 2.36 |
| Output ($\phi_Y$) | 0.68 | 0.86 | 0.7 |

**Source**: Authors calculations.

The simulations place higher weights on inflation ($\phi_M > \phi_Y$). Additionally, regardless of the central bank's preferences, the simulation assigns a greater emphasis on the dominant economy's monetary policy compared to the domestic central bank's goals. This implies that maintaining macroeconomic stability in the non-dominant economy results in a partial loss of autonomy. Indeed, Figure 2 shows that tightening monetary policy in the non-dominant economy ($H$), after the contraction in $D$, helps control domestic currency depreciation, reduces inflationary pressure, and better stabilizes output in the country $H$. Furthermore, Table 3 indicates that the higher the weight placed on inflation stabilization ($\gamma_\pi$) over output stabilization ($\gamma_y$), the stronger the focus on the dominant economy's monetary policy in the monetary policy rule ($\rho_{mD}$).

## 6. Robustness check

In this section, we reconsider the previous analysis in a more realistic configuration with inertia in the dynamics of the central bank interest rates. Indeed, previous studies have shown that the inertia coefficient in the interest rate rule is high and statistically significant (see Levieuge (2006) for a literature review on the subject). Gopinath et al. (2020) also the inertia rule.

The monetary rule is written:

$$i_{H,t} = \rho_{mD} i_{D,t} + (1-\rho_{mD})[\rho_m i_{H,t-1} + (1-\rho_m)(i^* + \phi_M(\pi_{H,t} - \pi^*_H) + \phi_Y \tilde{(y)}_{H,t})]$$

The nominal interest rate in $H$ and $R$ follows:

$$i_{H,t} - i^* = \rho_{mD}(i_{D,t} - i^*) + (1-\rho_{mD})[\rho_m(i_{H,t-1} - i^*) + (1-\rho_m)(\phi_M(\pi_{H,t} - \pi^*_H) + \phi_Y \tilde{y}_{H,t})] \quad (5)$$

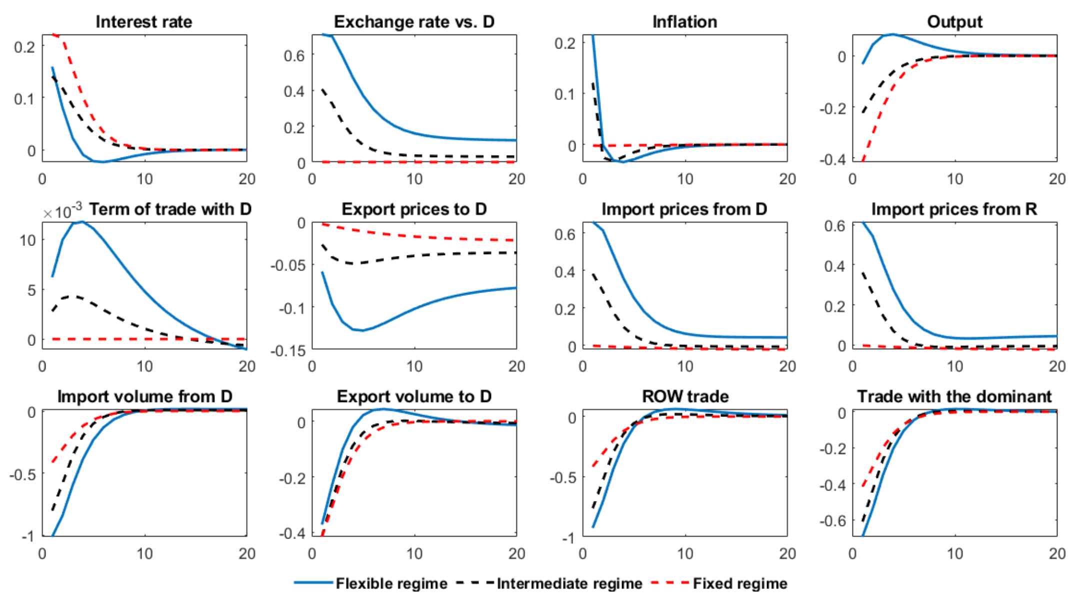
where $H$ denotes the home (non-dominant) country and $D$ is the dominant currency country. $0 \leq \rho_{mD} \leq 1$ measures the sensitivity of the domestic interest rate to the dominant's monetary policy ($i_{D,t}$). It gives the degree of dependence of domestic monetary policy on the dominant monetary policy and defines the different exchange rate regimes as announced in Table 2.

The dominant country's monetary policy follows a similar inertia rule:

$$i_{D,t} - i^* = \rho_m^D(i_{D,t-1} - i^*) + (1 - \rho_m^D)[\phi_M^D(\pi_{D,t} - \pi_D^*) + \phi_Y^D \tilde{y}_{D,t}]$$

where $\rho_m^D$ represents the interest rate smoothing coefficient in the dominant country. Following (Gopinath et al., 2020), we set $\rho_m^D = 0.5$. The initial value given to the interest rate smoothing coefficient in non-dominant countries is also fixed at 0.5 when proceeding to the optimization of monetary policy rules. We run the previous simulations using the inertia rule and compare the shock's impact in fixed, flexible, or intermediate monetary regimes (Figure 3).

Figure 3: Spillovers under different exchange rate regimes




Authors calculations.

We can easily observe that the results are qualitatively similar to the ones obtained without the simple rule (Figure 2). Inflation and output dynamics are again different in the different scenarios implying different monetary-policy trade-off for the monetary policy.

In order to determine the optimal regime able to better stabilize national variables, we redefine the central bank loss function so as to include an additional interest rate stabilization objective:

$$Ł_{CB} = \gamma_i var(di) + \gamma_y var(y) + \gamma_\pi var(\pi),$$

$var(di)$ represents the variance of domestic interest rate differential, $var(y)$ the variance of output, and $var(\pi)$ the variance of inflation. $\gamma_i$, $\gamma_y$ and $\gamma_\pi$ capture the central bank's preference for stabilizing the interest rate differential, output, and inflation, respectively. We then explore the optimal coefficients $\rho_{mD}$, $\rho_m$, $\phi_M$, and $\phi_Y$ for the monetary policy rule (eq **??**) which minimize the central bank's loss-function. We fix the coefficient for inflation stabilization importance in the loss function computation ($\gamma_\pi$) to 1.5 and $\gamma_y$ can take the values 0, 0.5 or 1, as previously. The importance of the interest rate differential stabilization is equal to 0.1. It is sufficiently high to explain the presence of the smoothing coefficient in the monetary rule, but small compared to the inflation stabilization coefficient that depicts the main monetary policy objective. Table 4 presents the optimization results for the three values of $\gamma_y$:

Table 4: The optimal regime and central bank's stabilization preferences

| | $\gamma_\pi = 1.5$ & $\gamma_y = 1$ | $\gamma_\pi = 1.5$ & $\gamma_y = 0.5$ | $\gamma_\pi = 1.5$ & $\gamma_y = 0$ |
|---|---|---|---|
| Dominant economy's MP ($\rho_{mD}$) | 0.21 | 0.31 | 0.97 |
| Domestic MP ($\rho_m$) | 0.54 | 0.53 | 0.21 |
| Inflation ($\phi_M$) | 1.5 | 1.53 | 1.96 |
| Output ($\phi_Y$) | 0.22 | 0.25 | 0.29 |

**Source**: Authors calculations.

As in the previous section, Table 4 indicates that the higher the weight placed on inflation stabilization ($\gamma_\pi$) over output stabilization ($\gamma_y$), the stronger the focus on the dominant economy's monetary policy in the monetary policy rule ($\rho_{mD}$). However, the optimal monetary regime is all the time an intermediate one, suggesting that non-dominant countries are more incited to adopt a middle-ground solution and not a corner monetary regime as in the traditional trilemma configuration.

## 7. Conclusion

This research complements, from a theoretical point of view, a large strand of the empirical literature showing that a flexible exchange rate regime is no longer entirely effective in insulating against foreign monetary shocks. More specifically, the recent and emerging literature on the US dollar's hegemony suggests a dilemma where the US monetary policy spills over to the rest of the world via the US dollar.

This paper revisits in particular the traditional Taylor rule for monetary policy in the dominant currency paradigm. We propose a new hybrid monetary rule that characterizes different degrees of monetary autonomy and/or exchange rate flexibility. Using the theoretical framework of Gopinath et al. (2020), we examine the optimal exchange rate regime that ensures better stability of the domestic variables during foreign monetary shocks.

The results suggest that in non-dominant economies, regardless of their exchange rate regimes, policymakers will tighten the monetary policy in response to a positive monetary policy shock in the dominant country. Contrary to the traditional Trilemma, we find that the soft exchange rate regimes, associated with "partial" central bank autonomy and "managed" exchange rate, ensure better economic performance compared to the fixed and flexible exchange rate regimes. They help control domestic inflation and limit output volatility. Future research could explore two potential avenues. Firstly, it could delve into examining the effects of implementing taxes to regulate capital flows on the optimal coefficients of the monetary rule and the optimal degree of monetary autonomy. Secondly, it could examine the impact of introducing asymmetries across the non-dominant economies to understand how this will affect choices in terms of exchange rates and monetary regimes.

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