The Fiscal Implications of Parallel Currencies *

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Abstract

To manage capital flows and influence the exchange rate, policy can control the scarcity of an offshore money. This is equivalent to choosing the rate of a Tobin tax. However, its fiscal implications are distinct, and this paper lays them out. Having a parallel currency creates both seignorage and liquidity revenues. They have different sizes and Laffer curves, which vary with the regime for the exchange rate, with liquidity policies, and with the size of the offshore market. The paper concludes that the fiscal footprint of this policy is small, boosting the chances that its use can stay independent from fiscal pressures.

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1 Introduction

The IMF (2021) proposes a systematic framework that countries can use to evaluate cross-border capital flows and choose a mix of policy tools in response to shocks. This *Integrated Policy Framework* (IPF) takes as given that there are significant deviations from efficient financial markets. As a result, some capital flows can inefficiently amplify shocks, and floating exchange rates may deviate from the optimal level that would guide the allocation of resources across borders (Bianchi and Lorenzoni, 2022). A wide set of policy tools can attack those inefficiencies directly, manage the capital flows, and steer the equilibrium exchange rate by affecting wedges in optimality conditions. In the formal model of the IPF (Basu et al., 2025) these are financial transaction taxes across borders, supplemented by macro-prudential policies over the leverage and risk-taking of financial intermediaries, and occasional foreign exchange interventions.

In practice, all of these policies face serious obstacles. Matching theoretical financial transaction taxes with accounting conventions struggles to net out gross flows and opens up many paths for tax evasion (for Brazil's experience with these, see Chamon and Garcia (2016)). Macro-prudential policies spill over to distort the allocation of domestic credit and are hard to adjust at high frequencies (Reis, 2021). Foreign exchange intervention may have only short-lived effects (Fratzscher et al., 2019). Therefore, there is still a search for other policy tools that can affect wedges in the arbitrage conditions between investing domestically or abroad and be part of the IPF.

One recently-studied alternative comes from the successful Chinese experience: the use of an offshore parallel currency. By simultaneously forcing cross-border capital flows to go through exchanges in and out of that currency, and at the same time controlling the relative scarcity of that currency, authorities can affect the relevant wedges in the IPF (Bahaj and Reis, 2026). An inferior alternative that shares the same theoretical underpinnings is to force the conversion of foreign capital into the domestic currency to go through state banks at an official exchange rate that deviates from the market. The formal offshore alternative has practical advantages: netting of gross flows happens automatically in currency exchanges, controlling the offshore money supply can be done at high frequencies, and there are well-studied liquidity policies in the toolkit of central banks to persistently affect the creation of money by banks.

One open question is what are the fiscal implications of these tools. On one side, transaction taxes and subsidies have clear revenues and expenses, while on the other side, macro-prudential constraints create rents without fiscal revenues. Intuitively, an offshore currency would sit in between, because the creation of base money creates seigniorage revenues, but the expansion of liquidity through the money multiplier creates rents for banks that may be only partly capturef by the public authorities. Understanding these fiscal consequences of any policy tool is important for at least two reasons. First, to understand whether the use of the tool is feasible in a world where there are no lump sum taxes and the government budget constraint bind. Second, when public debt rises, the best-intended policy can become a tool for financial repression if it has an untapped ability to generate fiscal revenues (Reis, 2026).

At the same time, if the offshore currency becomes widely used internationally, then these fiscal implications can take the stage away from the IPF uses. On the one hand, the potential for a currency to grow as an international currency depends on its fiscal backing. On the other hand, one of the advantages of having an international currency is to collect seigniorage revenues.

The goal of this paper is to study these fiscal implications of offshore parallel currencies.[1]

Section 2 presents a model where capital controls and an offshore market allow policy to manage capital flows and affect the exchange rate. The model builds on, but significantly expands, the setup of Bahaj and Reis (2026) to include an infinite horizon and liquidity benefits from the currency to both domestic and foreign holders.

Section 3 qualitatively discusses the fiscal properties of the model. First, it notes the equivalence of outcomes that can be achieved by either an offshore currency or a Tobin tax. Second, it decomposes transfers from the government to the households as a sum of four components. Isolating them shows that two of them would be present even without a scarce offshore currency. Moreover, their relative size is arbitrary as a consequence of Ricardian equivalence. Third, we define fiscal offshore revenues as composed of only two terms: seignorage revenues and liquidity revenues. Both disappear if offshore money is abundant, and both have a Laffer curve with respect to the size of the money supply. Fourth and finally, we discuss the incidence of these fiscal flows between domestic and foreign investors.

Section 4 quantifies the fiscal offshore revenues, and decomposes them into seignorage and liquidity, as well as into domestic or foreign. Calibrated to a realistic setting, the

[1]While our focus is on the fiscal backing of an externally issued currency, our work fits into a much broader literature on fiscal-monetary interactions in a domestic or closed economy setting. Issues range from the consequences of fiscal policy for the price level (Cochrane, 2023), the fiscal footprint of central bank policies (Reis, 2019), or the importance of seignorage (Kehoe and Nicolini, 2022).

model predicts that the total revenues are modest, around 0.2 percentage points of GDP. Therefore, the fiscal backing required by the system is limited. Moreover, we plot out the Laffer curves for each type of revenue, and find that they are relatively flat, and have peaks also at modest levels of revenue. This suggests that the temptation to use this tool for financial repression will be limited. These results hold whether authorities are trying to keep the exchange rate fixed, or if they choose to let if float.

Section 5 asks two related question. The first is whether the fiscal consequences change significantly as the demand for the currency for international uses rises. This is especially relevant for the Chinese application, as there is potential for the use of the RMB to increase as an international vehicle currency. The second is what are the fiscal revenues associated with liquidity policies that change bank's incentives to generate more inside money. These policies that affect the money multiplier are a common expression of financial repression.

Section 6 concludes. Offshore currencies leave a relatively modest fiscal footprint so that both their fiscal backing is limited and the temptation to use them as fiscal repression is weak. From the perspective of the integrated policy framework, these are advantages relative to financial transaction taxes.

2 A model of an offshore currency

There are four relevant agents in the economy: domestic households, foreign investors, offshore banks, and the government. The key assumption of the model is that there are capital controls and an offshore currency such that:

(i) domestic households cannot invest abroad directly, but they can hold bank deposits in the offshore currency;

(ii) foreign investors cannot invest domestically directly, but they can hold bank deposits in the offshore currency;

(iii) the government controls the supply of offshore narrow money, and offshore banks can create offshore broad money (deposits) subject to regulations.

The government can invest domestically and abroad at will, while offshore banks only invest domestically. By keeping the supply of offshore money scarce, the government creates a wedge between what households can earn on their offshore deposits and the returns of investing abroad, and likewise another wedge between what foreigners earn on their offshore deposits and what they could earn if allowed to invest domestically. It is in this sense that an offshore currency becomes a tool in the integrated policy framework.

We now present the problem of each agent in turn. Time is discrete and indexed by t going from zero to infinity. We consider a deterministic economy with a perfect foresight equilibrium.[2]

2.1 Domestic households

A representative household discounts the future by the factor $\beta in(0, 1)$ and gets utility from consuming non-tradable goods $c_{NT,t}$ and tradable goods $c_{T,t}$, as well as liquidity benefits from holding offshore deposits d_t^h. There are many ways to micro-found why money holdings provide benefits; we follow the classical money-in-the-utility function formulation for simplicity. The household therefore maximizes:

$$\sum_{t=0}^{\infty} \beta^t \left[\ln(c_{NT,t}) + \iota \ln(c_{T,t}) + \mu_t \ln(d_t^h) \right]. \tag{1}$$

The fixed parameter $\iota > 0$ controls the preferences between the two goods, while the time varying-parameter $\mu_t > 0$ determines how many offshore deposits households hold. This will be an important parameter in scaling the size of the offshore money market, and so on the fiscal implications.

We let $E_t^{\$}$ be the exchange rate between the foreign currency in which tradable goods are priced in international markets and the domestic currency in which non-tradables are quoted. An increase in $E_t^{\$}$ will stand for a depreciation of the domestic currency. In turn, E_t is the exchange rate between the offshore currency and its onshore domestic counterpart, so that again an increase in E is a depreciation of the onshore currency or an appreciation of the offshore currency.

Households can save domestically at date t in domestic bonds b_t^h that pay a return R_t in onshore units at date $t + 1$, or in offshore currency that pays a return $R_{d,t}$ in offshore units. Given their endowments of the two goods $y_{T,t}, y_{NT,t}$, their budget constraint (in non-tradable units) is:

$$E_t^{\$} c_{T,t} + c_{NT,t} + b_t^h + E_t d_t^h = E_t^{\$} y_{T,t} + y_{NT,t} + R_{t-1} b_{t-1}^h + R_{d,t-1} E_t d_{t-1}^h + T_t \,. \tag{2}$$

[2] Adding shocks to the key exogenous variables would keep most equations unchanged, aside from expectations operators over future variables. Because we focus our analysis and conclusions on balanced-growth paths, considering uncertainty would do little to our results, so we leave shocks to future work.

The household receives a lump-sum transfer T_t from the government: this will be discussed at length later. Note that nominal GDP is endogenous and given by:

$$Y_t = y_{NT,t} + E_t^{\$} y_{T,t}\,. \tag{3}$$

The optimal intertemporal behavior of this household is characterized by an Euler equation for savings and an equation for offshore money demand. Imposing already the goods market clearing condition that $y_{NT,t} = c_{NT,t}$, these two conditions become:

$$R_t = \left(\frac{1}{\beta}\right)\left(\frac{y_{NT,t+1}}{y_{NT,t}}\right), \tag{4}$$

$$\frac{d_t^h}{y_{NT,t}} = \mu_t \left(E_t - \frac{E_{t+1}R_{d,t}}{R_t}\right)^{-1}\,. \tag{5}$$

The first equation pins down domestic returns to equal the exogenous growth rate in non-tradable output. The second equation shows that a higher interest rate on offshore deposits, or a higher appreciation of the offshore currency, both reduce the opportunity cost of holding offshore deposits, and raise the household's demand for them.

Finally, intratemporal behavior in choosing between non-tradable and tradable consumption implies that:

$$c_{T,t} = \frac{\iota y_{NT,t}}{E_t^{\$}}\,. \tag{6}$$

A higher preference for the tradable good ι or a higher income from the nontradable endowment raises consumption, while a higher $E_t^{\$}$ increases the price of tradable goods, and so lowers their consumption.

2.2 Foreign investors

A representative foreign investor has linear preferences over foreign consumption in foreign-currency units c_t^* and deep pockets. The investor maximizes:

$$\sum_{t=0}^{\infty} (R^{\$})^{-t}\left[c_t^* + \gamma_t \ln(d_t^f)\right], \tag{7}$$

where $1/R^{\$} \in (0,1)$ is a constant discount factor, and $\gamma_t > 0$ is a time-varying preference for the services provided by offshore money that they hold d_t^f.

Since holding one unit of offshore deposits between t and $t+1$ gives the investor a gross payoff $R_{d,t}E_{t+1}/E_t$ in units of foreign currency, then, at an optimum, her demand for offshore money is given by the optimality condition:

$$d_t^f = \Gamma_t \left(\frac{R^{\$} E^{\$}_{t+1}}{E^{\$}_t} - \frac{R_{d,t} E_{t+1}}{E_t} \right)^{-1} . \tag{8}$$

where we defined $\Gamma_t \equiv \gamma_t R^{\$} E_{t+1}/E_t > 0$.

Note that in the limit $\Gamma_t \to 0$, the foreign demand for offshore currency is perfectly elastic, and we would recover the UIP condition: $R_{d,t} = R_t^{\$}(E^{\$}_{t+1}/E^{\$}_t)(E_t/E_{t+1})$ for an arbitrary level of deposits. With a finite elasticity of demand for offshore currency instead, there is a UIP wedge that pins down the finite level of offshore deposits held by foreigners.

2.3 Offshore banks

There is a competitive set of financial institutions that offer offshore deposits d_t. We assume that they hold domestic bonds b_t^b. Therefore, they are a vehicle through which foreign investors can invest domestically. Moreover, because they take both domestic and foreign deposits, at the margin they are also a vehicle through which domestic households invest abroad.

These banks can also hold offshore reserves at the central bank m_t, which earn a return R_t^m between t and $t+1$. Reserves reduce a liquidity cost that banks incur every time they issue a deposit $\Phi(m/d, M/D)$, which depends both on their individual choice of reserves and deposits as well as on aggregate conditions. This is because their assets are illiquid, while deposits and reserves are liquid, in the sense that within a period a bank may face a withdrawal in excess of its reserves that it must satisfy by borrowing from other banks or from the central bank at a penalty rate.

As banks maximize profits, their problem then is:

$$\max_{b_t^b, m_t, d_t} \quad R_t b_t^b + E_{t+1}\left(R_t^m m_t - R_t^d d_t\right) , \tag{9}$$

$$\text{s.t.} \quad b_t^b + E_t m_t + E_t \Phi(m_t/d_t, .) d_t = E_t d_t . \tag{10}$$

The two optimality conditions, together with a zero-profit condition from free entry, are:

$$R_t^m E_{t+1} = E_t R_t (1 + \Phi'(m_t/d_t, .)) \,, \tag{11}$$

$$R_t^d E_{t+1} = E_t R_t \left(1 - \Phi(m_t/d_t, .) + (m_t/d_t)\Phi'(m_t/d_t, .)\right) \,. \tag{12}$$

where $\Phi'(m_t/d_t, .)$ is the partial derivative of the function with respect to its first argument.

The first condition equates the return from holding an additional reserve at the central bank to the return of alternatively lending it out, taking into account that reserves both pay a return and lower liquidity costs. The second condition likewise equates the return paid on deposits to the return earned on investments, taking into account that deposits raise liquidity costs.

2.4 The government

The government issues domestic bonds B_t^g in units of the domestic currency, and supplies offshore reserves M_t in units of the offshore currency. It invests in foreign bonds $B_t^\$$ in units of foreign currency. The government is also the net recipient of banks' liquidity costs $\phi(M_t/D_t) = \Phi(M_t/D_t, M_t/D_t)D_t$ since in equilibrium these will match the penalty payments paid in its loans of last resort to banks. The government's period-t flow budget constraint in domestic currency units is:

$$E_t^\$ R^\$ B_{t-1}^\$ + B_t^g + E_t M_t + E_t \phi(M_t/D_t) D_t = E_t^\$ B_t^\$ + R_{t-1} B_{t-1}^g + E_t R_{t-1}^m M_{t-1} + T_t \,. \tag{13}$$

The government every period chooses: the rate at which to remunerate offshore narrow money R_t^m, the quantity of that money M_t, the amount of foreign reserves $B_t^\$$, the domestic public debt B_t^g, and transfers T_t. We make two assumptions on these choices.

The first is on the fiscal rule through which the government stays solvent: we assume the government keeps public debt rising at the constant rate $g_b = B_t^g / B_{t-1}^g$. Equation (13) then implies that transfers are given by:

$$T_t = E_t \left(M_t - R_{t-1}^m M_{t-1}\right) + E_t \Phi(M_t/D_t) D_t + E_t^\$ \left(R_{t-1}^\$ B_{t-1}^\$ - B_t^\$\right) - \left(R_{t-1} - g_b\right) B_{t-1}^g \,. \tag{14}$$

The government transfers to the households: (i) the increase in the supply of offshore narrow money after interest paid, (ii) the liquidity costs collected from banks, (iii) the gains on its foreign reserves, minus (iv) the net interest paid on the growing public debt. These are the four terms on the right-hand side, respectively.

The second assumption concerns the offshore exchange rate: consistent with this being a parallel currency, we assume that the government aims for a peg $E_t = 1$ at all dates. It achieves it by varying the interest paid on reserves. From the demand for inside money by banks in equation (11), this requires setting interest rates according to the following rule:

$$R_t^m = R_t(1 + \phi'(M_t/D_t)), \tag{15}$$

for any observed path of R_t and M_t/D_t, where $\phi'(M_t/D_t) = \Phi'(M_t/D_t, M_t/D_t)$.

2.5 Market clearing

The market clearing conditions in the financial markets for money, deposits, and domestic bonds, respectively, are:

$$M_t = m_t, \tag{16}$$

$$D_t = d_t^h + d_t^f, \tag{17}$$

$$B_t^g = b_t^h + b_t^b. \tag{18}$$

For goods markets, we already noted that for the non-tradable good: $y_{NT,t} = c_{NT,t}$. For the tradable good, combining the household and government budget constraints, the household intra-temporal condition, the bond market clearing condition and the peg policy $E_t = 1$—equations (2), (13), (6), and (18)—gives the balance of payments identity:

$$E_t^\$ y_{T,t} - \iota y_{NT,t} = E_t^\$ \left(B_t^\$ - R^\$ B_{t-1}^\$ \right) - \left(d_t^f - R_{d,t-1} d_{t-1}^f \right). \tag{19}$$

On the left-hand side is the trade balance, which is the difference between the endowment of the tradable good and its consumption by the household. On the right-hand side is the change in net foreign assets of the country minus the net investment income, which includes the government's foreign reserves and the foreigners offshore deposits.

The no-Ponzi scheme condition on the public debt is automatically satisfied as long as g_b is not too large. The no-Ponzi scheme condition on the households (or the nation) is:

$$\lim_{T\to\infty} \left(\prod_{s=0}^{T-1} \left(R_s^d \right)^{-1} \right) d_T^f = 0, \tag{20}$$

since the foreign households will not allow its credits over the banks be rolled over forever.

2.6 Equilibrium

The exogenous endowments pin down the domestic interest rate R_t given the households' Euler equation (4). The policy for the interest rate on money R_t^m in equation (15) pins down $E_t = 1$ given the banks' demand for narrow money.

Let $x_t = M_t/D_t$ and the marginal liquidity cost of issuing a deposit be: $\psi(x_t) \equiv \phi(x_t) - x_t\phi'(x_t)$. Then, the banks' optimality conditions with respect to deposits in equation (12) then $R_t^d = R_t(1 - \Psi_t)$, while domestic deposits are $d_t^h = \mu_t \left(1 - R_t^d/R_t\right)^{-1} = \mu_t/\psi_t$ from equation (5).

All combined, an equilibrium for the sequences of the money-deposit ratio, foreign deposits, and the exchange rate $\{x_t, d_t^f, E_t^\$\}_{t\geq 0}$, as a function of the exogenous paths for $\{R_t, \mu_t, \Gamma_t\}_{t\geq 0}$ and the exogenous policy paths $\{M_t, B_t^\$\}_{t\geq 0}$ solves the system of three equations:

$$E_t^\$ y_{T,t} - \iota y_{NT,t} = E_t^\$ \left(B_t^\$ - R^\$ B_{t-1}^\$\right) - \left(d_t^f - R_{t-1}(1 - \psi(x_{t-1}))d_{t-1}^f\right), \tag{21}$$

$$d_t^f = \Gamma_t \left[R^\$ \left(\frac{E_{t+1}^\$}{E_t^\$}\right) - R_t(1 - \psi(x_t))\right]^{-1}, \tag{22}$$

$$d_t^f = \frac{M_t}{x_t} - \frac{\mu_t}{\psi(x_t)}. \tag{23}$$

There are three boundary conditions: the initial values for d_{-1}^f and $B_{-1}^\$$ and

$$R_{-1}^d d_{-1}^f = \sum_{t=0}^{\infty} \left(\prod_{s=0}^{t-1} R_{d,s}^{-1}\right) \left[E_t^\$ y_{T,t} - \iota y_{NT,t} - E_t^\$ \left(B_t^\$ - R^\$ B_{t-1}^\$\right)\right], \tag{24}$$

which comes from iterating forward the balance of payments condition and imposing the no-Ponzi scheme condition.

Given a solution to this system, all the other variables in the model follow. Of particular importance to this paper, the equilibrium fiscal transfers from equation (14) are given by:

$$T_t = \left(M_t - R_{t-1}(1 + \phi'(x_{t-1}))M_{t-1}\right) + \frac{\phi(x_t)M_t}{x_t} + E_t^\$ \left(R^\$ B_{t-1}^\$ - B_t^\$\right) - (R_{t-1} - g_b)\, B_{t-1}^g. \tag{25}$$

The first term is seigniorage from printing base money; the second is the revenue extracted from banks by operating lending facilities at a penalty rate; the third is the net cash flow from the FX position; and the fourth is the interest expense for servicing the debt.

2.7 Balanced growth path

We restrict our analysis to a balanced growth path of the economy, where the exogenous paths for tradable output, non-tradable output, demand for offshore money, supply of money, and foreign reserves all grow at a constant rate. The appendix proves the following result.

Proposition 1. *If the gross growth rates of $\{y_{NT,t}, y_{T,t}, \mu_t, \Gamma_t, M_t, B_t^{\$}\}$ are all the same, then they are equal to the growth rate of nominal GDP: $Y_{t+1/Y_t} = g$. Fiscal transfers, money supply, domestic deposits, foreign deposits, and foreign reserves are all a constant fraction of GDP, while the money-deposit ratio x_t is constant and so is the exchange rate $E_t^{\$}$. The solution of the model comes from solving the system of three equations:*

$$1 - \frac{(1+\iota)y_{NT}}{Y} = \left(1 - \frac{R^{\$}}{g}\right)\frac{E^{\$}B^{\$}}{Y} + \left(\frac{1-\psi(x)}{\beta} - 1\right)\frac{d^f}{Y}, \tag{26}$$

$$\frac{d^f}{Yx} = \frac{\Gamma}{Y}\left[R^{\$} - g(1-\psi(x))/\beta\right]^{-1}, \tag{27}$$

$$\frac{d^f}{Y} = \frac{M}{Yx} - \frac{\mu}{Y\psi(x)}. \tag{28}$$

for the unknown values of $E^{\$}, x, d^f/Y$.

This set of equations shows the key force in the model. When policymakers issue more offshore money, this leads banks to create more deposits. Some of them are held by foreigners. From the balance of payments condition, the domestic exchange rate must depreciate ($E^{\$}$ rises) to restore equilibrium, unless the policymaker sterilizes that increase in foreign deposits by raising its foreign reserves $B_t^{\$}$. Because the increase in deposits is not equiproportional to the increase in the money supply, the money deposit ratio will change x, and this brings second-round effects that amplify the initial shock.

Therefore, by controlling the supply of offshore money, policymakers can control the level of the exchange rate. As long as offshore deposits are scarce, they pay an inferior return to either domestic returns and foreign returns, creating a wedge in the arbitrage conditions that connect them. By controlling the scarcity of narrow money, the central bank can keep deposits scarce ($\psi(.) > 0$) as long as there is a demand for them ($\mu, \Gamma > 0$).

Liquidity premia appear in the uncovered interest parity condition that determines the exchange rate. Since policy controls the amount of liquidity in the system, it can drive these premia.

3 Fiscal properties of the model

This section qualitatively discusses the fiscal properties of the model before the next section evaluates them quantitatively.

3.1 The connection to Tobin taxes

Define the tax wedge τ as:

$$1 + \tau \equiv \frac{\psi(x)}{1 - \psi(x)} \,. \tag{29}$$

Bahaj and Reis (2026) started with simpler model of an offshore currency, which only had two periods, and an infinitely elastic demand for offshore currency by foreigners, proved the following result. It then replaced the capital controls and the offshore currency with instead a financial transactions tax so that purchases of foreign bonds by households would have to pay a tax τ. It showed that the equilibrium exchange rate of this economy with a tax was the same as the equilibrium of the economy with an offshore currency, as long as the tax rate was equal to the wedge defined above.

Intuitively, a Tobin tax τ introduces a wedge between investing in the domestic economy or abroad. Likewise, a scarce offshore currency introduces such a wedge, as foreign investors can only earn the offshore deposit rate, and offshore banks that raise those deposits to invest domestically must incur the liquidity cost $\psi(x)$. Both wedges can be manipulated by policy to achieve a target exchange rate, in one case through fixing the tax rate, and in the other by controlling the supply of money.

Fiscally though, the two regimes are different. A Tobin tax collect as revenues the tax rate times the net foreign debts of the country. If the country has a positive net financial position and its goal is to encourage further external saving, as arguably is the case for China, then the Tobin tax manifests as a subsidy. It generates expenses as opposed to revenues. Things are not so simple with an offshore currency, as we explore next.

3.2 The four fiscal components

The appendix show that in the balanced growth path, the government budget constraint reduces to the following expression, as long as we modify the fiscal rule to have $g_b = g$ so that public debt remains a constant share of GDP:

Lemma 1. *The fiscal transfers in a balanced equilibrium where $g_b = g$ are equal to*

$$\frac{T}{Y} = \underbrace{\left(1 - \frac{1+\phi'(x)}{\beta}\right)\frac{M}{Y}}_{\textit{narrow-money}} + \underbrace{\phi(x)\frac{D}{Y}}_{\textit{broad-money}} + \underbrace{\left(\frac{R^\$}{g} - 1\right)\frac{E^\$ B^\$}{Y}}_{\textit{FX reserves}} - \underbrace{\left(\frac{1}{\beta} - 1\right)\frac{B^g}{Y}}_{\textit{public debt}}. \tag{30}$$

The first term on the right-hand side has the flow seignorage revenues from providing narrow offshore money M to the banks. This is a fiscal revenue arising from the monopoly power to issue narrow money.

The second term has the revenues from operating the lending facility to those banks. These equal the liquidity costs that the banks incur by issuing deposits. They are a revenue from providing liquidity, but in this case in the form of broad money.

The third term are the revenues that the government earns in its foreign investment. In this model, only the government can invest abroad, so all of the net investment income of the country appears as fiscal revenue. This term is positive when the foreign return exceeds the growth rate of reserves in foreign-currency units: $R^\$ > g$.

The fourth and final term is positive and is the one usually associated with Ricardian equivalence. When the government increase the size of the public debt B^g this is offset by lower transfers to agents. Private wealth is unchanged and so are agents' choices and the equilibrium for all variables.

3.3 The fiscal offshore revenues

The size of the third term in the lemma is somewhat arbitrary. If we assumed that private domestic agents could invest a fixed amount abroad, then the fiscal revenues would net that amount from $B^\$$. By changing this fixed allocation to private savings abroad, nothing would change in the equilibrium and in the efficacy of the offshore currency regime, but the fiscal revenues could become arbitrarily high or low.

A similar argument applies to the fourth term. Larger public debt comes with lager persistent transfers. By Ricardian equivalence, the size of the public debt is irrelevant.

Moreover, these two fiscal revenue are not strictly related to the offshore currency regime or to the manipulation of the exchange rate. Even if the capital controls and offshore market were abolished, or if the demand for offshore narrow money by banks was fully satiated so that policy could not longer affect the exchange rate, these two terms would still be there.

From now onwards, we therefore focus on the *fiscal offshore revenues* associated with the offshore currency alone.

Definition 1. *The fiscal offshore revenues associated with scarce offshore money are*

$$F(M) \equiv -\left(\frac{\phi'(x)}{\beta}\right)\left(\frac{M}{Y}\right) + \phi(x)\left(\frac{D}{Y}\right), \tag{31}$$

which is the sum of seignorage revenues and liquidity-provision revenues.

By lemma 1, it follows that:

$$\frac{T}{Y} = F(M) + \left(\frac{R^{\$}}{g} - 1\right)\frac{E^{\$}B^{\$}}{Y} - \left(\frac{1}{\beta} - 1\right)\frac{B^{g} + M}{Y}. \tag{32}$$

That is, relative to the fiscal flows from offshore money, transfers will also include the government's revenue from holding foreign reserves, and subtract the taxes needed to pay for the public debt, whether that takes the form of bonds or money.

3.4 The Laffer curves for fiscal offshore revenues

The equilibrium liquidity cost function $\phi(x)$ has the following properties.[3] First, it is non-negative, and it will reach zero when banks become narrow ($x = 1$). Second, as more of the banks' deposits are backed by liquid reserves, the cost falls, so $\phi'(x) \leq 0$, and this marginal cost approaches zero again as $x = 1$ and the bank becomes satiated in its demand for liquidity. Third, there are diminishing marginal benefits to liquidity, so the marginal cost rises: $\phi''(x) \geq 0$.

Consider then what happens if the demand for offshore money is satiated: there is enough offshore narrow money for banks to fully back their deposits with. In that case, since $\phi'(1) = \phi(1) = 0$, from the definition of $F(M)$, the fiscal offshore flows are zero. What makes the offshore money effective in manipulating the exchange rate and capital

[3] Bahaj and Reis (2026) derive these in a micro-founded model of the liquidity costs.

flows is its scarcity. When offshore money is abundant, this power goes away, and so do the fiscal flows.

At the other extreme, consider a world where money M is close to zero, and correspondingly so are deposits D. Therefore, so are the fiscal offshore flows. However, the demand curve for deposits approaches infinity when the quantity of deposits approaches zero, given our assumptions on the utility from money. Therefore, banks will want to issue some deposits, and $x = M/D$ will be close to zero. Liquidity costs will be large (but bounded) and a slight increase in the offshore money supply will raises fiscal flows.

As the supply of narrow money rises M, the base on which to collect seignorage rises. At the same time, the returns per unit of narrow money, $-\phi'(x)/\beta$, will fall. Depending on the properties of the liquidity cost function, we may have a scenario where for the first units of M, total seignorage revenue rises, but after a point they start declining. This would map a Laffer curve.

The same logic applies to deposits. As M rises, so will D (but not as much), so x rises and $\phi(x)$ falls. Therefore, while the deposit base rises, the revenue per deposit that the central bank collects in its lending facilities falls. Again, this will map a Laffer curve for liquidity revenues, in principle with a different peak than the one for seignorage revenues.

3.5 Domestic and foreign incidence

While banks pay both sources of revenue to the government, they are competitive and earn zero profits. Therefore they pass these costs on to their depositors, both foreign and domestic.

We can split the incidence of these revenues between domestic and foreign agents by using the shares of deposits held by each, respectively d^h/D and d^f/D adding to 1. How these vary with an increase in the supply of offshore money depends on what policy does about its foreign reserves $B^{\$}$.

In one case, policy keeps this fixed. Then, an equilibrium increase in deposits will keep the shares of domestic and foreign deposits unchanged.

In the other case, say that policymakers sterilize the increase in offshore money M by raising at the same time their holdings of foreign reserves $B^{\$}$. By doing so, they can keep the exchange rate $E^{\$}$ unchanged. However, since the balance of payments pins down net foreign assets as a function of the current account, this increase in foreign reserves must be matched by an increase in foreign deposits. Relative to the previous case, not only the share of foreign deposits rises, but the total change in deposits will be different as well.

Therefore, there will be a change in both the fiscal offshore flows, as well as in their split between domestic and foreign incidence.

4 Quantifying the fiscal offshore revenues

This section quantifies the fiscal flows and their components discussed in the last section. After discussing the calibration of the model, it discusses these flows under two alternative policy regimes.

4.1 Calibration

Some of the parameters refer to the features of a small open economy, and we set them to standard values in the international macroeconomics literature. Others refer to the size of the offshore market, and we calibrate them to the Chinese experience with the CNH offshore currency. Others still refer to the share of foreign investors in the offshore market, for which we use data from global offshore markets. A final set of parameters refers to the choice of policy regime. Table 1 collects all the parameters, the calibration targets, and the final values at which each parameter was set.

Open economy parameters: We set the net growth rate of the economy g to be 0, and the size of the initial nontradable endowment to be 1: these are close to normalizations. We then have tradable output be 20% of nontradable output, and set $\iota = 0.25$ so that the import expenditure share $\iota/(1+\iota)$ is 20%. Finally, domestic and foreign returns are 2%.

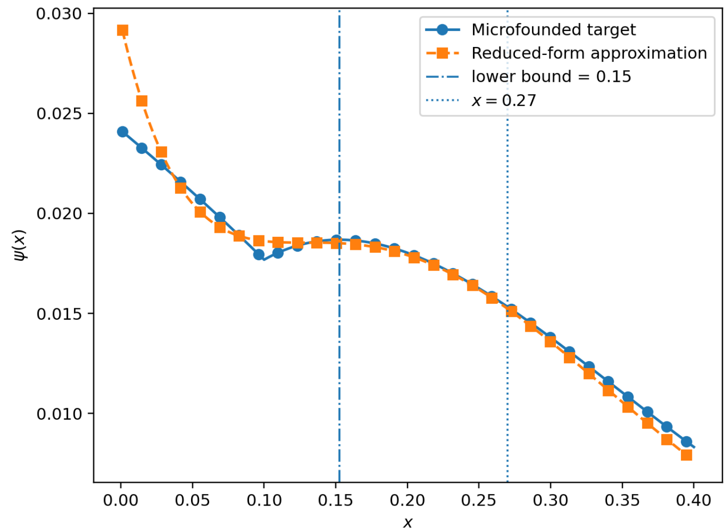
The liquidity cost function: We parameterize the marginal and total liquidity cost functions as:

$$\tilde{\phi}'(x) = -\lambda_2 \, x \, (1-x)^{\lambda_1} \qquad \tilde{\phi}(x) = \lambda_4 (1-x)^{\lambda_3} \,, \tag{33}$$

Note that in the equilibrium solution of the model, the relevant objects are $\phi'(x)$ and $\psi(x)$. The parameterization above implies that $\tilde{\psi}(x) \equiv \tilde{\phi}(x) - x\tilde{\phi}'(x) = \lambda_4(1-x)^{\lambda_3} + \lambda_2 x^2 (1-x)^{\lambda_1}$.

To choose the four λ's, we use the microfounded liquidity cost function in Bahaj and Reis (2026), evaluated using the data on the interbank CNH market in Hong Kong. Fitting the two functions above to that microfounded function, we estimate the λ's by nonlinear least squares in the range $x \in [0.15, 0.4]$, since the CNH $\psi(x)$ function has a peak at 0.15,

Figure 1 The calibrated $\tilde{\psi}(x)$ function against the target value.



and in the CNH data $x = 0.27$. Figure 1 plots the $\tilde{\psi}(x)$ against the targeted microfounded function. Over this range for x, τ starts at about 200bp when $x = 0.15$ and falls to around 100bp when $x = 0.4$. Appendix C provides more details on this exercise and displays the approximate functions of $\tilde{\phi}(x)$ and $\tilde{\phi}'(x)$ as well.

The size of the money market: The BIS locational banking statistics have data on cross-border deposits (excluding those held within the financial system) for the EUR, the GBP, the JPY and the CHF. We divide them by the output of the issuing country or currency area to get D/Y and average them over time. For each currency, they are respectively 0.167, 0.130, 0.134, and 0.066. We target an approximate average of these numbers of 0.15. The same statistics have cross border deposits not held by domestic residents, which we match to d^f/D. For each of the four currencies, they are 0.46, 0.75, 0.92, and 0.62, so we target 0.7. These two moments allow us to pick the domestic and foreign preference parameters for money, μ and Γ, respectively.

We choose the value of M to target the CNH money-deposit ratio: $x = 0.27$. It follows that $M = xD = x \times (D/Y) \times (E^{\$}y_T + y_{NT}) = 0.27 \times 0.15 \times 1.2 = 0.0486$.

Foreign exchange reserves: All that remains is to calibrate $B^{\$}$. Its size relative to M determines the level of the exchange rate. As a normalization, we target an initial value of $E^{\$} = 1$. This requires a $B^{\$}$ that is approximately 2.1 times GDP.

Table 1 Calibration

Object	Calibration target	Value
	Panel A. Small open economy parameters	
g	Growth rate of the economy	1
y_{NT}	Steady-state non-tradable output	1
y_T	Steady-state tradable output	0.2
ι	Import expenditure share	0.25
$R^{\$}$	Foreign gross return	1.02
β^{-1}	Domestic gross return	1.02
	Panel B. Liquidity cost function	
λ_1, λ_2	Liquidity cost function	$7.251, 1.900$
λ_3, λ_4	Marginal liquidity cost function	$10.50, 0.029$
	Panel C. Size of offshore money market	
μ	Target deposits-to-output D/Y ratio of 0.15	0.0008
Γ	Target foreign deposit share d^f/D of 0.7	0.0020
	Panel D. Foreign exchange reserves	
$B^{\$}$	Achieve $E^{\$} = 1$ in steady state	2.5281

Implications of these parameter choices: Before proceeding, it is useful to quickly inspect the implied values for other key values that result from this calibration. To start with the interest rates, $R^d = (g/\beta)(1-\psi) = 1.0045$ while $R^m = (g/\beta)(1+\tilde{\phi}'(x)) = 0.9666$. Then, turning to the liquidity cost function, the liquidity cost is $\tilde{\phi}(0.27) = 0.0011$, while the marginal liquidity cost is $\tilde{\phi}'(0.27) = -0.0524$. As for the cost of deposits, which appears in the model solution, it is $\tilde{\psi}(0.27) = 0.0152$. Finally, the tax wedge is $\tau = 0.0155$.

4.2 Quantifying the fiscal flows with a floating exchange rate

Following the discussion in section 3, we have to consider two options when it comes to foreign reserves $B^{\$}$. In the first case, covered in this section, as we vary M across counterfactuals, we keep $B^{\$}$ fixed, and $E^{\$}$ varies. In the second case, the exchange rate is pegged, and $B^{\$}$ moves with M instead; this is covered in the next section.

Figure 2a shows how changing the supply of offshore money changes the exchange rate as well as the equilibrium foreign deposits. Starting from the calibrated money-output ratio of 4.05%, increasing the stock of money devalues the domestic currency, as expected.

Also as expected, since the current account of the country barely changes and foreign reserves have not changed, foreign deposits increase roughly in line with the devaluation of the currency to keep the balance of payments in equilibrium.

Figure 2b then shows the fiscal offshore revenues F as a ratio to output Y. At the calibrated values, these revenues are equal to 0.23% of GDP. This is a modest amount. Running an offshore currency for the purposes of capital flow management would barely register a dent in the government's budget. If, at times, the country had to reduce the money supply given targets for the exchange rate or capital flows, the fiscal offshore revenues would be negative, but the losses could be easily absorbed into the central bank's other accounts, without requiring any explicit fiscal transfer from the government. The offshore money would therefore enjoy strong fiscal backing. It would be unlikely that this part of the country's integrated policy framework could be transformed into a tool for financial repression.

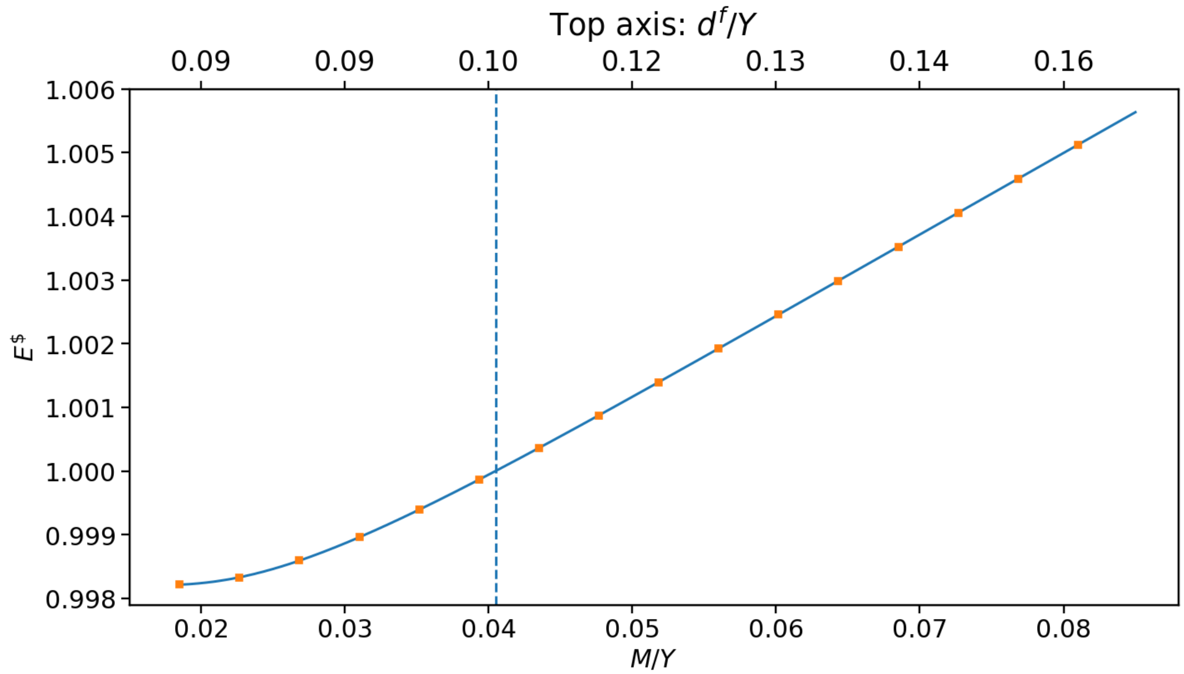
The top horizontal axis shows the implicit tax wedge in the model defined in equation (29), which at the baseline calibration is equal to 1.5%. While including an explicit Tobin tax in the model in this paper would require modifying the model in several ways, the equivalence result in Bahaj and Reis (2026) suggests an approximate comparison. Given the calibrated values of the net foreign assets of the country ($B^{\$} - d^f \approx 2 \times \text{GDP}$), then a back of the envelope calculation is that a Tobin tax would have a fiscal footprint worth of around 3% of GDP. Even with an NFA of around 50%, which is more comparable to what we see for many countries, the fiscal footprint of a financial transactions tax would still be about 3 times greater than the one of an offshore currency system calculated in figure 2b. Relative to financial transactions taxes, an offshore currency system has less of a fiscal footprint.

The figure also shows the Laffer curve for the fiscal offshore revenues. They increase with M at first, peaking when the offshore money to GDP ratio is about 5%. Noticeably, this curve is relatively flat: raising M from 2% of GDP to 8% generates a 85bp decrease in τ, yet the fiscal revenue to GDP ratio fluctuates 0.1bp. Lowering the tax rate expands the tax base sufficiently to keep revenues stable.

Figure 3 shows the decomposition of F into its seignorage and liquidity terms, split between domestic and foreign payers. Starting with the total for the fiscal offshore revenues in the top line, reading down the dashed vertical line, we can see the weight of the different components. Seigniorage accounts for 93%, while liquidity provision accounts for the remainder. With our parameter values, 70% of these costs are borne by foreigners, while

Figure 2 Varying the supply of offshore money under a floating exchange rate

(a) The exchange rate and foreign deposits



(b) Fiscal offshore revenues and the tax wedge

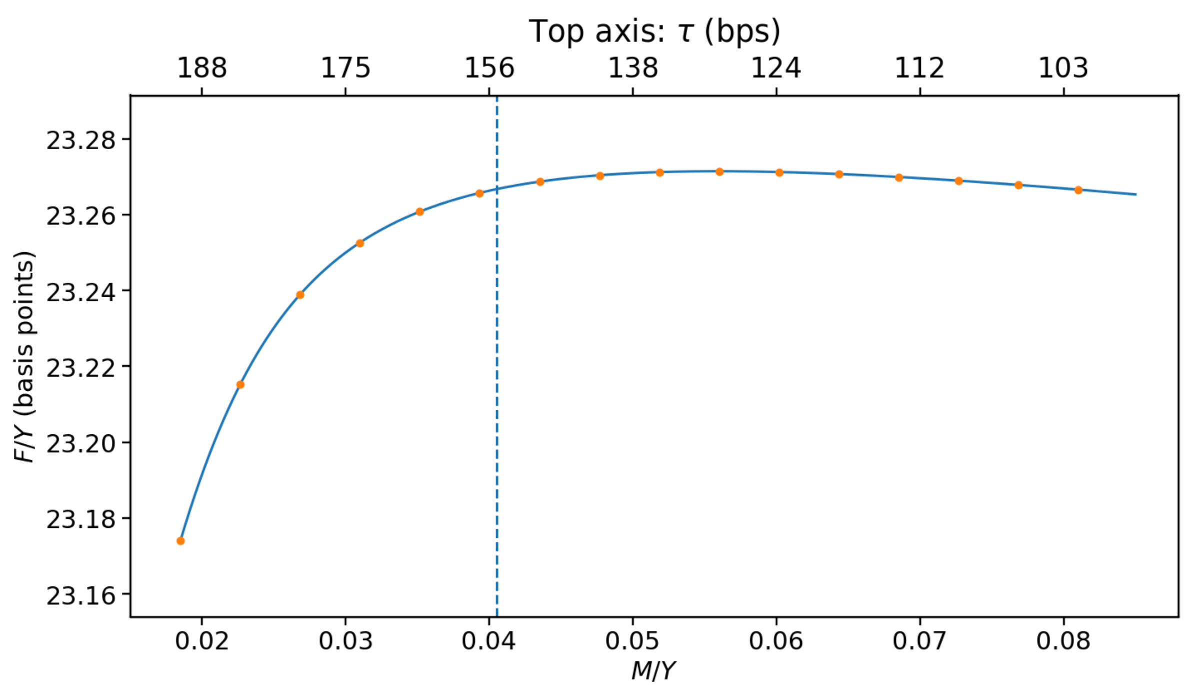
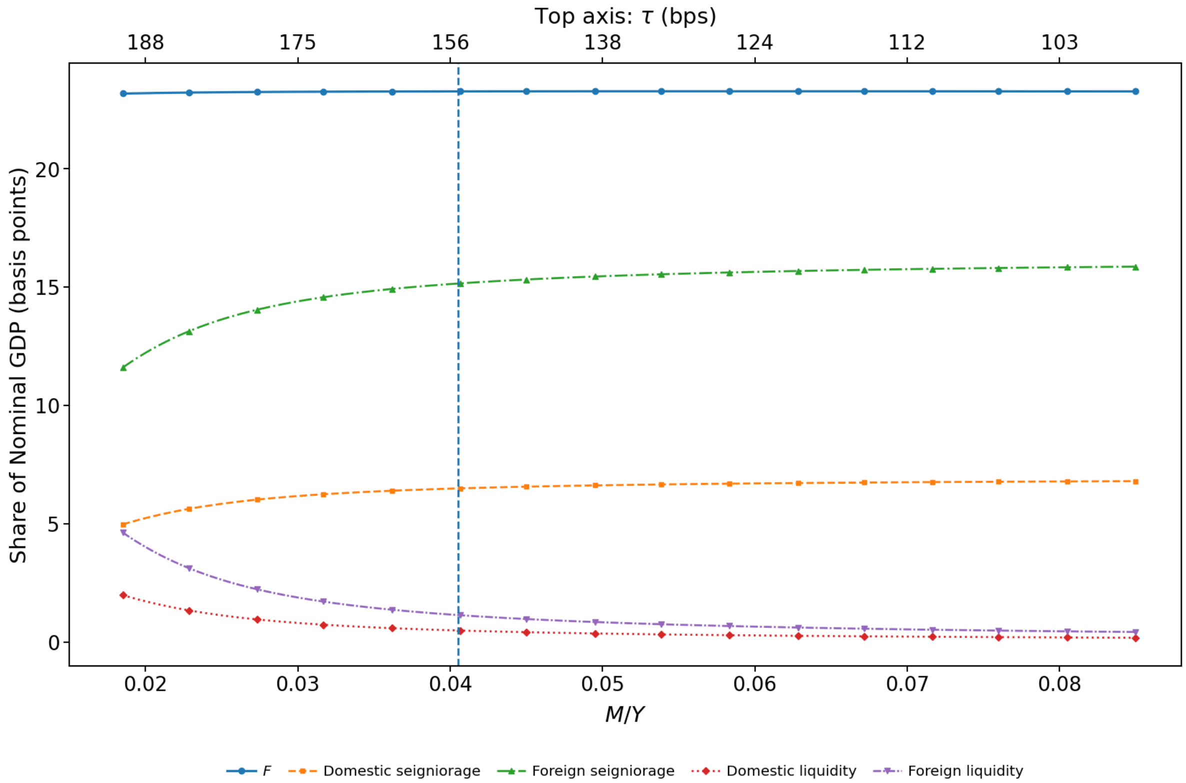


Figure 3 Varying the supply of offshore money under a floating exchange rate: fiscal decomposition



30% are paid by domestic households.

Moving along the horizontal axis, the lines in the figure show how each of the components of the fiscal offshore revenues changes with the supply of narrow money M. Thile their sum is flat, when M is low and liquidity is scarce the weight of the different components will vary. With scarcer money, banks face large liquidity costs, and so these make up a higher share of the offshore fiscal revenues, relative to seignorage. As M rises, this lowers the cost on banks but provides greater seigniorage revenues.

As for the split between foreign and domestic holders of money, the d^f/D ratio is unaffected by the supply of M. Foreigners and domestics face the same interest rates and have similar preferences over offshore deposits, so their deposit demand reacts proportionately to the change in the deposits rate R^d that is induced by a change in M. This result would break down if one type of agent had a deposit demand that was more elastic than the other. In that case, the more elastic one would take an increasing share of offshore deposits as M increases, and so would bear a higher share of the fiscal revenue to the government.

4.3 Quantifying the fiscal flows with a fixed exchange rate

Figure 4 shows instead the result of changing the supply of offshore money when policy responds to it by buying more foreign assets. This sterilizes the increase in money and keeps the exchange rate unchanged.

The figure in panel a) shows by how much $B^{\$}$ must rise as M rises. It also shows what happens to foreign deposits. As was the case with a floating exchange rate, the rise in money and deposits leads to an increase in the deposits held by foreigners. However, since foreign reserves are also rising, this increase is now smaller than it was before.

The figure in panel b) of 4 shows how the corresponding fiscal revenues vary, starting from the same vertical line as in figure 2. In principle, these two figures could look quite different. But in fact, they look almost identical. The fiscal offshore revenues behave in the same way. Our lessons are robust to this choice of policy regime.[4]

5 Two alternatives

This section asks two further questions: do the fiscal offshore revenues change significantly if the offshore currency increases its size as an international means of payment? And, how do they change if instead of changing the supply of money, policy loosens or tightens liquidity regulations?

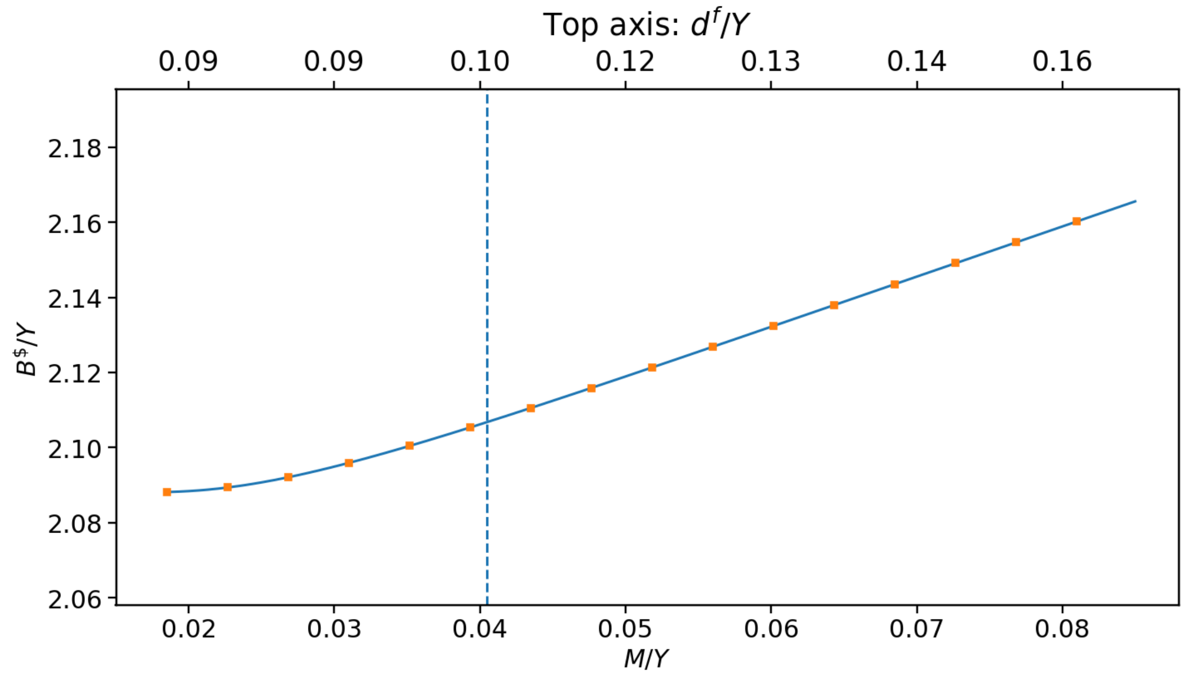
5.1 Impact of internationalizing the currency

Starting from the baseline calibration, we change the parameters determining the demand for money μ and Γ. We raise both of them so that the size of offshore deposits (D/Y) doubles, while the share of those deposits held by foreigners d^f/D stays the same. We think of this experiment as capturing what would happen if the offshore currency became more popular in making transactions. This is especially relevant in the Chinese experience, given the policy goal of increasing the usage of the offshore yuan internationally.

[4] Back to lemma 1, note that that sterilization, by raising foreign reserves will itself have fiscal consequences. Given our calibration, these are a 0.02 multiple of the $B^{\$}/Y$ in panel a), and so would amount to 0.14bp in the range of M/Y in the figure.

Figure 4 Varying the supply of offshore money under a fixed exchange rate

(a) The foreign reserves and foreign deposits



(b) Fiscal offshore revenues and the tax wedge

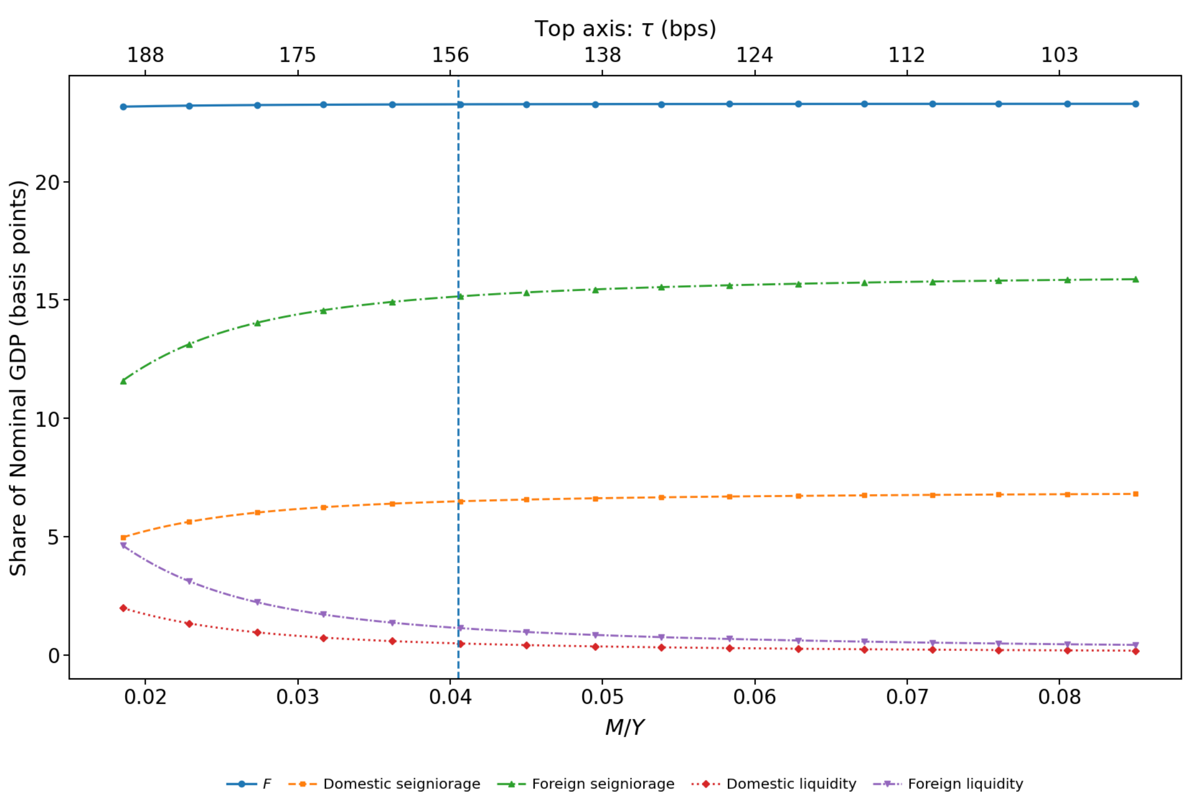


Figure 5 shows the new size of the fiscal offshore revenues and the breakdown between its four categories. Panel a) considers the case where policy responds to the increase in money demand by raising the money supply M so that the money-deposit ratio x stays the same. The fiscal revenues approximately double, from 0.23% of GDP, to 0.46% of GDP. The breakdown into different sources of revenues is also broadly unchanged. Therefore, we conclude that scaling up or down the size of the offshore market has little impact on our conclusions.

The panel b) in figure 5 shows what happens when the offshore money supply M is instead kept fixed. Not accommodating the rise in demand by providing more money has only a small fiscal impact: the revenues fall by 0.2bp of GDP compared to panel a).

The main difference with having a more international currency without a corresponding increase in the monetary base is distributional. Because the demand for deposits is matched by banks, the money-deposit ratio x falls in equilibrium. This raises the liquidity costs per deposit for banks. Therefore, the share of fiscal revenues coming from the operation of lending facilities as opposed to the classic seignorage revenue from printing money is higher.

At the same time, the revenues from seignorage still rise compared to the baseline case in figure 3, even though the narrow money supply M is the same. This is because the rise in the marginal benefit of reserves lowered the interest rate paid on the money to the banks in order to keep the onshore-offshore money peg.

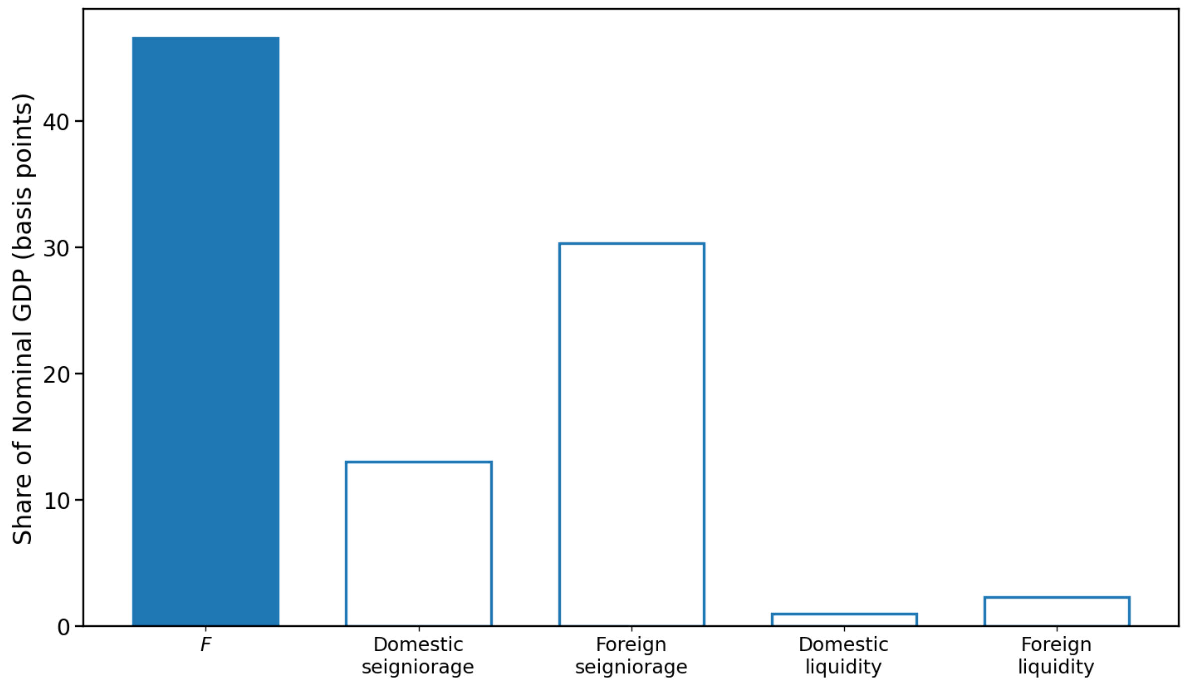
5.2 Liquidity policies

Bahaj and Reis (2026) discuss how liquidity policies—such as reserve requirements for banks, the interest rate charged on the discount window, or controls on the flow of liquidity between offshore and onshore wings of a bank—will shift the liquidity cost function. These policies can be as effective as changes in the supply of money to control the exchange rate. They work by changing the demand for money by banks, as opposed to the supply by the central bank. Bahaj and Reis (2026) found that in the Chinese experience with its offshore currency, these liquidity policies had played a larger role than policies affecting money supply in managing the exchange rate.

To investigate their fiscal implications, figure 6 shows the results of a different experiment. We proportionately raise the two scale parameters in the total and marginal liquidity cost functions (λ_2, λ_4), while keeping the parameters determining the shape of those functions (λ_1, λ_3) the same. As we scale these parameters, we record the resulting

Figure 5 Fiscal offshore revenues with a larger offshore market

(a) Fiscal decomposition with γ, Γ and M doubled



(a) Fiscal decomposition with γ, Γ doubled and M held fixed

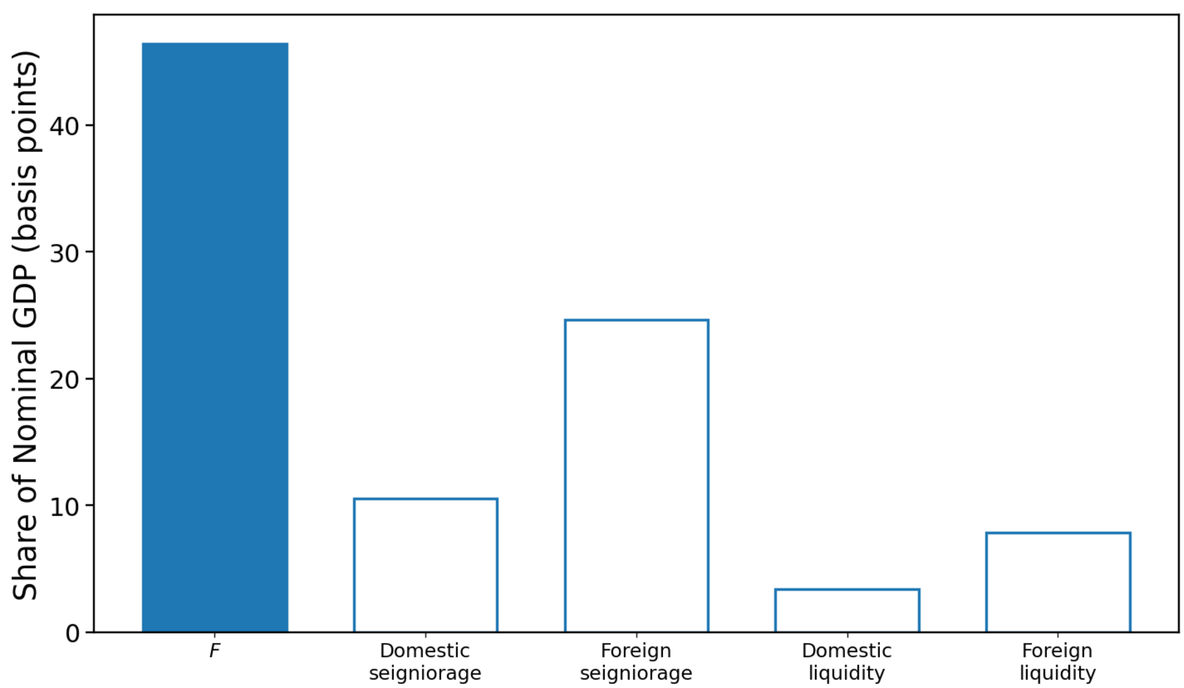
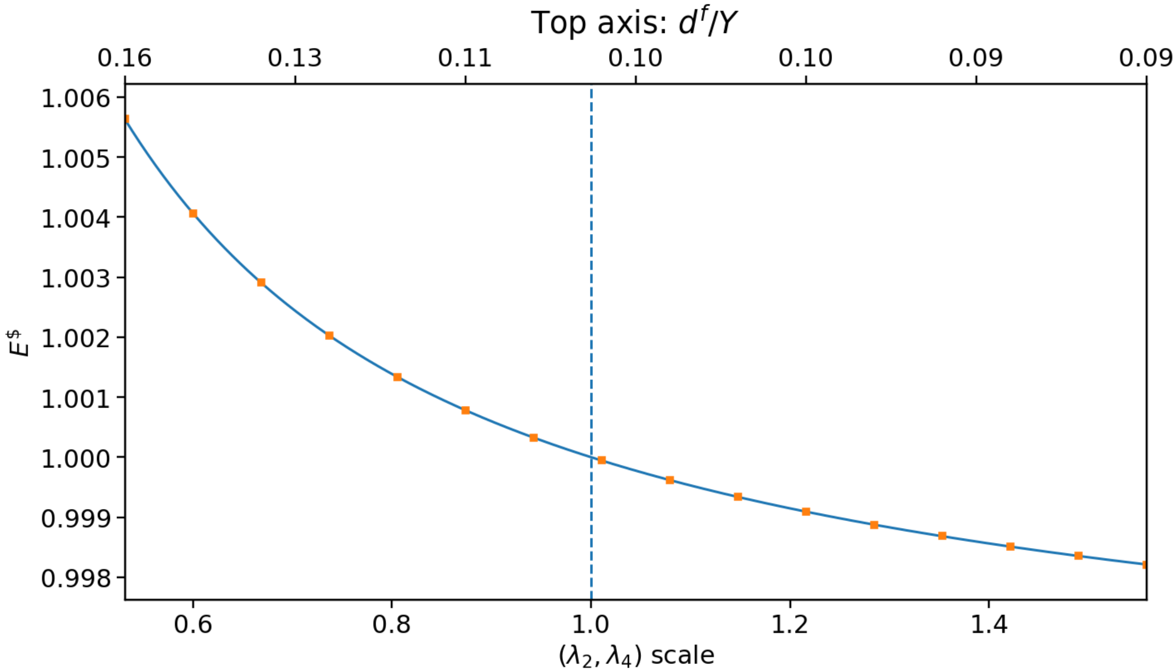
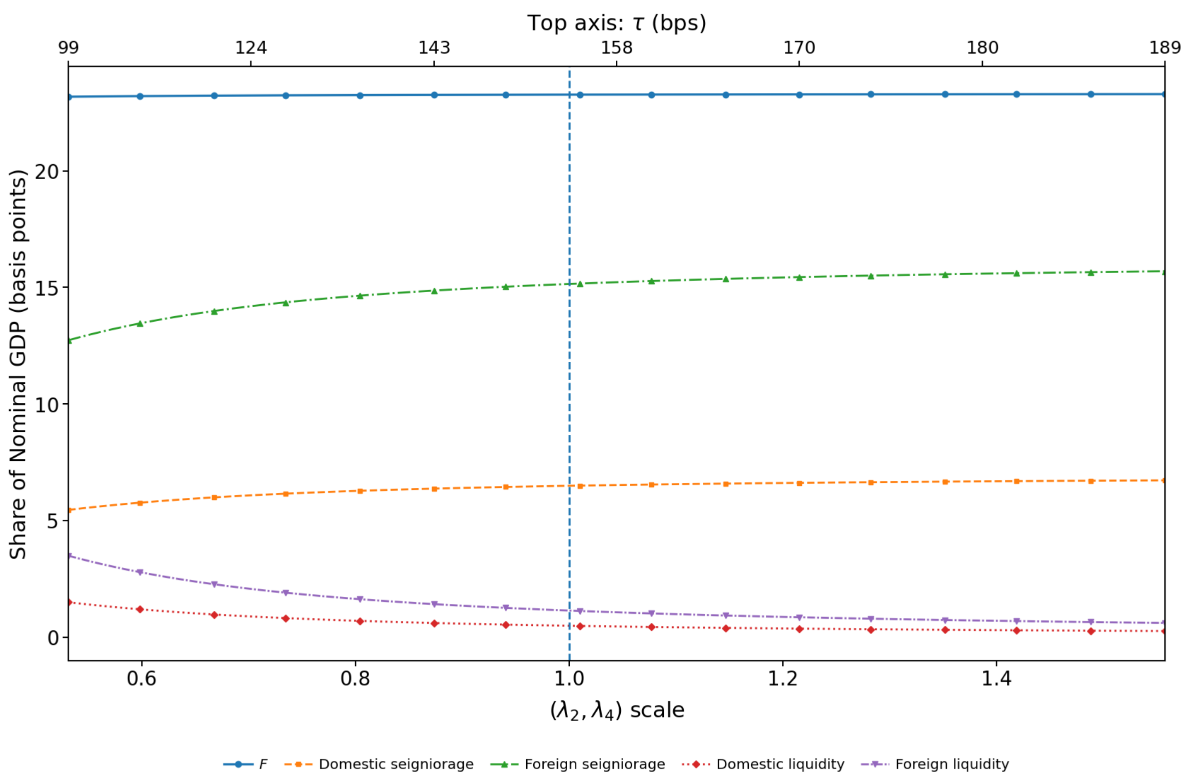


Figure 6 Varying liquidity policies instead of the money supply

(a) Foreign deposits and the exchange rate



(b) Fiscal offshore revenues



change in the implicit tax wedge τ and match this to the first experiment in figure 2.

As we vary the liquidity function parameters, then the exchange rate changes, just as it did when we varied the money supply instead. Now, as the costs of liquidity rises, the demand for offshore money rises, which appreciates its value, and so $E^{\$}$ falls. The top panel in figure 6 shows by how much the exchange rate moves.

The bottom panel shows the fiscal offshore revenues and its components. As before, the total revenues are close to unchanged as policy changes. Also the associated revenues are almost the same. Our conclusion that an offshore currency system has a soft fiscal footprint is robust to its operations being conducted by varying the money supply or liquidity policies.

The behavior of the components is quite different from the one in figure 2 when it was M changing. Now, an increase in the effective τ tilts revenues towards seigniorage and away from liquidity costs. This happens because when we raise liquidity costs, banks wish to hold more reserves against their deposits. Therefore, the seignorage revenue increases. This offsets the fall in the liquidity revenue that arises because banks issue fewer deposits.

6 Conclusion

The analysis of a macroeconomic policy is not complete without characterizing its fiscal implications. Many well-intended policies are never adopted because of the burden they put on the Treasury; many inferior policies are embraced because they bring in revenues in the short term.

The reality of financial transactions taxes is that they are used as much to manage capital flows as to collect revenues. The limits of using foreign exchange interventions are as much the ability to influence exchange rates, as they are instead the fiscal losses on the FX reserves of the country. The practice of macro-prudential policy is filled with forcing banks to hold government bonds at below-market rates.

This paper investigated the fiscal implications of managing the exchange rate and capital flows by using an offshore currency. A previously discussed advantage of this monetary tool relative to financial transactions taxes and macro-prudential policies is that it may be easier to implement and to adjust at high frequencies. This paper added a further advantage: its fiscal implications.

It found that the fiscal footprint of these policies is both small and relatively insensitive to the variation in the policy tools. This result was robust to whether policy chooses to float or peg to the exchange rate, to the scale of the demand for the offshore currency, and with the use of policies that affect money demand or money supply. It implies that these policies can be kept under the domain of the central bank, with minimal implications for the Treasury accounts, and they do not pose a significant temptation to be used for financial repression.

We also showed that the fiscal offshore revenues can be split into the seignorage from printing narrow money and the liquidity revenues from operating lending facilities. Seignorage was the largest of the two across experiments, but their relative sizes varied across policy experiments, as did the peaks of the Laffer curves for each component.

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Appendix

This appendix contains additional material mentioned in the text.

A Proof of proposition 1

Proof. Let the common gross growth rate of $\{y_{NT,t}, y_{T,t}, \mu_t, \Gamma_t, M_t, B_t^{\$}\}$ be g. Since nominal output is:

$$Y_t = y_{NT,t} + E_t^{\$} y_{T,t} ,$$

and $E_t = 1$ constant then, in the balanced-growth path, nominal output grows at the same rate as its two components:

$$\frac{Y_{t+1}}{Y_t} = g.$$

The household Euler equation implies that:

$$R_t = \beta^{-1} \frac{y_{NT,t+1}}{y_{NT,t}} = \frac{g}{\beta} .$$

Under the offshore peg, deposit pricing gives

$$R_{d,t} = R_t(1 - \psi(x_t)) = \frac{g}{\beta}(1 - \psi(x)) ,$$

if x is constant.

Divide the foreign-demand and deposit-market equations by Y_t. Since the three ratios:

$$\frac{\Gamma_t}{Y_t}, \qquad \frac{\mu_t}{Y_t}, \qquad \frac{M_t}{Y_t}$$

are constant, both equations reduce each period to the same static system in $(x_t, d_t^f / Y_t)$. Therefore x_t is constant on the BGP.

The foreign-demand equation then becomes

$$\frac{d^f}{Y} = \frac{\Gamma}{Y} \left[R^{\$} - \frac{g}{\beta}(1 - \psi(x)) \right]^{-1} .$$

This is the second equation in the proposition. The deposit-market equation becomes

$$\frac{d^f}{Y} = \frac{M}{Yx} - \frac{\mu}{Y\psi(x)} ,$$

which is the third equation.

Finally, noting that $B^{\$}_{t-1} = B^{\$}_t/g$ and that $d^f_{t-1} = d^f_t/g$ together with the deposit pricing equation above, the balance-of-payments condition becomes:

$$E^{\$}y_T - \iota y_{NT} = \left(1 - \frac{R^{\$}}{g}\right) E^{\$}B^{\$} + \left(\frac{1-\psi(x)}{\beta} - 1\right) d^f.$$

Dividing by Y gives

$$1 - (1+\iota)\frac{y_{NT}}{Y} = \left(1 - \frac{R^{\$}}{g}\right) \frac{E^{\$}B^{\$}}{Y} + \left(\frac{1-\psi(x)}{\beta} - 1\right) \frac{d^f}{Y},$$

which is the first equation in the proposition.

Since M_t, $B^{\$}_t$, d^h_t, d^f_t, and D_t all grow at the same rate g as Y_t, they are constant fractions of GDP. The transfer formula is linear in these terms, so T_t/Y_t is also constant. ■

B Proof of lemma 1

Proof. Start from the government flow budget:

$$T_t = (B^g_t - R_{t-1}B^g_{t-1}) + (M_t - R^m_{t-1}M_{t-1}) + \phi(x_t)D_t - E^{\$}_t(B^{\$}_t - R^{\$}B^{\$}_{t-1}).$$

On the balanced growth path, Proposition 1 implies constant ratios to GDP, $x_t \equiv x$, $g_b = g$, $g_M = g$, $g_B = g$, and $g_E = 1$. Moreover:

$$R^m = R(1+\phi'(x)) = \frac{g}{\beta}(1+\phi'(x)).$$

Dividing each term in the budget constraint by Y_t and using: $B^g_{t-1} = B^g_t/g$, $M_{t-1} = M_t/g$ and $B^{\$}_{t-1} = B^{\$}_t/g$ we obtain

$$\begin{aligned}
\frac{B^g_t - R_{t-1}B^g_{t-1}}{Y_t} &= \left(1 - \frac{R}{g}\right)\frac{B^g}{Y} = -\left(\frac{1}{\beta} - 1\right)\frac{B^g}{Y}, \\
\frac{M_t - R^m_{t-1}M_{t-1}}{Y_t} &= \left(1 - \frac{R^m}{g}\right)\frac{M}{Y} = \left(1 - \frac{1+\phi'(x)}{\beta}\right)\frac{M}{Y}, \\
-\frac{E^{\$}_t(B^{\$}_t - R^{\$}B^{\$}_{t-1})}{Y_t} &= -\left(1 - \frac{R^{\$}}{g}\right)\frac{E^{\$}B^{\$}}{Y} = \left(\frac{R^{\$}}{g} - 1\right)\frac{E^{\$}B^{\$}}{Y}.
\end{aligned}$$

Substituting each term into the flow budget constraint gives

$$\frac{T}{Y} = \left(1 - \frac{1+\phi'(x)}{\beta}\right)\frac{M}{Y} + \phi(x)\frac{D}{Y} + \left(\frac{R^{\$}}{g} - 1\right)\frac{E^{\$}B^{\$}}{Y} - \left(\frac{1}{\beta} - 1\right)\frac{B^{g}}{Y},$$

as claimed. ■

C Calibration of the reduced-form liquidity functions.

We calibrate the reduced-form functions $\tilde{\phi}(x,\lambda)$, $\phi'(x,\lambda)$, and $\psi(x,\lambda)$ using the microfounded banking block in Bahaj and Reis (2026, Section 7.4 and Appendix D.5). It derives the liquidity cost function from an underlying matching-and-bargaining environment that is calibrated to Chinese data, yielding microfounded counterparts for the level liquidity cost $\phi(x)$, the marginal liquidity cost $\phi'(x)$, and the per-deposit liquidity cost $\psi = \phi - x\phi'$. We take those microfounded objects as the target functions to be approximated in the quantitative model. As stated in the text, we then approximate these functions with the counterparts $\tilde{\phi}(x)$ and $\tilde{\phi}'(x)$ in equations (33) with four coefficients $(\lambda_1, \lambda_2, \lambda_3, \lambda_4)$.

An important point is that $\Phi'(.)$ is the partial derivative of $\Phi(.)$ with respect to the individual bank's reserve-deposit ratio, but $\phi'(x)$ is not the total derivative of $\phi(x)$. Recall that we defined $\phi'(x)$ to be the partial derivative of the $\Phi(m/d, M/D)$ function with respect to its first argument, evaluates where both arguments are equal to x. In words, for equilibrium, the relevant marginal liquidity-cost objects are the equilibrium $\phi(.)$ and $\phi'(.)$, which vary with the aggregate reserve-deposit ratio. This is why we can treat these two objects separately and use two different functions to approximate them: $\tilde{\phi}(x)$ and $\tilde{\phi}'(x)$.

We fit $(\lambda_1, \lambda_2, \lambda_3, \lambda_4)$ by nonlinear least squares to the microfounded targets over the economically relevant range of reserve-deposit ratios. In particular, we first identify the local peak of the microfounded $\psi(x)$, which occurs at $x_{\text{peak}} \approx 0.15$, and then fit the approximation over the interval $[x_{\text{peak}}, 0.4]$. This range covers the region relevant for the Chinese calibration, with the benchmark value $x = 0.27$ lying near the centre of the interval.

Following this procedure, the baseline fit implied by the Chinese microfoundation delivers:

$$(\lambda_1, \lambda_2, \lambda_3, \lambda_4) = (7.2507,\ 0.3736,\ 10.4929,\ 0.005797)\,.$$

We then rescale the level parameters so that the implied wedge $\tau(x) = \tilde{\psi(x)}/(1 - \tilde{\psi(x)})$ satisfies $\tau(0.27) = 0.015$, or 150 basis points at the benchmark Chinese value $x = 0.27$. Since varying the corridor width in the underlying microfounded model scales ϕ, ϕ', and ψ proportionally without materially changing their shape over the relevant range, this rescaling affects only λ_2 and λ_4. The final calibrated values used in the quantitative exercises are in table 1

Figure C.1 complements figure 1 in the main text by plotting the functions $\tilde{\phi}(x)$ and $\tilde{\phi}'(x)$ against their targets.

Figure C.1 The calibrated liquidity cost functions against the target value.

(a) $\tilde{\phi}(x)$ **(b)** $\tilde{\phi}'(x)$