On the Optimal Quantity of Stablecoins*

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Abstract

Stablecoins provide payment and decentralized finance (DeFi) services while generating demand for government securities. Their liquidity benefits can lower government borrowing costs and distortionary taxes, but competition with bank deposits can constrain lending and output. We develop a general-equilibrium model to characterize this trade-off and determine optimal issuance. Diminishing liquidity premia can generate a stablecoin Laffer curve, while payment demand, DeFi access, and banking competition shape fiscal and real effects. Calibrating the model to the U.S. economy, we find a welfare-optimal stablecoin stock of 2.89% of GDP. Optimal issuance depends on liquidity demand rather than government financing needs.

JEL Classifications: E42, E51, E62, G21.

1 Introduction

Can a financial innovation lower the government's cost of borrowing while raising the cost of financing productive activity? Stablecoins make this tension particularly salient. By facilitating digital payments and decentralized finance (DeFi),[1] stablecoins provide liquidity services that generate demand for assets backed by government securities.[2] This demand can lower government

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[1]Programmability and integration of stablecoins with financial applications can support cross-border payments, trade finance, and corporate cash management (Barr, 2025). Stablecoins also serve as settlement assets in DeFi. We abstract from detailed interactions between primary and secondary stablecoin markets; see Ma et al. (2025) on limited secondary-market arbitrageurs.

[2]The GENIUS Act, signed into law in July 2025, requires permitted stablecoins to be backed one-for-one by eligible liquid assets, including Treasury securities with remaining maturities of at most 93 days (U.S. Congress, 2025a). Treasury bills dominate most issuers' reserves; Tether holds over 60% in T-bills (Tether, 2026).

borrowing costs and create room for less distortionary taxation. Yet the same liquidity services compete with those provided by bank deposits, potentially eroding banks' funding advantages and restricting credit to productive firms.[3] Stablecoins thus create a fundamental trade-off between the fiscal benefits of liquidity provision and the costs of financial disintermediation. How this trade-off depends on the supply of stablecoins, and what it implies for their optimal quantity, are the central questions of this paper.

The policy relevance of these questions has grown with the expansion of stablecoin markets and mounting fiscal pressures in the United States. In fiscal year 2025, the federal deficit reached approximately $1.78 trillion, while publicly held federal debt approached 99% of GDP. Policymakers have increasingly viewed Treasury-backed stablecoins as a potential source of demand for government securities.[4] But the economic case for stablecoin expansion is less straightforward than the prospect of greater Treasury demand suggests. The fiscal advantage depends on the value of the liquidity services stablecoins provide, which may diminish as they become more abundant. Moreover, the substitution away from bank deposits can weaken credit supply and the tax base, potentially offsetting the government's financing savings. Evaluating stablecoin issuance therefore requires considering its effects on both public financing and private intermediation in general equilibrium.

We develop a general-equilibrium theory of the optimal quantity of stablecoins that brings these forces together. The central mechanism is an endogenous liquidity premium arising from the use of stablecoins in payments and DeFi lending. Because households value these services, they are willing to hold stablecoins at returns below those on otherwise comparable nontransaction assets. With competitive issuance and full Treasury backing, this willingness to accept lower returns is transmitted to the government's financing costs. Stablecoins thereby transform private demand for digital liquidity into a potential fiscal benefit. When these savings reduce distortionary taxes, they can stimulate production and, indirectly, bank lending.

The financing advantage, however, is limited by the scarcity of liquidity. As stablecoin issuance expands, additional balances relax payment constraints and increase the supply of funds available in DeFi markets. The resulting decline in DeFi yields reduces the return households can earn by reallocating idle balances. More generally, the marginal liquidity value of stablecoins falls as they become more abundant. Households consequently require higher financial returns, eroding the financing advantage associated with Treasury backing. Additional issuance therefore expands the quantity of government debt supported by stablecoin demand while reducing the financing benefit per unit. This mechanism creates an endogenous limit to the fiscal gains from stablecoin expansion.

[3]The Treasury Borrowing Advisory Committee cautions that substitution from deposits or money-market funds may offset Treasury demand and warrants monitoring bank-deposit effects (Treasury Borrowing Advisory Committee, 2025b).

[4]Bessent links stablecoin growth to greater Treasury demand (U.S. Department of the Treasury, 2025); Miran notes that this demand lowers government borrowing costs, all else equal (Miran, 2025).

A second force arises from competition with bank deposits. Deposits provide liquidity services that allow banks to attract funding at relatively low costs. When bank lending is constrained by profitability, these funding advantages support the supply of credit. By competing with deposits, stablecoins reduce bank funding profits and tighten lending constraints, potentially lowering employment, output, and tax revenues. The fiscal and intermediation effects consequently interact: cheaper government financing can permit tax reductions that stimulate credit demand, but disintermediation can simultaneously restrict credit supply and shrink the tax base. The net effect is not determined by Treasury demand alone.

We formalize these mechanisms in a monetary general-equilibrium model with payment frictions, DeFi lending, imperfectly competitive banks, and distortionary taxation. Households use deposits and stablecoins for ordinary transactions, while certain digital purchases require stablecoins; idle stablecoin balances can be lent to households with digital-payment needs. Competitive issuers fully back stablecoins with short-term government securities. Banks compete à la Cournot for deposits and finance firms' working capital subject to profit-based lending constraints, similar in spirit to Abadi et al. (2023). The government adjusts distortionary taxes to finance expenditures and debt service. We first characterize the mechanisms analytically and then quantify their implications in an extended model calibrated to the U.S. economy.

Our analysis yields four main theoretical results. First, we show that cheaper government financing does not necessarily lead to lower taxes or higher output. Although stablecoins can reduce government borrowing costs, they also weaken bank lending and shrink the tax base. Fiscal savings must therefore be sufficiently large to offset lost tax revenues before taxes can fall. For output to rise, the resulting tax relief must also outweigh the contraction in bank credit. Thus, generating fiscal savings, lowering taxes, and expanding output require progressively stronger liquidity benefits.

Second, we show that the endogenous liquidity premium can generate a stablecoin Laffer curve. When liquidity services are sufficiently valuable, net fiscal resources initially increase with issuance, reach an interior maximum, and eventually decline as the financing advantage erodes. If the initial liquidity premium is too small, issuance generates no positive net fiscal resources. Moreover, the quantity that maximizes fiscal resources generally differs from the quantity that minimizes distortionary taxes: the former depends on the financing advantage, while the latter also reflects changes in the tax base. The key insight is that the fiscal value of stablecoin issuance is governed by the equilibrium scarcity of liquidity, rather than by the scale of Treasury purchases alone.

Third, we distinguish the effects of greater digital-payment demand from those of broader DeFi access. Both strengthen the case for introducing stablecoins when issuance is initially small. At positive issuance, however, their implications can diverge. Greater DeFi access facilitates the reallocation of existing balances, but the resulting increase in lendable liquidity can depress DeFi yields enough to reduce the overall liquidity premium. This raises the returns required by stable-

coin holders and can increase taxes and reduce centralized production, even as digital consumption rises. By contrast, greater digital-payment demand increases the need for liquidity and sustains its scarcity value, supporting lower financing costs and higher economic activity. Thus, improving the allocation of existing liquidity and increasing the demand for liquidity need not have the same aggregate consequences.

Fourth, we uncover a potentially surprising role for banking competition. Greater deposit competition raises deposit returns, weakening the financing advantage that stablecoins derive from their liquidity services. At the same time, stronger competition can reduce the marginal loss of bank profits caused by stablecoin issuance, mitigating the contraction in lending capacity. When competition is sufficiently strong, the latter effect dominates: stablecoins can become more likely to expand lending and output even as their fiscal benefits diminish. Hence, the banking structures that make stablecoins most attractive as a source of government financing need not be those in which they have the most favorable effects on real economic activity.

Together, these results identify two distinct limits to stablecoin expansion. Diminishing liquidity premia restrict the fiscal gains from additional issuance, while deposit substitution creates a real cost through constrained financial intermediation. The interaction of these forces implies that neither fiscal savings nor payment efficiency alone provides a sufficient criterion for optimal issuance.

To evaluate their quantitative importance, we extend our basic model to incorporate foreign stablecoin holdings, endogenous DeFi participation, the reuse of payment receipts, financial intermediaries' liquidity requirements, producer markups, and issuer operating costs. We interpret stablecoin policy as a cap on the outstanding stock and evaluate domestic welfare conditional on foreign holdings.

Calibrating the extended model to the U.S. economy, we find a welfare-optimal stablecoin stock of 2.89% of benchmark GDP, equivalent to approximately $889 billion in 2025 dollars, compared with a calibrated stock of 1.00% of GDP. At this optimum, consumption-equivalent welfare increases by 0.35%, real output by 0.67%, and bank lending by 0.19%, relative to an economy without stablecoins. The output-maximizing stock is larger, at 3.78% of benchmark GDP, while welfare-optimal stocks remain between 2.41% and 3.05% across the domestic participation elasticities considered. Thus, stablecoins can improve welfare and economic activity, but the optimal quantity is modest relative to scenarios of substantially larger market expansion.

The fiscal transmission mechanism is quantitatively important. When the government uses financing savings to reduce distortionary taxes, the resulting increase in firms' credit demand can outweigh the contractionary effect of deposit substitution. By contrast, holding tax rates fixed and rebating fiscal savings through lump-sum transfers causes bank lending to fall by 0.12% relative to an economy without stablecoins at the same issuance level. This comparison highlights the role of distortionary taxation in translating the financing advantage of stablecoins into real economic

gains.

We also examine the conditions under which substantially greater issuance would be desirable. Treasury discussions and private forecasts have contemplated a global stablecoin market reaching approximately $3 trillion by 2030. In our calibration, this corresponds to 8.83% of benchmark GDP after inflation adjustment, roughly three times the welfare-optimal stock. Holding the domestic share fixed, issuance at this scale reduces welfare by 0.15% and output by 0.11% relative to their levels at the welfare optimum. Making it welfare-optimal requires digital-payment use to reach 3.23 times its benchmark level. Thus, a substantially larger market can be justified only by correspondingly stronger demand for the underlying liquidity services.

The composition of stablecoin demand also matters. Additional foreign holdings can support a larger global stock without raising domestic holdings, but when foreign holders supply liquidity to domestic DeFi markets, their participation depresses DeFi yields and weakens the domestic financing advantage. Finally, fiscal objectives imply different issuance scales: maximizing direct seigniorage favors a stock of 0.58% of benchmark GDP, whereas minimizing the distortionary tax rate favors 2.40%. Greater fiscal pressure does not necessarily justify greater issuance. In our model, higher government spending weakens production and liquidity demand, reducing the welfare-optimal stock. These findings reinforce the distinction between the government's demand for financing and the private sector's demand for liquidity.

Our paper contributes to the literature on the macroeconomics of digital currencies, which studies their effects on financial intermediation, monetary policy, and government financing (Keister and Sanches, 2023; Davoodalhosseini, 2022; Jiang and Zhu, 2021; Garratt et al., 2022). Within this literature, Barrdear and Kumhof (2022) and Burlon et al. (2024) examine the fiscal benefits of CBDC issuance, while Williamson (2022) studies disintermediation and collateral efficiency in optimal CBDC design. More directly, Hofmann et al. (2026) analyze stablecoins through opposing bank-lending and fiscal-space channels.[5] We share this fiscal-intermediation trade-off and show how payment services, DeFi lending, and imperfect bank competition jointly shape it. This distinguishes greater payment demand from greater access to existing liquidity and identifies the role of banking market structure. We derive conditions for fiscal resources, tax relief, and lending expansion, then quantify optimal issuance and the payment adoption needed to justify projected stocks. Xiao (2026) studies competition for collateral between banks and stablecoin issuers along the lines of Williamson (2022).

The banking side of this trade-off builds on research on deposit competition. Andolfatto (2021) and Chiu et al. (2023) show how CBDC competition for deposits can support bank lending, while Brunnermeier and Niepelt (2019) establish conditions for equivalence between private and public money. Complementing these theoretical contributions, Whited et al. (2023), Li (2023), and Li et al. (2026) study digital currencies using empirical industrial organization methods. Our em-

[5] Ahmed and Aldasoro (2025) provide empirical evidence that stablecoin inflows lower short-term Treasury yields.

phasis on cheap deposit funding relates to Drechsler et al. (2017, 2021), while substitution toward alternative bank funding connects to Chen et al. (2025). We extend this literature by showing how deposit-market conduct shapes both the credit cost of disintermediation and the fiscal benefit of stablecoin issuance.

The fiscal side connects to research on public debt as private liquidity (Woodford, 1990; Holmström and Tirole, 1998) and the trade-off between its insurance benefits and distortionary taxation (Aiyagari and McGrattan, 1998). Angeletos et al. (2023) show that additional debt supplies liquidity but erodes its scarcity premium, raising financing costs and shaping optimal policy. We connect this diminishing financing advantage to Treasury-backed stablecoins, whose payment and DeFi services sustain demand but also compete with bank funding. Optimal issuance therefore balances liquidity provision, tax distortions, and bank lending, linking our analysis to Bassetto and Cui (2024) on optimal financial distortions. These interactions explain both when fiscal relief expands output and why greater fiscal pressure need not justify more issuance.[6]

Finally, the payment and DeFi mechanisms underlying these results draw on the monetary-search tradition of Kiyotaki and Wright (1993), Trejos and Wright (1995), Lagos and Wright (2005), Rocheteau and Wright (2013), and Berentsen et al. (2007). Our treatment of liquidity reallocation relates particularly to Choi and Rocheteau (2021) and Cui et al. (2025). Within this tradition, Gu et al. (2026) study dynamics under fiscal and monetary leadership. We examine the long-run interaction of payment needs, DeFi lending, and constrained bank intermediation, bringing these mechanisms together to determine the optimal scale of stablecoins.

Our analysis delivers a broader implication: the optimal quantity of stablecoins is determined by the economic value of their liquidity services, net of the distortions they create in financial intermediation, rather than by the government's financing needs. Stablecoins can improve fiscal efficiency and economic welfare, but their benefits diminish as liquidity becomes abundant and may be offset by disintermediation. Understanding these competing forces is essential for assessing both the desirable scale of stablecoin markets and their macroeconomic consequences.

2 The Basic Model

Time is discrete and infinite. Each period has a DeFi borrowing and lending market (DFM), a decentralized goods market (DM), and a centralized market (CM). The economy contains a measure-two continuum of households, split evenly between buyers and sellers; a measure-one continuum of firms; N banks; a competitive bond fund; competitive stablecoin issuers; and a consolidated

[6]Cheaper financing alone need not stimulate activity. van der Kwaak (2026) shows that fiscal stimulus financed with interest-paying central bank reserves can lower government funding costs without additional output or inflation effects relative to debt financing under his irrelevance conditions. In our model, fiscal relief operates through distortionary taxes and bank lending constraints.

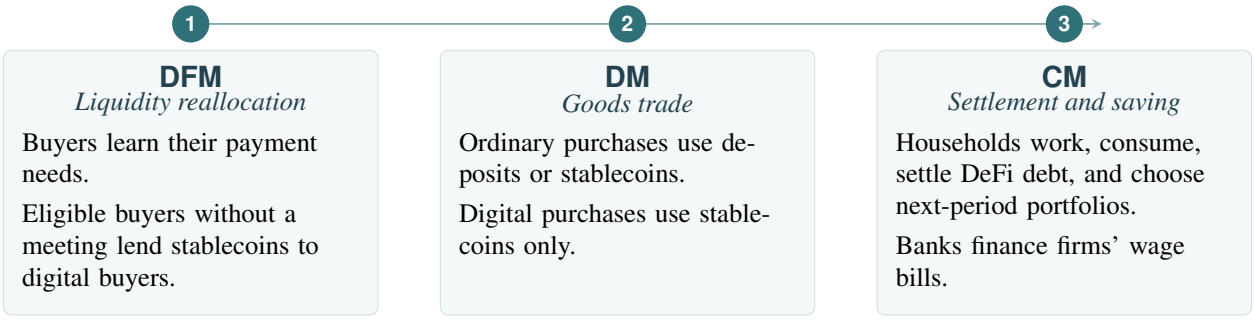

Figure 1: Within-period timeline. Note: Portfolios chosen in the CM carry into the next period's DFM.

government.

Sellers produce a perishable DM good for buyers; firms produce a perishable CM good for all households. Anonymity and limited commitment preclude unsecured DM credit, so purchases require bank deposits or stablecoins. At the start of each period, buyers learn whether they have an ordinary meeting, a digital meeting, or no DM consumption opportunity, with probabilities α_o, α_e, and $\alpha_n = 1 - \alpha_o - \alpha_e$, independently across buyers and periods.

Ordinary purchases accept deposits and stablecoins; digital purchases accept only stablecoins. Digital buyers borrow coins in the DFM at the net rate i^e and repay in the next CM. A fraction $\nu_D \in (0, 1]$ of buyers without meetings can lend idle coins, while ordinary buyers do not participate in DeFi and retain their balances for purchases.

In the CM, households consume, work, settle DeFi debt, and choose portfolios; firms borrow wage bills from banks to produce next-period goods. Banks, unlike households, enforce firm repayment, compete in deposits, and face profit-based lending constraints resembling capital requirements. All private profits are rebated equally to households.

Gross between-CM deposit and stablecoin returns, R^d and R^e, differ from the within-period DeFi rate i^e. Taxes on firms finance CM purchases and debt service. Purchases and long-debt market value are fixed and positive; taxes adjust with issuance. Figure 1 summarizes the timing. We study stationary equilibria, suppress dates, and use the subscript "$-$" for the preceding-period choices. We focus on zero inflation so that nominal and real returns coincide. Constant nonzero inflation just requires adjusting real returns.

2.1 The Households

We solve backward through CM choices, DM trade, and DFM lending.

CM The CM period utility function is $U(c) - h$, with labor h, $U' > 0$, $U'' < 0$, real wage w, and the CM price normalized to 1. Households access government debt only through the competitive fund or save in wholesale bank time deposits; neither provides DM liquidity. Inherited deposit,

stablecoin, and fund claims m_-^d, m_-^e, s_- pay principal plus interest in current CM goods. New claims m^d, m^e, s pay next CM and cost $1/R^d$, $1/R^e$, and $1/R^f$ per unit. Wholesale time deposits are equivalent non-payment savings and are included in s.

With the CM value $W(m_-^d, m_-^e, s_-)$ and between-period discount factor $\beta \in (0,1)$, the household solves the following dynamic programming problem:

$$W(m_-^d, m_-^e, s_-) = \max_{c,h,m^d,m^e,s} \quad U(c) - h + \beta J(m^d, m^e, s)$$
$$\text{s.t.} \quad c + \frac{m^d}{R^d} + \frac{m^e}{R^e} + \frac{s}{R^f} = wh + \Delta^B + \Delta^F + m_-^d + m_-^e + s_-.$$

Here J is the value function before meeting and access draws in the DFM, and Δ^B and Δ^F are per capita bank and firm dividends. The quasi-linear CM utility makes portfolio choices independent of wealth (Appendix A.1):

Lemma 1. *CM consumption is* $c = (U')^{-1}(w^{-1})$. *The CM value function is linear in financial positions, with slopes* $W_1 = W_2 = W_3 = 1/w$.

Households consume the same CM quantity, and buyers hold the same deposits and stablecoins. This quasi-linear utility is standard in monetary-search models and can arise from indivisible labor (Hansen, 1985; Rogerson, 1988).

DM A DM buyer holds deposits m_-^d, post-DFM coins $m^{e,j}$, and DeFi debt d. Consumption y yields utility $u_j(y)$, $j = o, e$, with $u_j(0) = 0$, $u_j' > 0$, and $u_j'' < 0$ over the relevant range; sellers produce the consumption good on the spot using labor one-for-one. Ordinary buyers retain $m^{e,o} = m_-^e$, giving liquidity $x^o = m_-^d + m_-^e$. Digital buyers borrow $\tilde{m}^e$, giving liquidity $x^e = m^{e,e} = m_-^e + \tilde{m}^e$.

Kalai bargaining with the buyer power $\theta_j \in (0,1]$ yields a compensation function for the seller defined as $g_j(y) = (1-\theta_j)u_j(y) + \theta_j y$, which specifies the CM utility that a seller needs to obtain to produce y. If $\theta_j = 1$, the buyer has all the bargaining power and only needs to compensate the seller's production cost. But if $\theta_j < 1$, the buyer needs to share a part of the utility from DM consumption with the seller. The seller obtains the CM utility indirectly by receiving payments from the buyer. Payments of real value x^j allow the seller to work $\hat{x}^j = x^j/w$ hours less in the CM and therefore generate $\hat{x}^j$ CM utility due to the quasi-linear utility. We refer to $\hat{x}^j$ as the wage-normalized liquidity. If a buyer has wage-normalized liquidity $\hat{x}^j$, consumption and payment in CM goods are

$$Y_j(\hat{x}^j) = \min\{g_j^{-1}\left(\hat{x}^j\right), \bar{y}^j\}, \qquad E_j(\hat{x}^j) = \min\{\hat{x}^j w, \bar{x}^j\}.$$

Here $\bar{y}^j$ is satiation consumption, satisfying $u_j'(\bar{y}^j) = 1$, and $\bar{x}^j = w g_j(\bar{y}^j)$. The payment costs the buyer E_j/w units of utility. The marginal liquidity premium is

$$\lambda_j(\hat{x}^j) = \max\{u_j'(Y_j(\hat{x}^j))Y_j'(\hat{x}^j) - 1, 0\}, \qquad j \in \{o, e\}.$$

The premium is positive when constrained and zero when slack, since extra liquidity then adds no consumption.

Since d is in stablecoins, the DM value function of a type $j \in \{o, e\}$ buyer is given by

$$V_j(m_-^d, m^{e,j}, s_-, d) = u_j(Y_j(x^j/w)) - \frac{E_j(x^j/w)}{w} + W(m_-^d, m^{e,j} - d, s_-).$$

Appendices A.1 and A.2 derive these expressions.

DFM Following Berentsen et al. (2007), the competitive pool reallocates stablecoins only after payment needs are revealed. The ex-ante value function is $J = \alpha_o J_o + \alpha_e J_e + \alpha_n J_n$, where J_j denotes the DFM value function of a buyer with type $j \in \{o, e, n\}$.

Ordinary buyers do not participate in the DFM, so $J_o(m_-^d, m_-^e, s_-) = V_o(m_-^d, m_-^e, s_-, 0)$. If a digital buyer borrows $\tilde{m}^e \geq 0$, he needs to repay $d = (1 + i^e)\tilde{m}^e$ in stablecoins in the coming CM. The digital buyer's problem is given by

$$J_e(m_-^d, m_-^e, s_-) = \max_{\tilde{m}^e \geq 0} V_e(m_-^d, m_-^e + \tilde{m}^e, s_-, (1 + i^e)\tilde{m}^e).$$

Positive borrowing satisfies

$$i^e = \lambda_e(x^e/w). \tag{1}$$

A no-meeting buyer has access with probability ν_D and lends all coins at positive rates, giving expected value

$$J_n(m_-^d, m_-^e, s_-) = \nu_D W(m_-^d, (1 + i^e)m_-^e, s_-) + (1 - \nu_D)W(m_-^d, m_-^e, s_-).$$

At $i^e = 0$, indifference over lending quantities leaves this value unchanged. The baseline abstracts from collateral; Appendix A.9 derives the same borrowing conditions with abundant collateral.

Let Z^d and Z^e be aggregate claims chosen today in CM goods, which are also equal to each buyer's choices m^d and m^e due to our quasi-linear utility specification (Lemma 1). Their inherited values Z_-^d and Z_-^e are also equal to each buyer's pre-DFM holdings m_-^d and m_-^e as symmetric buyers have unit mass and sellers hold no payment balances. At positive pool rates, market clearing requires

$$\underbrace{\alpha_n \nu_D Z_-^e}_{\text{eligible idle balances}} = \underbrace{\alpha_e \tilde{m}^e}_{\text{aggregate digital borrowing}}.$$

Consequently, total liquidity available for goods trade is

$$x^o = Z_-^d + Z_-^e, \qquad x^e = \frac{\alpha_e + \alpha_n \nu_D}{\alpha_e} Z_-^e.$$

The latter equation determines the DFM rate through (1) given the aggregate stablecoin balances.

When digital buyers are satiated, $i^e = 0$ and some eligible balances can remain idle. More generally, clearing satisfies $0 \leq \alpha_e \tilde{m}^e \leq \alpha_n \nu_D Z_-^e$ and $i^e(\alpha_n \nu_D Z_-^e - \alpha_e \tilde{m}^e) = 0$.

Portfolio Choices / Euler Equations In a stationary equilibrium, we have $Z_-^d = Z^d$ and $Z_-^e = Z^e$, hence $x^o = Z^d + Z^e$ and, with positive borrowing, $x^e = (\alpha_e + \alpha_n \nu_D) Z^e / \alpha_e$. Combining marginal values gives the portfolio conditions (Appendix A.1), with hats denoting wage normalization.

Lemma 2. *In a stationary equilibrium, the household Euler conditions are*

$$\begin{aligned} 1 &\geq \beta R^d [1 + \alpha_o \lambda_o(\hat{x}^o)], \\ 1 &\geq \beta R^e [1 + \alpha_o \lambda_o(\hat{x}^o) + \alpha_e \lambda_e(\hat{x}^e) + \alpha_n \nu_D i^e], \\ 1 &\geq \beta R^f. \end{aligned}$$

Each condition holds with equality for an asset held in positive amounts.

The deposit Euler equation defines inverse demand $R^d = \mathcal{R}(Z^d; Z^e)$: forgone consumption is balanced against discounted redemption and ordinary-payment services. Stablecoins additionally provide digital-payment services and income from lending idle balances. With positive borrowing, $i^e = \lambda_e(\hat{x}^e)$ combines these benefits into $(\alpha_e + \alpha_n \nu_D)\lambda_e(\hat{x}^e)$. Positive finite non-payment savings, through the fund or deposits, require $R^f = 1/\beta \equiv 1 + r$.

2.2 Firms and Financial Intermediaries

Firms A firm lives from one CM to the next, borrowing ℓ / R^L from banks against payoff ℓ to finance wages wh and produce $f(h)$ next CM. Taking output tax τ as given, it solves

$$\max_{h, \ell \geq 0} \beta[(1-\tau) f(h) - \ell] \qquad \text{subject to} \qquad \ell = R^L w h.$$

Substitution and aggregation across the unit mass of firms give

$$(1-\tau) f'(H) = R^L w, \qquad \text{and} \qquad L = R^L w H.$$

Here L is aggregate loan plus interest and L/R^L is principal. Profits are transferred to households as dividends.

The bond fund The fund invests s/R^f exclusively in long-term government bonds and pays s next CM. Thus R^f equals their return, including coupons and continuation value (Appendix A.3). Equivalent to direct bond holding here, the fund accommodates the quantitative extension.

Banks Banks commit to deposit repayment and enforce firm repayment. They issue retail deposits, finance working capital, and hold long-term bonds or borrow wholesale at R^f, with Cournot deposit competition and perfect loan-market competition.

Bank positions are next-CM repayment values: loans ℓ_j, deposits z_j^d, and the bond portfolio b_j, including coupons and continuation value net of wholesale repayments. Principal values are ℓ_j/R^L, z_j^d/R^d, and b_j/R^f; aggregates are $L = \sum_{j=1}^N \ell_j$ and $Z^d = \sum_{j=1}^N z_j^d$.

Bank j takes R^L, R^f, inverse deposit demand $\mathcal{R}$, rivals' repayments $Z_{-j}^d = \sum_{i \neq j} z_i^d$, and next-CM stablecoin claims Z^e (including interest) as given and solves

$$\begin{aligned} \max_{\ell_j, z_j^d \geq 0,\, b_j \in \mathbb{R}} \quad & \Delta_j^B \equiv \ell_j + b_j - z_j^d \\ \text{s.t.} \quad & \frac{\ell_j}{R^L} + \frac{b_j}{R^f} = \frac{z_j^d}{\mathcal{R}(z_j^d + Z_{-j}^d; Z^e)}, \\ & \frac{\ell_j}{R^L} \leq \chi \Delta_j^B. \end{aligned}$$

Profit Δ_j^B is net repayment income. The balance-sheet constraint equates principal raised and invested; the lending constraint ties loan principal to profits, capturing a restriction similar in spirit to capital requirements.[7]

We focus on the case with $R^L > R^f$ and $\chi(R^L - R^f) < 1$, which implies a binding lending constraint. Symmetry across N banks gives the following result.

Proposition 1. *The interior equilibrium deposit-rate markdown satisfies*

$$R^f - R^d = R^f \frac{Z^d}{N R^d} \frac{\partial \mathcal{R}(Z^d; Z^e)}{\partial Z^d}. \tag{2}$$

Proof. See Appendix B.1. □

The derivative fixes wages, other returns, and stablecoin supply. Attracting deposits requires $\partial \mathcal{R}/\partial Z^d > 0$, reducing funding per promised repayment. Banks therefore restrict issuance, giving $R^d < R^f$. Greater return sensitivity raises the markdown at fixed R^f and funding per bank $Z^d/(NR^d)$.

The binding lending constraint gives

$$\frac{L}{R^L} = \chi \frac{Z^d}{R^d} \frac{R^f - R^d}{1 - \chi R^L + \chi R^f}. \tag{3}$$

Household dividends come from inherited bank positions. Stablecoin competition changes deposit demand, profits, and thus lending capacity.

Stablecoin Issuers Competitive issuers fully back coins with short-term government debt yielding R^s. Without operating costs, $R^s = R^e$; the full model relaxes this restriction. With government repayment obligation B^s, backing requires $B^s/R^s = Z^e/R^e$. The short-debt return lies below the fund return, so households and banks do not hold it.

[7] Banks choose promised deposit repayments rather than the principal raised when deposits are issued. The two formulations are not equivalent but yield similar quantitative results. We use the former for analytical tractability.

2.3 Stationary Equilibrium with Government Debt Policy

In a stationary economy, the government fixes long-term bonds issuance B^b/R^f and chooses short-term bonds issuance B^s/R^s. Assuming competitive pass-through $R^e = R^s$, we have $B^s/R^s = Z^e/R^e$ because stablecoins are backed by short-term bonds one-for-one. The government taxes cover its purchases and net debt service. We then have the government budget constraint

$$\tau f(H) = G + (R^f - 1)\frac{B^b}{R^f} + (R^e - 1)\frac{Z^e}{R^e}. \tag{4}$$

Definition. Given G, B^b/R^f, stablecoin policy Z^e/R^e, and the model's primitives, a stationary equilibrium consists of $(c, H, L, Z^d, R^d, R^e, R^L, w, \tau, i^e)$, DM allocations, and asset holdings such that households, firms, banks, and issuers optimize, the DFM clears, and the government budget (4) holds. The CM goods and loan markets satisfy $2c + G = f(H)$ and $L = wHR^L$. The deposit market clears at $Z^d = \sum_j z_j^d$ and $R^d = \mathcal{R}(Z^d; Z^e)$, and short-term debt satisfies $B^s/R^s = Z^e/R^e$. The bond fund and banks together hold all long-term government debt. Fund shares and wholesale time deposits clear, with aggregate household acquisition spending on non-payment savings equal to $B^b/R^f - (Z^d/R^d - L/R^L) \geq 0$. Appendix A.3 collects the stationary equations and gives the corresponding gross holdings.

The next section uses these equilibrium conditions to compare the financing benefit of stablecoins with the loss of bank lending capacity.

3 Fiscal Limits of Stablecoin Issuance

Payment and DeFi services support cheap government financing but compete with deposits and erode lending profits. In this section, we study when fiscal relief offsets disintermediation and why bank competition can weaken financing benefits while facilitating credit and output expansion.

To derive theoretical results, we set $G = 0$ initially; Section 3.2 later allows $G > 0$ to study fiscal capacity and issuance limit. Throughout this section, we set $U(c) = \log c$ and $f(H) = H^{\varpi}$, $0 < \varpi \leq 1$; from Section 3.2, we use $\varpi = 1$ and specialize DM preferences as needed. We refer to the loan principal, L/R^L, as lending. We will fix G and B^b/R^f, and study the effects of increasing Z^e starting from zero, while allowing τ to adjust. The proofs are in Appendix B.

3.1 Equilibrium Characterization

To separate liquidity from wage responses, parametrize equilibria by $\hat{Z}^e = Z^e/w$ and normalize deposits as $\hat{Z}^d = Z^d/w$; actual issuance is $Z^e/R^e = \hat{Z}^e w/R^e$. The fund holds only long debt, without a short-debt buffer, so $R^f = 1/\beta \equiv 1 + r$, $r > 0$, is both the long-bond return and banks'

outside return (Section 2). Write $\xi = 1 + \chi(1 + r)$ and maintain a binding lending constraint: $R^L > 1 + r$ and $\xi - \chi R^L > 0$.

Households accept a low deposit return to finance ordinary purchases. As stablecoins supply more liquidity, banks must offer a higher return. The deposit Euler equation is

$$(R^d)^{-1} = \beta[1 + \alpha_o \lambda_o(\hat{Z}^d + \hat{Z}^e)].$$

Banks internalize this funding cost when choosing deposits. Using Lemma 2, the markdown condition (2), and the symmetry gives

$$N\lambda_o(\hat{Z}^d + \hat{Z}^e) + \hat{Z}^d \lambda_o'(\hat{Z}^d + \hat{Z}^e) = 0, \tag{5}$$

These equations determine normalized deposits and their return given $\hat{Z}^e < \hat{\bar{x}}^o \equiv \bar{x}^o/w$. Throughout this section, assume λ_o is strictly decreasing and twice continuously differentiable on $(0, \hat{\bar{x}}^o)$. Its elasticity $\varepsilon(x) = -x\lambda_o'(x)/\lambda_o(x)$ satisfies $\varepsilon'(x) > 0$, $\varepsilon(0+) < 1$, and $\varepsilon(x) \to \infty$ as $x \uparrow \hat{\bar{x}}^o$. These conditions ensure unique normalized deposits. Define wage-normalized funding profits as the return from investing all deposit principal in long bonds:

$$\mathcal{P}(\hat{Z}^e) \equiv \frac{(Z^d/R^d)(R^f - R^d)}{w} = \alpha_o \hat{Z}^d \lambda_o(\hat{Z}^d + \hat{Z}^e).$$

Here $\hat{Z}^d$ solves (5) given $\hat{Z}^e$.

Lemma 3. *For each $0 \le \hat{Z}^e < \hat{\bar{x}}^o$ and $N \ge 1$, (5) determines a unique wage-normalized deposit balance $\hat{Z}^d \in (0, \hat{\bar{x}}^o - \hat{Z}^e)$. Moreover,*

1. *A higher $\hat{Z}^e$ raises $Z^d + Z^e$ and R^d, and lowers $\mathcal{P}(\hat{Z}^e)$. It lowers $\hat{Z}^d$ if $x\lambda_o''(x)/\lambda_o'(x) > -N$ on $(0, \hat{\bar{x}}^o)$.*[8]

2. *For any $\hat{Z}^e < \hat{\bar{x}}^o$, a higher N increases $\hat{Z}^d + \hat{Z}^e$. As $N \to \infty$, $\hat{Z}^d + \hat{Z}^e \to \hat{\bar{x}}^o$ and $R^d \to 1/\beta$.*

We now study the impact on other equilibrium variables. We show that a stationary equilibrium can be determined by two equations in two variables τ and H. First, combine (3) and $L/R^L = wH$ to obtain

$$H = \frac{\hat{L}}{R^L} = \frac{\chi \mathcal{P}(\hat{Z}^e)}{\xi - \chi R^L}, \tag{6}$$

where $\hat{L} = L/w$. By Lemma 3(1), issuance lowers $\mathcal{P}(\hat{Z}^e)$ and hence hours and normalized lending at fixed R^L: the direct *bank disintermediation effect*. The fiscal channel operates through τ, changing firms' labor and credit demand and thus equilibrium R^L and H.

[8] This condition holds if $\theta_o = 1$, $N \ge 2$, and u_o is CRRA with a coefficient less than one.

Recall that the firm's problem yields $R^L = (1-\tau)\varpi H^{\varpi-1}/w$, while household optimality and goods clearing give $c = w$ and $2w = H^{\varpi}$. Combine them with (6) to obtain

$$\tau = 1 - \frac{\xi H - \chi \mathcal{P}(\hat{Z}^e)}{2\chi\varpi}. \qquad \text{ME}$$

This equation defines equilibrium hours H as a decreasing function of τ: a higher tax rate reduces employment and production.[9] We refer to this relationship as the market equilibrium curve (ME).

The second equation can be derived from the government budget constraint (4). The stablecoin return determines backing-debt costs and the tax rate needed at given activity. For $\alpha_e > 0$, let $\alpha_s = \alpha_e + \alpha_n \nu_D$ combine purchase and lending opportunities, and define the liquidity premium

$$\Lambda(\hat{Z}^e) \equiv \alpha_o \lambda_o(\hat{Z}^d + \hat{Z}^e) + \alpha_s \lambda_e(\alpha_s \hat{Z}^e/\alpha_e).$$

Then it follows from Lemma 2 that the Euler equation of stablecoins can be rewritten as $(R^e)^{-1} = \beta[1 + \Lambda(\hat{Z}^e)]$. As $\hat{Z}^e$ increases, $\Lambda(\hat{Z}^e)$ decreases and the required stablecoin return R^e rises.

Recall that full backing and competitive issuance give $B^s/R^s = Z^e/R^e$ and $R^s = R^e$. Net debt service is therefore $(1 - 1/R^e)Z^e$, which we normalize by aggregate private CM consumption, $2c = 2w = f(H) = H^{\varpi}$:

$$\mathcal{D}(\hat{Z}^e) = \frac{\hat{Z}^e}{2}[1 - (R^e)^{-1}] = \frac{\beta \hat{Z}^e}{2}[r - \Lambda(\hat{Z}^e)].$$

It implies that stablecoins generate net resources if and only if $R^e < 1$. Use $\mathcal{D}(\hat{Z}^e)H^{\varpi}$ to eliminate the short-term debt servicing cost in (4). Then impose $G = 0$ and rearrange to obtain the government budget curve (GB):

$$\tau = \mathcal{D}(\hat{Z}^e) + \frac{rB^b/R^f}{H^{\varpi}}. \qquad \text{GB}$$

GB slopes downward because higher output expands the tax base, reducing the tax rate needed to finance a given expenditure. Any intersection of the two curves is an equilibrium if and only if the corresponding hours satisfy $H > \chi \mathcal{P}(\hat{Z}^e)$, which ensures a binding lending constraint.

Proposition 2. *For a fixed $0 \leq \hat{Z}^e < \hat{\bar{x}}^o$, there exist two debt thresholds $\underline{B}^b$, $\bar{B}^b$ and one deposit profit threshold $\bar{\mathcal{P}}$ such that:*

1. *If $\mathcal{P}(\hat{Z}^e) < \bar{\mathcal{P}}$ and $\underline{B}^b < B^b < \bar{B}^b$, there exist two steady-state equilibria with a binding lending constraint. The equilibrium with higher hours also has higher wages and CM output, and a lower tax rate.*

2. *If $B^b < \underline{B}^b$, there exists one steady-state equilibrium with a binding lending constraint.*

[9] The restriction $\tau \leq 1$ implies $H \geq \chi \mathcal{P}(\hat{Z}^e)/\xi$. Binding lending requires the stronger condition $H > \chi \mathcal{P}(\hat{Z}^e)$, equivalent to $R^L > 1 + r$.

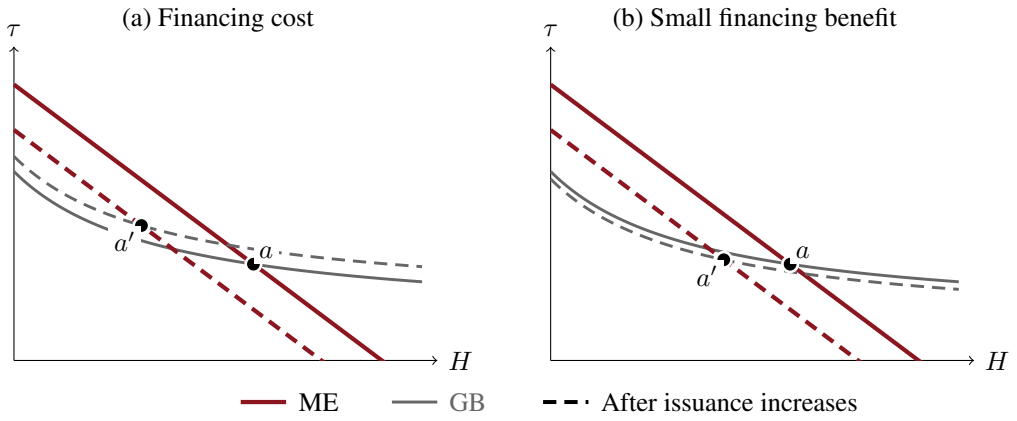

Figure 2: Stablecoin issuance with lower output. Note: Higher-hours intersections: dark red ME and gray GB, solid before issuance and dashed after, with equilibrium moving from a to a'. Financing costs rise in (a); benefits fail to offset the tax-base loss in (b). Both yield lower hours and higher taxes. ME is linear; GB is convex with positive inherited debt. Shifts are schematic and cropped axes do not start at zero.

Appendix B.3 proves the result. Linear ME and strictly convex GB have two intersections when $B^b < \bar{B}^b$. With sufficiently low funding profits and $B^b > \underline{B}^b$, both satisfy $H > \chi\mathcal{P}(\hat{Z}^e)$. Below $\underline{B}^b$, only the higher-hours intersection has binding lending; the lower-hours, higher-tax equilibrium has slack lending. We consider only the binding-lending equilibrium. When two of them exist, we select the higher-hours, lower-tax intersection of ME and GB, which is locally stable under budget balancing.[10]

Figures 2 and 3 show the two channels. Lower $\mathcal{P}(\hat{Z}^e)$ shifts ME down, reducing employment at any tax rate. Higher financing costs $\mathcal{D}(\hat{Z}^e)$ shift GB up, reinforcing the employment loss and raising taxes (Figure 2a). Even falling costs can leave taxes higher if the tax base contracts sufficiently (Figure 2b). Larger savings permit tax cuts, but hours rise only when relief outweighs disintermediation (Figure 3). CM output H^{ϖ} and lending move with hours: lending finances the wage bill, and wages rise with hours.

Thus $R^e < 1$ is necessary but insufficient for lower taxes and higher hours than without stablecoins: financing benefits must offset disintermediation and tax-base losses. If $R^e > 1$, issuance raises taxes and lowers hours. These results extend to $G > 0$ (Appendix B.3).

3.2 Fiscal Benefits and Crowding In

In this subsection, We derive conditions for tax relief and credit expansion at initial issuance, a small increase from zero. The required stablecoin return is then lowest and rises with the stock; if initial issuance generates no net fiscal resources, neither does a larger stock.

[10] A small tax increase contracts the tax base, but raises the required tax rate by less than the initial increase, so taxes adjust back. The higher-tax equilibrium is unstable under this rule (Appendix B.3). The comparison fixes $\hat{Z}^e$, so actual issuance can differ across the two allocations.

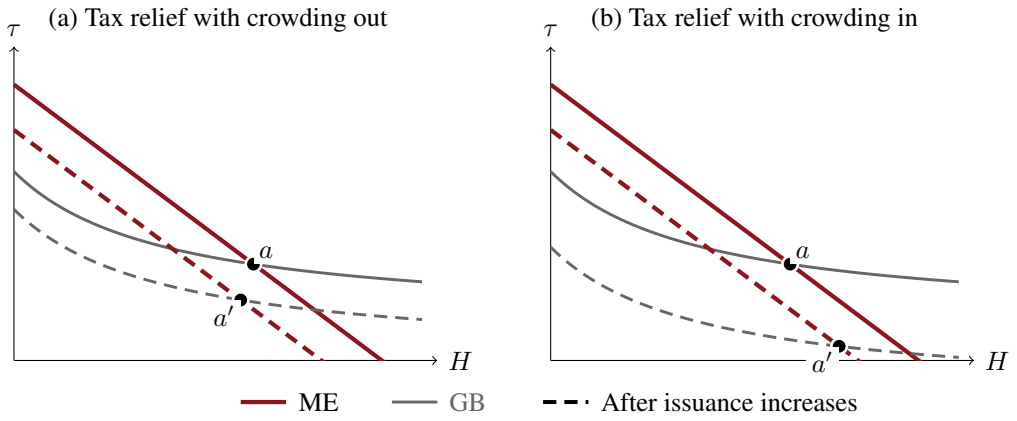

Figure 3: Stablecoin issuance with tax relief. Note: Conventions and ranges match Figure 2. Financing benefits lower taxes but leave lending and hours lower in (a); in (b), relief outweighs disintermediation and hours rise. Only the higher-hours intersection is shown.

For simplicity, we assume $f(H) = H$, which implies $H = 2w$ and $L/R^L = H^2/2$. Let $\gamma_e = \lambda_e(0) > 0$ and measure net fiscal resources by $\mathcal{F}(\hat{Z}^e) = (1/R^e - 1)Z^e = -\mathcal{D}(\hat{Z}^e)H$. Initial issuance generates net fiscal resources if $\mathcal{F}'(0) > 0$.

Proposition 3 (Financing benefits and fiscal crowding in)**.** *Consider a connected feasible issuance interval starting at zero on the higher-hours branch, with $\hat{Z}^e < \hat{\bar{x}}^o$. If B^b is not too big, there exist three thresholds for $\Lambda(0)$*

$$\kappa_R = r, \qquad \kappa_\tau = r - \frac{2\chi r B^b \mathcal{P}'(0)}{(1+r)\beta\xi H(0)^2}, \qquad \kappa_H = r - \frac{\mathcal{P}'(0)}{\beta},$$

such that $\kappa_R < \kappa_\tau < \kappa_H$ and

1. *Initial issuance generates fiscal resources iff $\Lambda(0) > \kappa_R$, lowers the tax rate iff $\Lambda(0) > \kappa_\tau$, and raises lending, wages, hours, and CM output if and only if $\Lambda(0) > \kappa_H$.*

2. *If $\Lambda(0) \leq r$, zero issuance minimizes taxes and maximizes lending and CM output on this interval.*

3. *If $\Lambda(0) > \kappa_\tau$ and there is a unique $\hat{Z}^e_c < \hat{\bar{x}}^o$ in this interval with $\Lambda(\hat{Z}^e_c) = r$, the tax rate is minimized by some $\hat{Z}^e \in (0, \hat{Z}^e_c)$ and net fiscal resources are also maximized by some $\hat{Z}^e$ in the same interval.*

Figure 4 summarizes the thresholds. Higher $\Lambda(0)$ lowers the required issuer return. Below r, $R^e > 1$ and $\mathcal{F}'(0) < 0$; above r, issuance saves financing costs, but tax-base contraction may still raise taxes. Tax relief requires $\Lambda(0) > \kappa_\tau$, while credit and output expansion require $\Lambda(0) > \kappa_H$. The latter is stricter because, with $\tau < 1$, a dollar of lost output costs less than a dollar of tax revenue: savings can offset the revenue loss without restoring output.

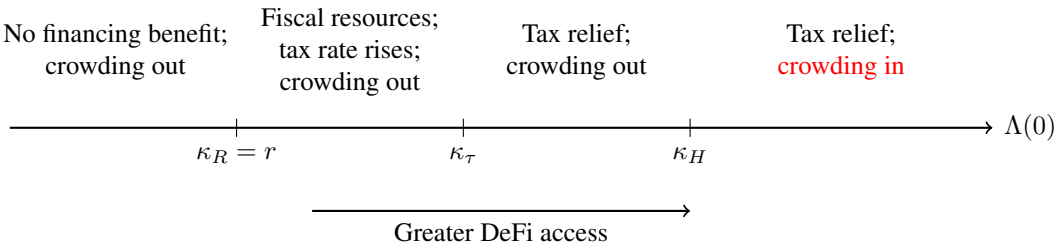

Figure 4: Fiscal resources, tax relief, and real crowding in. Note: Local responses to issuance from zero, with positive inherited debt. Crowding out (in) means lower (higher) bank lending and CM output. Greater DeFi access moves the economy rightward, holding other primitives fixed. Spacing is schematic; equality cases are omitted and feasible access need not cross every boundary.

DeFi services allow households to earn a return on idle stablecoins. Holding α_o fixed, greater access raises $\Lambda(0)$ at rate $\alpha_n\gamma_e$, while greater digital-payment demand raises it at rate $(1-\nu_D)\gamma_e$, since $\alpha_n = 1-\alpha_o-\alpha_e$. Neither changes ordinary allocations, $\mathcal{P}'(0)$, $H(0)$, or the three thresholds. Both therefore favor fiscal resources, tax relief, and crowding in at initial issuance. At full access, the payment-demand effect vanishes because idle coins already support digital purchases through lending.

Because Λ is continuous and strictly decreasing, including through digital satiation, $\Lambda(0) > r$ and a limit below r before deposits vanish imply a unique financing-cost crossing $\hat{Z}_c^e$, where $R^e = 1$.[11] Net fiscal resources are zero at both zero issuance and $\hat{Z}_c^e$, positive between them, and negative beyond; hence they attain a positive interior maximum. If $\Lambda(0) > \kappa_\tau$, taxes also attain an interior minimum. The maximizing and minimizing stocks need not coincide because issuance changes the tax base.

Positive government spending ($G > 0$). Define fiscal capacity as maximum inherited debt service supported by ME and GB over admissible hours. With linear production, $G > 0$ lowers capacity, but initial issuance raises an interior capacity maximum iff $\Lambda(0) > \kappa_H$, as at $G = 0$. Financing benefits must therefore offset lost lending and taxable output. Appendix B.5 derives the result and issuance bounds, conditional on remaining asset-market feasibility restrictions. This complements the opposing lending and fiscal-space channels in Hofmann et al. (2026).

3.3 Bank Competition and DeFi Access

Bank competition lowers deposit markdowns and the liquidity premium stablecoins command, reducing their fiscal benefits. However, if issuance destroys less bank profit, less tax relief is needed to offset lost lending capacity.

To compare these forces, express the initial issuance conditions in terms of the DeFi access

[11] A sufficient condition is $g_e(\bar{y}^e) \leq \alpha_s\hat{\bar{x}}^o/\alpha_e$ (Appendix A.6).

needed to meet each one. For $\alpha_o, \alpha_e, \alpha_n > 0$, define

$$\nu_j(N) = \frac{\kappa_j(N) - \alpha_o \lambda_o(\hat{Z}^d(0)) - \alpha_e \gamma_e}{\alpha_n \gamma_e}, \qquad j \in \{R, \tau, H\}.$$

Here $\hat{Z}^d(0)$ is ordinary liquidity at zero issuance and depends implicitly on N; ordinary consumption is $Y_o(\hat{Z}^d(0))$. Bank allocations at zero issuance, and hence these thresholds, are independent of ν_D. To characterize their competition response, assume λ_o is C^3 on $(0, \hat{\hat{x}}^o]$, with derivatives at satiation taken from below, $\lambda_o(\hat{\hat{x}}^o) = 0$, and $\lambda_o'(\hat{\hat{x}}^o) < 0$. Define

$$p(N) = -\frac{\hat{Z}^d(0)\lambda_o''(\hat{Z}^d(0))}{\lambda_o'(\hat{Z}^d(0))}, \qquad d(N) = N + 1 - p(N) > 0.$$

Here $\varepsilon(\hat{Z}^d(0)) = N$. The index $p(N)$ measures curvature of the liquidity premium, and $d(N)$ governs the local deposit response; primes on p denote derivatives with respect to N. When $\theta_o = 1$, $\lambda_o = u_o' - 1$ and $\hat{Z}^d(0)$ equals ordinary consumption, so $p(N)$ becomes relative prudence evaluated at zero issuance.

Proposition 4 (Competition and the two margins)**.** *Hold other primitives fixed and consider bank counts for which the regular smaller-tax equilibrium at zero issuance remains feasible.*

1. *The conditions for positive fiscal resources, tax relief, and lending and output crowding in are respectively $\nu_D > \nu_R$, $\nu_D > \nu_\tau$, and $\nu_D > \nu_H$. The thresholds satisfy $\nu_R < \nu_\tau < \nu_H$. Greater access strengthens all three sign conditions.*

2. *Competition raises ν_R strictly. It lowers ν_H precisely when*

$$\frac{(N-1)[2 - p'(N)]}{N + 1 - p(N)} > \frac{1}{1+r}. \tag{7}$$

3. *If, additionally, λ_o is C^4 on $(0, \hat{\hat{x}}^o]$, and $p'(N) \geq 0$ and $p''(N) \leq 0$ on $N \geq 1$, there is a unique $N^* > 1$ at which (7) holds with equality. The output threshold rises below N^* and falls above it, wherever the maintained equilibrium is feasible.*

Competition can therefore facilitate crowding in while weakening cheap financing. Beyond N^*, the marginal loss of bank profits and lending capacity falls, so less DeFi access suffices for crowding in but more is needed for fiscal resources (Figure 5). These local thresholds do not rank revenue, output levels, response magnitudes, or welfare. Uniqueness requires the shape restriction on p, not utility concavity alone. We treat N as continuous; integers describe monopoly ($N = 1$) and oligopoly ($N \geq 2$).

The intermediate regions retain the interpretation in Figure 4. The tax-relief threshold is a weighted average of the other two (Appendix B.6), which preserves its ordering but does not imply

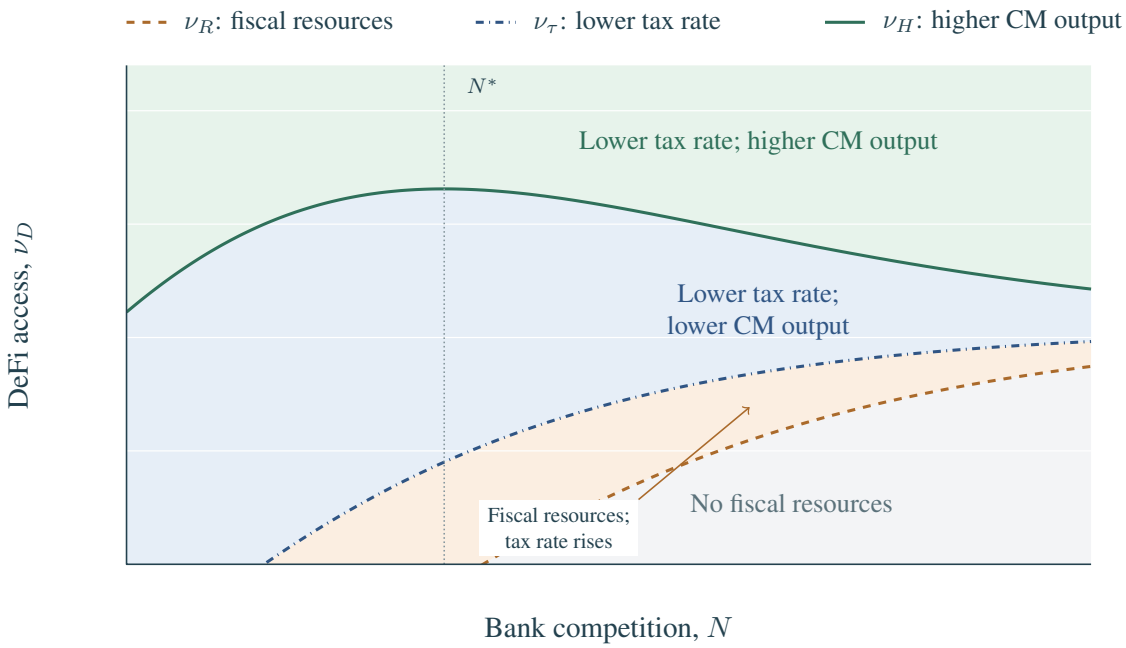

Figure 5: Bank competition, DeFi access, and local fiscal crowding in. Note: Local sign conditions hold above their curves. Competition raises ν_R but lowers ν_H beyond N^*; the shape of ν_τ is illustrative. Axes and spacing are schematic, with continuous N and a utility-dependent peak. For the ordinary CRRA example with $\theta_o = 1$ following Corollary 1, every integer $N \geq 2$ lies to its right.

a monotone competition response. If feasibility extends to $N \to \infty$, all three thresholds converge to $(r/\gamma_e - \alpha_e)/\alpha_n$ as the ordinary liquidity premium and marginal loss of deposit profits vanish.

The following corollary specializes (7) to familiar utilities with general bargaining power; full buyer power yields sharper bounds below.

Corollary 1 (Familiar utilities with general bargaining power)**.** *Let $\theta_o \in (0, 1]$ and consider the following ordinary utilities:*

1. ***CARA:*** $u_o(y) = M_o(1 - e^{-a_o y})/a_o$, $M_o > 1$, $a_o > 0$.
2. ***Quadratic:*** $u_o(y) = (1 + \gamma_o)y - b_o y^2/2$, $\gamma_o, b_o > 0$, *on* $[0, \bar{y}^o]$ *with* $\bar{y}^o = \gamma_o/b_o$.
3. ***CRRA:*** $u_o(y) = A_o y^{1-\sigma_o}/(1 - \sigma_o)$, $A_o > 0$, $0 < \sigma_o < 1$.

Increasing elasticity and $d(N) > 0$ hold for CARA and quadratic utility; maintain these conditions for CRRA, where they hold, in particular, if $0 < \sigma_o \leq 1/2$ or $\theta_o = 1$. Define a cutoff $N^* > 1$ by

$$\frac{(N^* - 1)[2 - p'(N^*)]}{N^* + 1 - p(N^*)} = \frac{1}{1 + r}.$$

For all three families, competition raises ν_R throughout. For CARA and quadratic utility, the cutoff exists and is unique: competition raises ν_H below N^* and lowers it above N^*. For CRRA, take

the largest solution, which exists and is finite; competition lowers ν_H above it. The CRRA cutoff is unique under the shape conditions in Proposition 4. Without those shape conditions, CRRA still has at most one cutoff on $[2, \infty)$, and any such crossing is from rising to falling ν_H (Appendix B.7). Thus all cutoffs other than the largest lie in $(1, 2)$. Increasing elasticity alone does not ensure uniqueness on the full domain; Appendix B.7 gives a counterexample.

Notice that $M_o > 1$ is needed for positive CARA trade because $u_o'(0) = M_o$ must exceed unit marginal cost. In contrast, A_o sets the scale of CRRA consumption but does not affect its competition cutoff.[12] For illustration, set $\theta_o = 1$. Appendix A.7 shows that the cutoffs are then unique and satisfy

$$\begin{aligned} 1 < N^*_{\text{CARA}} &< \frac{3+2r}{1+2r} < 3, \\ N^*_{\text{quad}} &= \frac{3+2r}{1+2r} < 3, \\ N^*_{\text{CRRA}} &= 1 + \frac{1-\sigma_o}{1+2r} \in (1, 2). \end{aligned}$$

Notice how low these cutoffs are under full buyer bargaining power: ν_H falls throughout $N \geq 2$ for CRRA and $N \geq 3$ for CARA or quadratic utility, even as ν_R rises. Easier crowding in therefore arises across a broad range of oligopolistic banking structures, not only near perfect competition. For CARA and quadratic utility, the falling region also includes $N \geq 2$ when $N^* < 2$; $N^* < 3$ alone does not rank the thresholds at two and three banks. Normalized deposits fall with issuance for $N \geq 2$ in these full-bargaining-power examples.

3.4 DeFi Access Beyond Initial Issuance

At positive issuance, greater DeFi access and greater digital-payment demand can have opposite effects because they change liquidity scarcity in different directions. At fixed $0 < \hat{Z}^e < \hat{\bar{x}}^o$, before digital satiation, access puts idle balances into use and raises consumption per digital buyer, $y^e = \alpha_s \hat{Z}^e / \alpha_e$. Its effect on the liquidity premium is

$$\frac{\partial \Lambda(\hat{Z}^e)}{\partial \nu_D} = \alpha_n [\lambda_e(y^e) + y^e \lambda_e'(y^e)].$$

The first term captures more opportunities to lend idle coins; the second captures the lower DeFi yield as buyers become less constrained. If the yield decline dominates, so that $\lambda_e(y^e) + y^e \lambda_e'(y^e) < 0$, holders require a higher issuer return. Higher debt-service costs then require higher taxes, discouraging hiring and reducing bank lending and CM output despite greater digital consumption.

[12] For digital trade, shifted CRRA utility has $u_e'(y) = A_e(y + \zeta_e)^{-\sigma_e}$, $\sigma_e, \zeta_e > 0$, and $A_e \zeta_e^{-\sigma_e} > 1$, which ensures finite $\gamma_e = A_e \zeta_e^{-\sigma_e} - 1$ and $\bar{y}^e = A_e^{1/\sigma_e} - \zeta_e$. CARA, quadratic, and other concave digital utilities with finite $u_e'(0+) > 1$ and the maintained satiation properties are also admissible. Their initial marginal value changes the access thresholds but not N^*. Appendix B.7 gives the derivations; Appendix A.6 gives shifted CRRA utility in levels.

Wage-normalized funding profits $\mathcal{P}(\hat{Z}^e)$ are unchanged at fixed normalized issuance, so this contraction is fiscal.

By contrast, increasing α_e with α_o fixed replaces no-meeting lenders with digital buyers. More buyers demand liquidity and fewer idle balances enter the pool, so consumption per buyer falls when DeFi is active. This sustains the yield and liquidity premium: at fixed normalized issuance, $\Lambda(\hat{Z}^e)$ weakly rises, the required issuer return and tax rate weakly fall, and lending and CM output weakly rise. The adverse access effect also holds at fixed actual issuance Z^e/R^e when $\partial_{\hat{Z}^e}(Z^e/R^e) > 0$ and $\tau \geq 0$.

For example, quadratic digital utility gives $\lambda_e(y) = \gamma_e - b_e y$, $\gamma_e, b_e > 0$, below $\bar{y}^e = \gamma_e/b_e$. The access effect reverses at $y^e = \bar{y}^e/2$, while the payment-demand effect remains favorable. The same contrast holds for CARA and shifted-CRRA digital utility, with a unique access reversal strictly before half of each specification's satiation quantity. These comparisons require the feasible branch to reach the relevant consumption range; Appendix A.8 gives the derivations.

4 The Full Model

We extend the basic model to quantify optimal issuance and its payment, DeFi, credit, and fiscal effects.

4.1 Overview

We add foreign holdings, endogenous DeFi participation, reuse of sellers' receipts, a fund liquidity requirement, producer markups, and issuer costs.

Retain Section 2's CM preferences and bargaining shares, including $\theta_e \in (0, 1]$, and use $f(H) = AH$ with calibrated A. Purchases remain $G \geq 0$, but transfers T and inflation can be nonzero, and the receipts tax τ now covers DM sales. Stationary real allocations, wages, and returns are constant. Unlike Sections 2–3, we distinguish nominal gross returns R^j from real returns:

$$1 + r^j \equiv \frac{R^j}{\Pi}, \qquad j \in \{d, e, L, s, b, f\},$$

The benchmark real rate remains $r^f = 1/\beta - 1$, denoted r in Section 3.[13] We use real returns for acquisition values and resource accounting, while retaining nominal returns for the banking and issuer parameter conventions and the calibration. In particular, $R^e = 1$ means $1 + r^e = 1/\Pi$.

Domestic and foreign claims satisfy $Z_D^e + Z_F^e = Z^e$, with acquisition values $Z_D^e/(1 + r^e)$ and $Z_F^e/(1 + r^e)$; deposit principal is $Z^d/(1 + r^d)$. As in Sections 2–3, caps, stock ratios, and stock derivatives use principal. Foreigners make no domestic DM purchases but lend fraction ν_F of their

[13] The within-period DeFi rate i^e is unchanged and is distinct from the stablecoin holding return r^e.

fully reserve-backed coins. Their holdings and access are exogenous; foreign portfolio choice is not modeled.

Motivated by protocols such as Aave (Aave Labs, n.d.a), we add two pooled lending rounds. Each digital buyer trades once, knowing her meeting type and exogenous anonymous position before borrowing. Early buyers use the initial pool; early sellers redeposit all receipts to fund late buyers. Full redeposit is assumed, and recycling stops after two rounds. Both cohorts repay in the CM at $1 + i^e$, also paid to lenders.[14]

As in Section 2, dates are suppressed and hats divide by w: $\hat{Z}_D^e = Z_D^e/w$, $\hat{Z}_F^e = Z_F^e/w$, $\hat{Z}^d = Z^d/w$, and $\hat{z}^d(i) = z^d(i)/w$. Payment $\hat{p}$ transfers $w\hat{p}$ CM goods; without foreigners, $\hat{Z}_D^e$ equals Section 3's $\hat{Z}^e$.

4.2 Households, Payments, and DeFi

DFM: participation and borrowing. Unlike the basic model's fixed access, heterogeneous lending costs make domestic participation yield-responsive: falling yields reduce lending and moderate liquidity expansion. Foreign balances and recycled receipts can nevertheless satiate demand, preserving the possibility of a zero-rate kink.

After portfolio choice and meeting draws, ordinary and digital buyers reserve their payment balances. Domestic no-meeting holders draw a utility cost κ per normalized unit and lend when $\kappa \leq i^e$, since interest income and cost are $i^e \hat{Z}_D^e$ and $\kappa \hat{Z}_D^e$. A log-logistic distribution F_κ gives $\nu_D(i^e) = F_\kappa(i^e)$:

$$\frac{\nu_D(i^e)}{1-\nu_D(i^e)} = \frac{\bar{\nu}_D}{1-\bar{\nu}_D}\left(\frac{i^e}{\bar{i}^e}\right)^\eta, \qquad i^e > 0, \quad \nu_D(0) = 0, \quad \eta > 0. \tag{8}$$

We fix $(\bar{i}^e, \bar{\nu}_D)$ and foreign access across counterfactuals, while domestic participation and the yield adjust jointly. The initial pool is

$$\hat{S}_0 = \alpha_n \nu_D(i^e)\hat{Z}_D^e + \nu_F \hat{Z}_F^e. \tag{9}$$

The factor α_n excludes domestic buyers' own payment balances, which cannot simultaneously finance another buyer.

For no-meeting holders, the expected net lending premium per unit of own balances is

$$M_D(i^e) = \int_0^{i^e} (i^e - \kappa)\, dF_\kappa(\kappa) = \int_0^{i^e} \nu_D(q)\, dq.$$

The associated aggregate cost applies only to initial domestic lenders and uses utility rather than

[14] We abstract from duration differences, protocol fees, and interim repricing, and assume enforceable repayment, nonbinding collateral, and no default, liquidation, or early withdrawal.

goods:

$$\mathcal{C}_D = \alpha_n \hat{Z}_D^e [i^e \nu_D(i^e) - M_D(i^e)]. \tag{10}$$

Appendix C.1 provides details of the cost distribution and these derivations.

A round-k buyer promises payoff ℓ_k^e and borrows $\ell_k^e/(1+i^e)$ in stablecoin repayment claims before bargaining; write $\hat{\ell}_k^e = \ell_k^e/w$.

DM: payments and liquidity recycling. Recycling raises payments per coin by financing late purchases from early receipts. It also changes bargaining: early sellers value relending income.

As in Section 2, producing y costs y utility units and Kalai bargaining gives buyers share $\theta_j \in (0,1]$. Sellers pay sales taxes in the CM, leaving gross receipts available for interim lending; principal, redeposits, and DeFi interest are not separately taxed. Receipt value is $v_s = 1-\tau$ for ordinary and late sellers and $v_s = 1+i^e-\tau$ for early sellers. Buyer and seller surpluses are $u_j(y)-\hat{p}$ and $v_s\hat{p}-y$. With $g_j(y) = (1-\theta_j)u_j(y)+\theta_j y$, proportional sharing gives $\hat{p} = g_j(y)/(1-\theta_j+\theta_j v_s)$:

$$\begin{aligned} \hat{p}^o &= \frac{g_o(y^o)}{D^o}, & D^o &= 1-\theta_o\tau, \\ \hat{p}_1^e &= \frac{g_e(y_1^e)}{D_1^e}, & D_1^e &= 1+\theta_e(i^e-\tau), \\ \hat{p}_2^e &= \frac{g_e(y_2^e)}{D_2^e}, & D_2^e &= 1-\theta_e\tau. \end{aligned} \tag{11}$$

Note that, with $i^e > 0$, $D_1^e > D_2^e$, so a given payment buys more in the first round.

Buyers anticipate (11) when choosing their loans.[15] With binding payment constraints, $\hat{p}_k^e = \hat{Z}_D^e + \frac{\hat{\ell}_k^e}{1+i^e}$, so borrowing maximizes $u_e(y_k^e) - \hat{\ell}_k^e$. The payment schedule implies the interior conditions, for $k \in \{1,2\}$,

$$\frac{D_k^e u_e'(y_k^e)}{g_e'(y_k^e)} = 1+i^e, \qquad \frac{\hat{\ell}_k^e}{1+i^e} = \hat{p}_k^e - \hat{Z}_D^e. \tag{12}$$

These conditions equate marginal liquidity value and repayment cost at given prices and taxes.

Let $\alpha_{e,1}$ and $\alpha_{e,2} = \alpha_e - \alpha_{e,1}$ be the cohort masses, with aggregate payoffs $L_k^e = \alpha_{e,k}\ell_k^e$ and $\hat{L}_k^e = L_k^e/w = \alpha_{e,k}\hat{\ell}_k^e$. Pool advances are $\hat{L}_k^e/(1+i^e)$, and early sellers receive $\hat{P}_1^e = \alpha_{e,1}(\hat{Z}_D^e + \frac{\hat{\ell}_1^e}{1+i^e})$. Redeposit adds these receipts to unused initial funds:

$$\frac{\hat{L}_1^e}{1+i^e} \le \hat{S}_0, \qquad \frac{\hat{L}_2^e}{1+i^e} \le \hat{S}_0 - \frac{\hat{L}_1^e}{1+i^e} + \hat{P}_1^e. \tag{13}$$

Receipts, rather than CM repayments, supply interim liquidity; both rounds exhaust funds on the

[15] If the buyer and seller fail to agree after borrowing, the buyer retains her coin balances but still owes the loan repayment. Successful trade adds consumption utility and subtracts the payment, giving surplus $u_e(y_k^e) - \hat{p}_k^e$.

positive-rate interior:

$$\underbrace{\alpha_{e,1}\frac{\hat{\ell}_1^e}{1+i^e}}_{\text{first-round loans}} = \hat{S}_0, \qquad \underbrace{\alpha_{e,2}\frac{\hat{\ell}_2^e}{1+i^e}}_{\text{second-round loans}} = \underbrace{\alpha_{e,1}(\hat{Z}_D^e + \frac{\hat{\ell}_1^e}{1+i^e})}_{\text{seller redeposits}}. \tag{14}$$

At a trial yield, (12) and (9) imply $\alpha_{e,1} = (1+i^e)\hat{S}_0/\hat{\ell}_1^e$; second-round clearing determines the yield jointly with the remaining equilibrium. Anonymous order gives early-service probability $\alpha_{e,1}/\alpha_e$, without priority bidding.[16] At zero yield, (13) can be slack, and buyers retain unused own balances when borrowing is unnecessary.

CM: settlement and portfolio choice. CM consumption and labor choices remain as in Section 2. New claims cost $m^d/(1+r^d)$, $m^e/(1+r^e)$, and $s/(1+r^f)$; inherited claims pay $m_-^d + m_-^e + s_-$. DeFi repayments cover initial lenders' and early sellers' principal and interest.[17]

Before meeting and cost draws, households anticipate these returns. Nonborrowing ordinary buyers have liquidity $\hat{x}^o = (Z^d + Z_D^e)/w$. Under taxed bargaining, constrained buyers spend $\hat{p}^o = \hat{x}^o$ and consume $Y_{o,\tau}(\hat{x}^o) = g_o^{-1}(D^o\hat{x}^o)$. At fixed prices and taxes, their liquidity premium is

$$\lambda_{o,\tau}(\hat{x}^o) = \max\left\{D^o\frac{u_o'(Y_{o,\tau}(\hat{x}^o))}{g_o'(Y_{o,\tau}(\hat{x}^o))} - 1, 0\right\}.$$

The premium uses normalized liquidity, is positive when constrained and zero otherwise, and reduces to $\lambda_o(\hat{x}^o)$ at $\tau = 0$.

By (12), an extra own coin saves borrowing cost i^e in either digital cohort, while a no-meeting holder earns the net premium $M_D(i^e)$. Combining these outcomes gives the interior portfolio conditions:

$$\begin{aligned} 1 &= \beta(1+r^d)[1+\alpha_o\lambda_{o,\tau}(\hat{x}^o)], \\ 1 &= \beta(1+r^e)\left[1+\alpha_o\lambda_{o,\tau}(\hat{x}^o) + \alpha_e i^e + \alpha_n M_D(i^e)\right]. \end{aligned} \tag{15}$$

Thus participation affects both pool funding and stablecoin value: $M_D(i^e)$ replaces Section 2's gross term $\nu_D i^e$ by deducting costs. No participation derivative enters because households take the yield as given.

[16] Utilization falls temporarily to $\hat{S}_0/(\hat{S}_0 + \hat{P}_1^e)$ just after redeposit; the common rate suppresses interim repricing.
[17] On the binding branch, $(\hat{L}_1^e + \hat{L}_2^e)/(1+i^e) = \hat{S}_0 + \hat{P}_1^e$.

4.3 Firms and Financial Intermediaries

Firms. Producer markups allow us to match CM price–cost margins separately from receipts taxes and working-capital costs.

A competitive final-good firm combines a fixed unit mass of differentiated varieties using the CES aggregator

$$Y^{CM} = \left[\int_0^1 y(v)^{\frac{\varepsilon_c - 1}{\varepsilon_c}} dv\right]^{\frac{\varepsilon_c}{\varepsilon_c - 1}},$$

with elasticity $\varepsilon_c > 1$. Cost minimization gives demand $y(v) = [p(v)/P]^{-\varepsilon_c} Y^{CM}$, where $p(v)$ and P are the variety and final-good prices. Each monopolistically competitive producer uses $y(v) = Ah(v)$ and borrows its wage bill. Taking P and aggregate demand as given, it chooses price and loan payoff to maximize $(1-\tau)p(v)y(v)/P - \ell(v)$, subject to $\ell(v)/(1+r^L) = wy(v)/A$ and the demand schedule. The optimal after-tax price is $\varepsilon_c/(\varepsilon_c - 1)$ times marginal cost $(1+r^L)w/A$. In symmetry, $p(v) = P$ and $Y^{CM} = AH$, so

$$1 + r^L = \frac{\varepsilon_c - 1}{\varepsilon_c} \frac{(1-\tau)A}{w}.$$

Sales are taxed once, without an aggregation tax; profits return to households. As $\varepsilon_c \to \infty$, Section 2's competitive linear-technology condition is recovered. Section 5.1 calibrates the markup.

The bond fund. The fund now holds a fixed share ω_f of market value in short-term debt to meet early redemptions, and the remainder in long-term debt. Their nominal returns R^s and R^b determine the fund return R^f; with positive household fund holdings,

$$R^f = \omega_f R^s + (1-\omega_f) R^b, \qquad 1 = \beta(1+r^f),$$

The buffer therefore separates R^f from R^b, which coincided in Sections 2–3.

Banks. Banks retain deposit-quantity competition and profit-constrained lending, with (2) and (3) adjusted for inflation. Acquisition values use real returns; the profit convention preserves calibrated χ. Deposit demand depends on Z_D^e, taxed DM trade, and endogenous participation; foreign coins do not directly finance ordinary payments. Bank portfolios face the fund's short-debt buffer and earn R^f, also paid on wholesale deposits. Their combined market value with the household fund is $B^f/(1+r^f)$. Appendix C.2 details constraints and accounting.

Stablecoin issuers. Short-term debt still fully backs stablecoins, but issuers now retain a spread $R^s - R^e = \Delta_s$. Operating costs use $c_s Z^e/R^e$ goods; profits $(\Delta_s - c_s)Z^e/R^e$ are rebated to households. Thus government financing costs depend on the reserve return R^s, while only operating

costs absorb resources.[18]

4.4 Government Policy and Equilibrium

Gross DM sales are $V^o = w\alpha_o \hat{p}^o$ and $V^e = w(\alpha_{e,1}\hat{p}_1^e + \alpha_{e,2}\hat{p}_2^e)$. Together with CM production, they form measured output and taxable receipts:

$$Y = Y^{CM} + V^o + V^e, \qquad \text{where } Y^{CM} = AH.$$

As in Section 2, B^s and B^b are next-CM real debt payoffs, including coupons and continuation values. With stationary market values, new issuance replaces principal, so taxes finance purchases, transfers, and net service on short- and long-term debt:

$$\tau Y = G + T + r^s \frac{B^s}{1+r^s} + r^b \frac{B^b}{1+r^b}. \tag{16}$$

The policy experiments fix CM purchases G, aggregate lump-sum transfers T, and the market value and composition of debt held outside stablecoin reserves, $B^f/(1+r^f)$ and ω_f. Stablecoin issuance varies and τ adjusts to balance the budget.

Market clearing and equilibrium. Short debt is held as issuer reserves and as the liquidity buffer of fund and bank portfolios; long debt fills the remaining portfolio share:

$$\frac{B^s}{1+r^s} = \frac{Z^e}{1+r^e} + \omega_f \frac{B^f}{1+r^f}, \qquad \frac{B^b}{1+r^b} = (1-\omega_f)\frac{B^f}{1+r^f}.$$

Thus additional coins finance additional short debt, regardless of holders' residence. Combining market clearing with $r^f = \omega_f r^s + (1-\omega_f) r^b$ gives

$$\tau Y = G + T + r^s \frac{Z^e}{1+r^e} + r^f \frac{B^f}{1+r^f}.$$

Separating Z^e from B^f matches the policy experiment: reserve backing $Z^e/(1+r^e)$ varies, while $B^f/(1+r^f)$ and its composition remain fixed. Reserve-debt service is priced at r^s; the second term services the outside-reserve portfolio. Fund and bank portfolios allocate this debt across holders without creating liabilities.

Unlike domestic interest, foreign income requires resources. After reinvesting $Z_F^e/(1+r^e)$ to

[18] A Cournot issuer specification gives similar quantitative results. We retain the simpler exogenous spread and the calibrated units of Δ_s and c_s, with $Z^e/R^e = Z^e/[\Pi(1+r^e)]$.

maintain their real stock, foreign holders receive

$$X_F = [(1 + r^e)(1 + \nu_F i^e) - 1]\frac{Z_F^e}{1 + r^e}.$$

All eligible foreign balances are lent at positive yields; at zero yield, the DeFi interest term vanishes. Positive X_F requires CM exports and negative X_F represents imports, so goods clearing becomes

$$C + G + c_s\frac{Z^e}{R^e} + X_F = Y^{CM}, \qquad C = 2c.$$

Domestic taxes, transfers, and interest redistribute purchasing power; participation cost (10) enters domestic welfare rather than goods resources. Foreign utility is excluded.

Stationary equilibrium retains Section 2's optimality conditions, with budget (16), goods clearing above, taxed payments (11), and Appendix C.2's accounting. Labor, deposits, and reserves satisfy $L/(1 + r^L) = wH$, $Z^d = \sum_i z^d(i)$, and $Z^e = Z_D^e + Z_F^e$. DeFi satisfies (13), with (14) at positive yields. Fiscal relief reflects both taxable sales and debt service.

5 Quantitative Analysis

We calibrate the full model and study issuance, bank competition, and the domestic use and foreign holdings needed to support a larger stock. Throughout this section and Section 6, stocks and fiscal flows are scaled by fixed benchmark GDP $Y_{\text{ref}} = 1$; Y remains endogenous taxable output.

5.1 Calibration

We calibrate the full model to an annual steady state. Table 1 groups the parameters and targets by their roles in the model. Appendix C.3 gives the detailed empirical adjustments and mappings.

Fiscal and bond-market parameters. We target 2025 U.S. tax revenue $\tau = 0.2663$ and purchases $G/Y = 0.1715$ (U.S. Bureau of Economic Analysis, 2026). Purchases include consumption and investment, excluding transfers; revenue covers all government levels and social-insurance contributions. Thus τ is an aggregate burden, not a literal sales tax. Budget (16) determines T. Experiments then fix G and T and adjust taxes, isolating relief for a given obligation.

Debt outside the Federal Reserve is 85.20% of GDP, including 20.66% in short debt (U.S. Department of the Treasury, 2026; Treasury Borrowing Advisory Committee, 2025a). Subtracting the 1.00% stablecoin reserve stock gives $B^f/[(1 + r^f)Y] = 0.8420$ and $\omega_f = 0.2335$, avoiding double-counting reserves in private fund and bank portfolios.

We target a non-interest-bearing coin, $R^e = 1$, consistent with the GENIUS Act's prohibition on issuer yield solely for holding, using, or retaining payment stablecoins (U.S. Congress, 2025a,

Table 1: Calibration

Parameter	Value	Target or maintained restriction
Fiscal and bond-market parameters		
G/Y	0.1715	Government purchases/GDP: 17.15% (U.S. Bureau of Economic Analysis, 2026).
$B^f/[(1+r^f)Y]$	0.8420	Debt outside the Fed/GDP: 85.20%, net of stablecoin reserves (Federal Reserve Bank of St. Louis, 2026).
ω_f	0.2335	Short debt outside the Fed/GDP: 20.66%, including stablecoin reserves (Treasury Borrowing Advisory Committee, 2025a).
Π	1.0200	Maintained annual inflation: 2.00%.
β	0.9804	FY2025 average twenty-year Treasury yield: 4.75%.
Δ_s	0.0167	FY2025 consolidated average interest cost: 3.46%.
Banking		
$1/\chi$	0.0350	Adjusted bank margin per unit of lending: 3.50%.
N	12	Loan–deposit spread: approximately 4.20 percentage points.
Meetings, preferences, and production		
α_o	0.3210	Annual deposit rate: 1.70%.
α_e	0.0300	Survey-informed digital-meeting incidence: 3.00%.
σ_o	0.7185	Par stablecoin return: $R^e = 1$.
σ_e	0.4662	LP-informed digital utility curvature.
ζ	0.1960	Annual DeFi lending rate: 6.40%.
θ_o	0.9337	Ordinary DM producer receipt-to-cost ratio: 1.25.
θ_e	0.3446	Digital DM producer receipt-to-cost ratio: 1.25.
ε_c	5.0000	CM producer receipt-to-cost ratio: 1.25.
A	0.6298	Market-valued benchmark GDP: $Y = 1$.
Stablecoin issuance and deployment		
c_s	0.0075	Issuer operating-cost benchmark: 75 basis points annually.
$Z^e/[(1+r^e)Y]$	0.0100	Benchmark stablecoin stock/GDP: 1.00%.
s_D	0.3000	Maintained domestic holdings share: 30.00%.
ν_F	0.0380	Foreign-access proxy: 3.80% (Tether, 2026).
$\bar{\nu}_D$	0.4847	Overall pre-meeting DeFi allocation: 17.20% (Noll, 2026).
η	0.5000	Maintained elasticity of deployment odds to the DeFi yield.

Notes: $(\alpha_o, \sigma_o, \theta_o, \theta_e, \zeta, A)$ are jointly calibrated. The two bond-market targets jointly determine β and Δ_s. The integer choice $N = 12$ gives a spread of 4.19 percentage points.

Sec. 4(a)(11)); i^e instead compensates lending. Given debt composition and inflation $\Pi = 1.02$, the FY2025 consolidated interest-cost target of 3.46% and twenty-year Treasury yield of 4.75% jointly imply $\beta = 0.9804$ and $\Delta_s = 0.0167$ at $R^e = 1$. Nominal short and fund returns are 1.67% and 4.03%, with real returns $r^s = -0.32\%$ and $r^f = 1.99\%$. The fund's buffer distinguishes its return from the long yield; the negative real short return preserves the financing advantage.

Banking. The lending constraint requires profits per loan dollar, whereas FDIC net interest margins use earning assets and omit labor costs. Since banking labor is absent here, we use an adjusted FY2025 margin of 3.50%, setting $\chi = 28.5714$. Deducting salaries and benefits from net interest income yields 3.42%; adding noninterest income and other operating expenses yields 3.58%, both relative to loans. We average them because the first omits costs and the second includes activities outside the model.[19]

The deposit-rate target is 1.70% on checking and payment-accessible savings, excluding time

[19] We use FY2025 FDIC Quarterly Banking Profile income and expense and balance-sheet series.

deposits and money-market funds. FDIC transaction and savings rates, including noninterest-bearing balances, are 1.65% and 1.82%, bracketing this return on the full payment-accessible stock. Untargeted deposits/GDP of 35.28% provide a liquidity-specification check. A loan–deposit spread near 4.20 percentage points implies $N = 11.75$; choosing $N = 12$ and recalibrating gives a 5.89% loan rate and 4.19-point spread.

Meetings, preferences, and production. We use $U(c) = \log c$ for CM consumption, retain linear labor and DM production costs, and specify DM utility functions as

$$u_o(y) = \frac{y^{1-\sigma_o}}{1-\sigma_o}, \qquad u_e(y) = \frac{(y+\zeta)^{1-\sigma_e} - \zeta^{1-\sigma_e}}{1-\sigma_e}.$$

Both utilities equal zero at zero consumption: $0 < \sigma_o < 1$ ensures $u_o(0) = 0$, and the subtraction ensures $u_e(0) = 0$. The ordinary shifter is omitted for parsimony, supported by the reasonable deposit stock reported above.

SHED reports that 2.00% of adults use cryptocurrency for financial transactions, versus 10.00% using or holding it for any reason (Board of Governors, 2026b). The former better matches payments but omits firms, merchant settlement, and some DeFi use. We add one percentage point, setting $\alpha_e = 0.03$ as a survey-informed assumption, not a direct estimate. Given returns and participation, the difference between Euler conditions (15) jointly determines $\alpha_o = 0.3210$.

The 9–12-month local-projection exercise on stablecoin activity and monetary-policy surprises informs $\sigma_e = 0.4662$, not a structural two-window estimate (Appendix C.4). Joint calibration matches the 6.40% DeFi rate with $\zeta = 0.1960$ and $R^e = 1$ with $\sigma_o = 0.7185$.

A producer receipt-to-production-cost ratio of 1.25 in ordinary DM, digital DM, and CM production disciplines markups (De Loecker et al., 2020). Receipts exclude sales taxes and subsequent lending income; the digital target aggregates both rounds, permitting different early and late markups. These targets jointly determine θ_o, θ_e, and $\varepsilon_c = 5$. They are producer benchmarks, not stablecoin-merchant estimates. Productivity A normalizes benchmark GDP to one.

Stablecoin issuance and deployment. We set issuer operating costs to $c_s = 0.0075$, informed by Circle's 2025 expense-to-circulation ratios of 0.74%–0.78%.[20] These support the scale of the coefficient, not a marginal network-cost estimate; distribution payments can include revenue sharing rather than resource costs.

The worldwide stock reached about $300 billion in September 2025 (International Monetary Fund, 2025), approximately 1% of benchmark U.S. GDP of $30.762 trillion. We set the stock at 1.00%, about $308 billion, as a rounded benchmark rather than an annual average. Foreign holdings also require Treasury reserves, whereas domestic payment liquidity depends on ownership;

[20] See Circle's 2025 results. The range reflects alternative expense definitions relative to average USDC circulation.

we maintain domestic share $s_D = 0.30$.

At reference yield $\bar{i}^e = 0.064$, Tether's DEX and DeFi allocation proxies foreign access, $\nu_F = 0.038$ (Tether, 2026). Given the holdings split, overall pre-meeting allocation of 17.20% (Noll, 2026) implies $\bar{\nu}_D = 0.4847$. The geographic interpretation is assumed. This measures pre-meeting holdings, not the initial pool or DeFi-financed payment share, because buyers retain payment balances.

Yield-seeking evidence supports positive participation responses but does not identify η (Cornelli et al., 2025). We maintain $\eta = 0.50$ and examine 0.10–1.00 as issuance lowers yields. The benchmark share elasticity $\eta(1-\bar{\nu}_D) = 0.2577$ lies within the bank-deposit own-rate range of 0.09–0.31 in Jiang et al. (2026), an indirect comparison because bank choice, DeFi participation, and supplier and borrower yields differ. Appendix C.5 illustrates the implied deployment responses.

5.2 Optimal Provision of Stablecoins

Varying issuance, we fix the 30/70 holdings split, all preference, technology, fiscal-transfer, fund-portfolio, and deployment-schedule parameters, and full seller redeposit (Section 4.2). Domestic deployability and taxes adjust endogenously.

Output uses fixed benchmark prices; consumption-equivalent welfare gains deduct domestic participation costs and compare the same economy without stablecoins (Appendix C.6).

Benchmark payment demand favors modest issuance: welfare peaks at 2.89% of GDP, about $889 billion in 2025 dollars, with a 0.35% CEV gain; output peaks at 3.78%. Both exceed the calibrated 1.00% stock but remain below the multi-trillion-dollar scenario below. Diminishing liquidity scarcity limits the gains from tax relief and credit crowding in. Moreover, *easier initial crowding in need not imply a larger optimum*: competition reduces welfare-optimal issuance here even though Section 3.3 shows it can lower the initial expansion threshold.

Figure 6 quantifies Section 3.2's trade-off between payment gains, lost deposit-funded lending capacity, and tax relief supporting after-tax returns and working capital. Full-model output includes digital production, so output and lending gains can differ.

At $\eta = 0.50$, the output optimum raises output 0.69% with a 0.36% DeFi rate; at the welfare optimum the rate is 0.97%, output rises 0.67%, and lending 0.19%. Lending remains 0.13% above zero-issuance lending at the output optimum: optimality concerns marginal costs and benefits, not the cumulative credit effect. The tax minimum occurs at 2.40% of GDP and a 26.59% rate. The welfare optimum adds $581 billion to the calibrated $308 billion stock. On the same 2025 GDP scale, the output optimum is $1.163 trillion and the tax minimum $739 billion.

At the welfare optimum, taxes fall from 26.72% without coins to 26.60%, about 0.13 percentage points. Valued at the original rate, the expanded tax base yields $50.68 billion annually, covering $11.01 billion in net real reserve-debt service and leaving $39.67 billion for tax relief. Al-

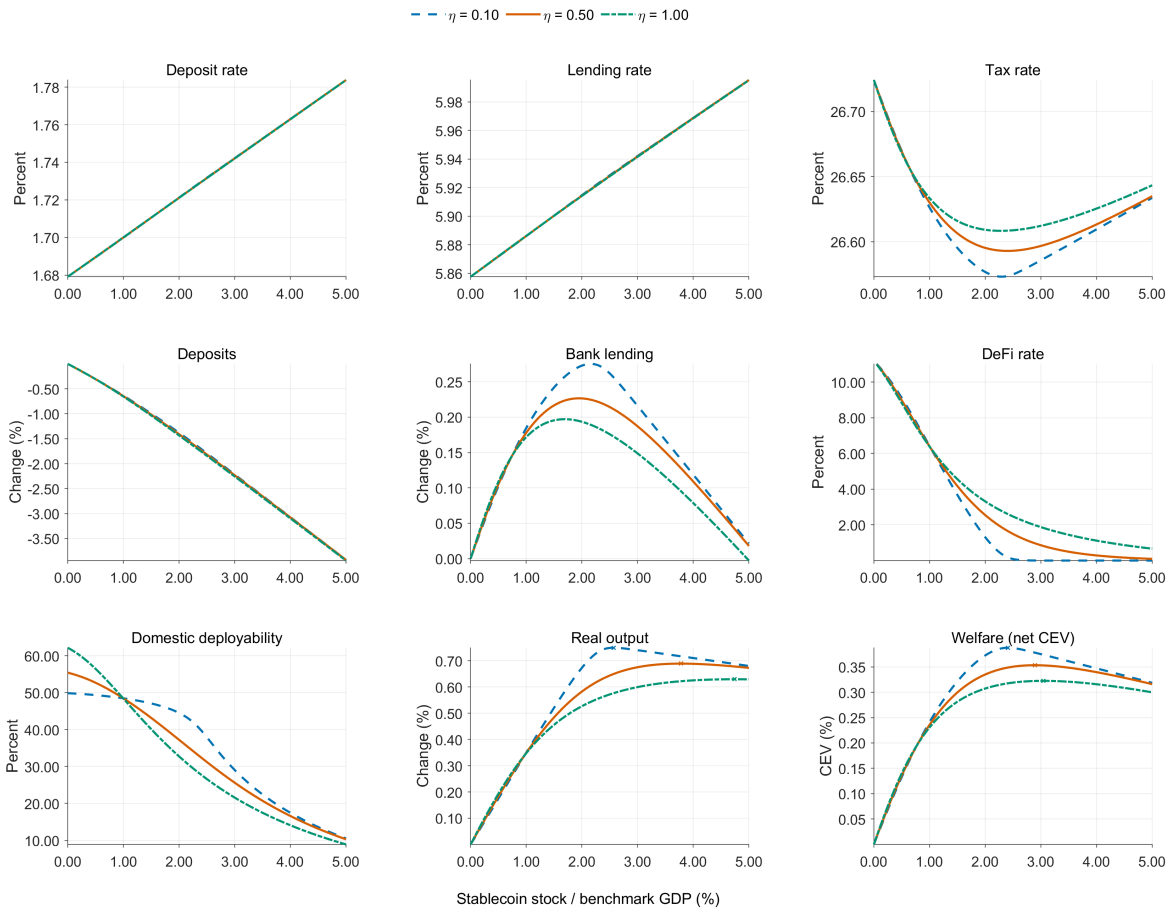

Figure 6: The macroeconomic impacts of stablecoins. Note: Blue dashed, orange solid, and green dash-dot curves denote $\eta = 0.10$, 0.50, and 1.00, respectively. The orange solid curve is the benchmark. Scenarios vary only η, keeping the participation reference pair and other primitives fixed. Because η changes net participation costs, these scenarios need not share the calibrated equilibrium at the 1.00% stock. Deposit and lending rates are net nominal rates, $R^d - 1$ and $R^L - 1$; the DeFi rate is i^e. Rates are annual percentages; changes in output, credit, deposits, and welfare are relative to zero stablecoins. Some allocation curves nearly coincide. Domestic deployability responds to yield; foreign access is fixed and early sellers redeposit all receipts. Crosses mark output and welfare maxima. The displayed range is 0–5.00% of benchmark GDP. The $\eta = 0.10$ grid ends at 5.00%; the other grids extend to 9.00%. These are sensitivity scenarios, not confidence bands.

though the real short return reaches 1.24% and direct seigniorage is negative, tax-base expansion outweighs financing costs, illustrating Section 3.2's distinction between financing benefits and tax relief.

Fixing taxes at their no-stablecoin level and returning savings through transfers isolates tax adjustment. At the same 2.89% stock, output and welfare gains are 0.52% and 0.27%, versus 0.67% and 0.35% with tax cuts; lending falls 0.12% rather than rising 0.19%. These compare identical stocks and zero-issuance references, not separately optimized policies. Tax cuts reverse credit crowding out; transfers retain payment benefits without preventing it (Proposition 3).

Lower DeFi income raises required issuer returns (Section 3.4); together with deposit displacement and diminishing payment gains, this can limit issuance before yields reach zero.

Table 2: Sensitivity to domestic yield responsiveness

η	Output optimum			Welfare optimum		
	Stock	Output gain	DeFi rate	Stock	CEV gain	DeFi rate
0.10	2.57	0.75	0.05	2.41	0.39	0.17
0.25	3.10	0.73	0.15	2.66	0.37	0.47
0.50	3.78	0.69	0.36	2.89	0.35	0.97
0.75	4.30	0.66	0.58	3.00	0.34	1.42
1.00	4.74	0.63	0.76	3.05	0.32	1.83

Notes: Stocks are percentages of benchmark GDP; gains and rates are percentages. Welfare is net of participation utility costs. The table retains all five sensitivity cases; the figure displays three for readability. Optima are refined within the computed grids, which end at 5.00% for $\eta = 0.10$, 6.00% for $\eta = 0.25$, and 9.00% otherwise. Additional optima beyond these endpoints are not ruled out.

Falling yields also induce domestic withdrawal from DeFi. Below the reference yield, higher η sustains rates but reduces liquidity at a given stock; reaching the output and welfare peaks requires more issuance, with smaller gains (Table 2). Welfare-optimal stocks range from 2.41% to 3.05% of GDP, and output peaks remain below 5.00% within the computed ranges. With weak responsiveness, the output peak approaches the zero-rate floor. Deployment-schedule ordering reverses above the reference yield.

Payment benefits persist beyond the tax minimum; welfare also counts utility, effort, and participation costs omitted from fixed-price output. Hence the benchmark welfare optimum lies between the tax minimum and output maximum, a quantitative ordering not implied by the initial crowding-in thresholds.

Banking competition. We vary $N \in \{8, 12, 18\}$ around calibrated $N = 12$, holding $\eta = 0.50$ and other primitives fixed (Section 3.3). This changes conduct, not entry or calibrated margins. Welfare-optimal stocks are respectively 3.42%, 2.89%, and 2.67% of benchmark GDP, with CEV gains of 0.39%, 0.35%, and 0.33% relative to each environment without coins. All retain interior welfare and output maxima at positive DeFi rates.

Competition raises deposit remuneration and compresses profits and lending capacity, yet beyond N^* can reduce marginal profit losses and ease initial crowding in (Section 3.3). Optimal stocks balance payment, fiscal, and funding effects; these within-environment comparisons do not rank banking structures by welfare.

For the equity sensitivity, households contribute stock E, fixed across issuance levels. The balance sheet becomes $\frac{L}{1+r^L} + \frac{b^B}{1+r^f} = \frac{Z^d}{1+r^d} + E$, where $\frac{b^B}{1+r^f}$ is net portfolio acquisition value, and lending capacity becomes $\frac{L}{1+r^L} \leq \chi\pi^B + E$. Here π^B deducts the normal gross fund payoff on equity under the baseline convention (Appendix C.2). Each equity unit supports one unit of loan principal but replaces other household holdings, adding no resources. We set $E/Y_{\text{ref}} = 8.13\%$ using FY2025 average bank book equity and recalibrate χ to preserve the benchmark allocation and $\pi^B/[L/(1+r^L)] = 3.50\%$, giving $\chi = 23.92$.[21] At $\eta = 0.50$, the welfare-maximizing stock changes only from 2.89% to 2.90% of GDP, and the output-maximizing stock from 3.78% to 3.80%. Gains remain 0.35% and 0.69% at reported precision, with nearly identical issuance curves (Figure 6).

5.3 Digital Use at the Treasury Scale

The modest optima in Section 5.2 contrast with Treasury's multi-trillion-dollar discussion (U.S. Department of the Treasury, 2025) and the $1 trillion to $3 trillion interquartile range of private forecasts reported by Miran (2025). We ask what payment expansion would justify an illustrative $3 trillion stock in 2030, not an official target or welfare recommendation.

The target is an acquisition value, $Z_T^e/(1+r^e)$, using the same stock convention as the model. Deflating at 2.00% annually gives

$$\frac{Z_T^e}{(1+r^e)Y_{\text{ref}}} = \frac{\$3 \text{ trillion}/1.02^5}{\$30.7621 \text{ trillion}} = 8.83\%.$$

Thus the scenario represents $2.717 trillion in 2025 purchasing power. The denominator remains 2025 GDP: this is a comparison across stationary equilibria, not a forecast of the stock-to-GDP ratio in a growing 2030 economy.

For this stock, roughly three times the benchmark welfare optimum, we measure existing payments and the demand expansion needed for optimality. Domestic stablecoin-supported payments are

$$\mathcal{P}^e = \alpha_o Z_D^e + w(\alpha_{e,1}\hat{p}_1^e + \alpha_{e,2}\hat{p}_2^e). \tag{17}$$

This counts ordinary stablecoin purchases and both digital sales, excluding loan originations, re-

[21] The average of FDIC total equity capital over 2024Q4–2025Q3 is $2.500 trillion, or 8.13% of our FY2025 GDP denominator; see the FDIC equity series. This sensitivity exercise preserves the margin after the normal equity return. Before that charge, net interest income per unit of lending is 4.16%; its empirical mapping differs from the baseline margin target.

Table 3: Digital use required for a larger stablecoin stock

$100\alpha_e$	$100s_e$	Welfare-optimal stock	Output-optimal stock	Tax-minimizing stock	Payments at target ($bn)
3.00	8.55	2.89	3.78	2.40	425.36
6.00	15.75	5.63	7.33	4.69	589.41
7.33	18.59	6.80	8.83	5.68	657.25
9.70	23.21	8.83	11.41	7.40	761.75
10.00	23.76	9.08	11.72	7.61	772.95

Notes: Stocks are percentages of the original benchmark GDP. $s_e = \alpha_e/(\alpha_o + \alpha_e)$ is the digital fraction of decentralized meetings. Payments are annual domestic goods payments from (17), in 2025 dollars. The third and fourth rows solve for incidence making the target stock output- and welfare-optimal, respectively. Maxima are refined and checked against issuance grids extending to 18.00% of benchmark GDP. Welfare includes participation utility costs. These are conditional scenarios, not adoption estimates.

deposits, and repayments as extra purchases. Recycling raises flows without creating stock. At the calibrated stock, this statistic is $105.75 billion on the 2025 GDP scale: $29.04 billion from ordinary payments and $76.72 billion from digital payments. The latter also measures digital production in benchmark GDP; away from the reference point, current sales and fixed-price output need not coincide. As an illustrative comparison, 30.00% of the $350 billion global real-economy payment estimate in Batra et al. (2026) is $105 billion. We do not impose equality between domestic stock and payment shares.

At the welfare optimum, annual domestic payments are about $237 billion against worldwide holdings of $889 billion; foreign payments are outside the model. Expanding to the target with $\alpha_e = 0.03$ and the 30/70 split yields $425 billion in payments and effectively zero DeFi yield. Welfare rises 0.20% over zero issuance, below its 0.35% maximum: supply-driven payments alone do not justify the target.

Raise α_e at fixed α_o, with $\alpha_n = 1-\alpha_o-\alpha_e$: digital opportunities replace no-meeting outcomes. All other parameters, the 30/70 split, fiscal levels, reference prices, and redeposit stay fixed without recalibration. Initial domestic funding remains $\alpha_n \nu_D(i^e)\hat{Z}_D^e$ in (9). Higher demand and fewer initial lenders sustain yields and issuance value (Section 3.4).

In Table 3, the target becomes output-optimal at $\alpha_e = 0.07328$, more than twice benchmark incidence, and welfare-optimal at $\alpha_e = 0.09703$, or 3.23 times benchmark incidence and 23.21% rather than 8.55% of DM meetings. The latter yields $762 billion in annual domestic payments, including $501 billion digitally, and a 0.86% DeFi rate. Relative to zero issuance with the same enlarged digital sector, welfare rises 1.17% CEV, output 2.23%, and lending 0.69%. Output-optimal incidence yields $657 billion in payments and a 0.29% DeFi rate at the target. Both solutions avoid the zero-rate kink. These are conditional requirements, not adoption forecasts; neither the survey benchmark nor the current $350 billion global payment estimate establishes that they will occur.

Table 4: Foreign absorption of the Treasury-scale stock

$100\nu_F$	Welfare gain	Output gain	Lending gain	DeFi rate
1.00	0.09	0.09	-0.08	4.15
3.80	0.07	0.32	-0.07	0.00
10.00	0.02	0.20	-0.13	0.00
20.00	-0.05	0.04	-0.22	0.00

Notes: All entries are percentages. Welfare, output, and lending gains compare the Treasury-scale stock with an economy holding 1.00% of benchmark GDP in stablecoins, split 30/70 between domestic and foreign holders, at the same ν_F as the row. Domestic acquisition value remains 0.30% of benchmark GDP in both economies. Welfare gains are consumption equivalents net of domestic participation utility costs; the DeFi rate is the level at the Treasury-scale stock.

5.4 Foreign Circulation at the Treasury Scale

Unlike Section 5.3, this exercise imposes \$3 trillion, with foreign absorption, rather than optimizing issuance. Limited foreign access insulates domestic liquidity; greater access can satiate borrowing even with small domestic holdings.

Keep $\alpha_e = 0.03$ and domestic principal $Z_D^e/[(1+r^e)Y_{\text{ref}}] = 0.003$, with foreigners absorbing the remainder of $Z_T^e/(1+r^e)$. Domestic investment is \$92 billion and foreign investment \$2.625 trillion in 2025 dollars, implying 96.60% foreign ownership. Fixed investment does not fix payment liquidity: $\hat{Z}_D^e = 0.003 Y_{\text{ref}}(1+r^e)/w$ adjusts with returns and wages.

Vary ν_F while fixing domestic participation and seller redeposit. Every foreign coin requires reserves, but only $\nu_F \hat{Z}_F^e$ enters the initial domestic pool, so holdings and access jointly determine added liquidity.

In Table 4, 1.00% foreign access permits a 4.15% DeFi rate and \$136 billion in annual domestic payments at the target stock. Benchmark 3.80% access instead drives the rate to zero, with \$194 billion in payments. Domestic withdrawal cannot offset foreign supply with fixed access. Further access adds excess capacity without changing the target allocation; reported gains vary because each row uses a smaller-stock reference at the same access.

Foreign liquidity lowers DeFi yields and raises issuer and, at a fixed spread, reserve returns (Section 3.4). Debt service raises taxes in every row despite tax-base expansion, weakening after-tax returns and credit demand. Liquidity and taxes also alter deposits and profits, so lending can fall at fixed domestic investment.

At benchmark access, bank lending falls by 0.07% even as total output rises by 0.32%, reflecting the gain in digital production. Domestic welfare also accounts for payments to foreign lenders and the resource flow X_F. At 20.00% access, expanding foreign holdings raises output by only 0.04%, reduces lending by 0.22%, and lowers welfare by 0.05% relative to the smaller-stock economy with the same access.

Worldwide holdings matter through both ownership and domestic DeFi access. Because foreign demand and payment benefits are unmodeled, this exercise qualifies stock projections without

establishing a larger optimum.

6 Fiscal Applications

Using Section 5.2's payment, credit, and fiscal mechanisms, we examine fiscal objectives and whether greater financing needs justify more issuance.

6.1 Fiscal Capacity and Issuance Objectives

With purchases and transfers fixed, we compare seigniorage-maximizing, tax-minimizing, and welfare-maximizing issuance. With taxes fixed, we measure additional annual purchases or transfers. Gains thus finance tax cuts in the first exercise and spending in the second.

Both exercises retain the calibration of Section 5.1, with $\eta = 0.50$. Stocks and fiscal flows are expressed relative to benchmark GDP Y_{ref}; reported output gains use fixed reference prices, and welfare includes domestic participation costs.

As Section 3.2 emphasizes, issuance changes both net debt service and taxable activity. We use the sales base $Y = Y^{CM} + V^o + V^e$ defined in Section 4.4. Let $S = -r^s \frac{Z^e}{1+r^e}$ denote net real seigniorage on stablecoin-backed debt. With purchases, transfers, and the fund portfolio fixed, the budget constraint implies

$$\underbrace{(\tau_0 - \tau)Y}_{\text{tax relief}} = \underbrace{\tau_0(Y - Y_0)}_{\text{tax-base contribution}} + \underbrace{S - S_0}_{\text{net seigniorage contribution}}, \tag{18}$$

where subscript zero denotes the same economy without stablecoins. Additional sales are valued at the original tax rate. As in Section 5.2, this decomposes the tax-adjusting equilibrium, not a separate fixed-tax counterfactual. The required fund return fixes aggregate portfolio service costs despite changing Treasury yields.

Differentiating the budget along a smooth equilibrium branch with fixed G, T, and inflation gives:

$$-Y\frac{d\tau}{d[Z^e/(1+r^e)]} = \tau\frac{dY}{d[Z^e/(1+r^e)]} + \underbrace{-r^s - \frac{Z^e}{1+r^e}\frac{dr^s}{d[Z^e/(1+r^e)]}}_{dS/d[Z^e/(1+r^e)]}.$$

Total derivatives include endogenous tax and allocation responses. Additional reserves earn the current margin but change service costs on the existing stock. At the tax minimum, marginal seigniorage exactly offsets the revenue effect of taxable activity, which a seigniorage objective ignores.

In Table 5, seigniorage peaks at 0.58% of GDP, yielding \$1.88 billion annually. Taxes are minimized at 2.40%, where \$48.43 billion from the tax base offsets \$7.96 billion in service costs.

Table 5: Fiscal and welfare objectives for stablecoin issuance

Objective	Stock	CEV	Tax saving	Tax base	Seigniorage	Tax relief
Welfare maximum	2.89	0.35	0.13	50.68	-11.01	39.67
Tax minimum	2.40	0.35	0.13	48.43	-7.96	40.47
Seigniorage maximum	0.58	0.16	0.06	17.36	1.88	19.24

Notes: Stocks are percentages of benchmark GDP; CEV gains are percentages; tax savings are percentage-point reductions. The last three columns are annual billions of 2025 dollars and implement (18). Purchases and transfers are fixed, and each comparison uses the no-stablecoin equilibrium. The search covers stocks from zero to 9.00% of benchmark GDP, with interior optima refined numerically.

Welfare peaks at 2.89% because payment benefits persist beyond the tax minimum. Choosing the tax minimum sacrifices less than 0.01 percentage points of CEV; maximizing seigniorage yields only 0.16%, versus the welfare optimum's 0.35%.

As in Section 5.2, liquidity expands activity and revenue, allowing tax cuts that reinforce working-capital demand. Seigniorage maximization ignores this feedback, stopping before the welfare optimum and missing the main fiscal contribution.

Next, hold τ at its no-stablecoin rate of 26.72% and let transfers close the budget; separately, fix transfers and adjust purchases, resources, and the tax base. Within the search range, transfers can rise by $27.86 billion annually, or 0.09% of benchmark GDP, at 2.39% issuance. Purchases can rise by $37.83 billion, or 0.12%, also at 2.39%, because they induce a larger taxable-sales response. These capacities differ from the $39.67 billion tax relief at the welfare optimum because spending and tax adjustment produce different tax bases. They are sustainable annual flows, not debt-sale proceeds, and are small relative to fiscal needs despite meaningful payment-related welfare gains.

6.2 Stablecoin Policy under Fiscal Pressure

Beyond Section 6.1's fixed-tax capacity, taxes now adjust to larger obligations. For each, we compare welfare-optimal issuance with tax-only financing.

Unlike Section 5.3, payment opportunities stay fixed. Higher calibrated taxes weaken production, credit, and liquidity gains, favoring smaller stocks under Section 3.2's trade-off. Stablecoins still improve welfare over tax-only financing. The result holds for transfers and purchases, independently of direct goods absorption.

Retaining the same calibration and $\eta = 0.50$, we start from $G/Y_{\text{ref}} = 17.15\%$ and $T/Y_{\text{ref}} = 7.80\%$ and separately increase purchases or transfers by up to 7.50% of benchmark GDP, keeping all other primitives fixed. The tax rate balances the budget at the chosen stock; the tax-only comparison sets issuance to zero.

With the fund portfolio and inflation fixed, changes in the financing requirement satisfy

$$dG + dT = \underbrace{Y\,d\tau}_{\text{tax-rate adjustment}} + \underbrace{\tau\,dY}_{\text{tax-base response}} + \underbrace{dS}_{\text{net seigniorage response}}.$$

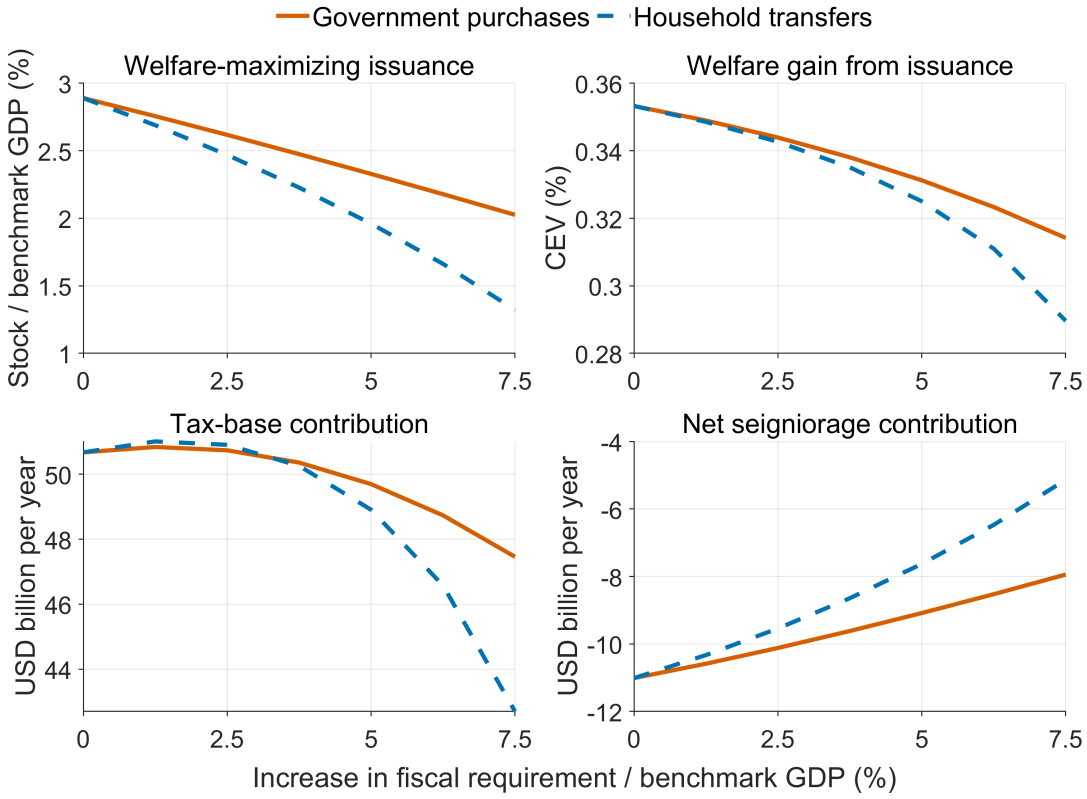

Figure 7: Stablecoin policy under higher fiscal requirements. Note: Orange solid curves increase government purchases; blue dashed curves increase household transfers. The horizontal axis measures the increase from the calibrated fiscal requirement. All panels evaluate welfare-maximizing issuance in each environment. CEV gains and fiscal contributions are relative to tax-only financing of the same requirement. The lower panels implement (18); their sum is tax relief in annual billions of 2025 dollars. The seven fiscal increments are 1.25 percentage points apart. All reported optima are interior to the issuance search range of 0–9.00% of benchmark GDP.

Taxes cover obligations not financed by tax-base and seigniorage responses; their required increase therefore depends on how purchases and transfers affect allocations.

Purchases absorb CM goods; transfers redistribute purchasing power. With representative households, the transfer exercise captures financing distortions and payment benefits, not targeted redistribution. Purchases do not directly enter utility, so welfare comparisons hold the fiscal obligation fixed.

Figure 7 shows declining optimal issuance, more sharply for transfers. An additional 5.00% of GDP in purchases lowers optimal issuance to 2.33%, with 0.33% welfare gains over tax-only financing and taxes of 32.03% rather than 32.16%. Equal additional transfers yield 1.96% optimal issuance, 0.33% welfare gains, and taxes of 34.99% rather than 35.14%. Stablecoins improve financing without eliminating tax increases: the transfer expansion costs $1.54 trillion annually, far above fixed-tax capacity.

At the welfare optima, the lower panels of Figure 7 show positive tax-base contributions and negative seigniorage. The former rises slightly before falling, while smaller stocks limit service

costs. Changed DM terms of trade and weaker production and credit reduce taxable activity available to offset reserve-debt costs. Transfers contract the tax base more than equal purchases, explaining their larger tax increase.

Greater fiscal need therefore does not overturn the modest optimal scale in Section 5.2: conventional taxation bears most of the additional obligation, even when stablecoins improve the financing mix.

7 Conclusion

Stablecoins connect payments, Treasury backing, and DeFi lending. Payment services and DeFi income sustain demand for coins, while reserve backing transmits their liquidity value to government financing. In turn, lower distortionary taxes can offset the bank-credit losses from deposit displacement. Fiscal benefits therefore extend beyond cheap reserve funding: additional taxable activity can support tax relief even when backing debt carries a positive net real servicing cost.

However, these gains face fiscal limits. As issuance expands relative to payment needs, liquidity becomes less scarce, DeFi yields fall, and holders require higher issuer returns. The financing advantage consequently erodes, generating a stablecoin Laffer curve. Under calibrated payment fundamentals, welfare favors a modest stock at a positive DeFi yield, well below the Treasury-discussed scale. A larger optimum therefore requires substantially more payment use. Foreign holdings alone do not establish that need, since their liquidity effects depend on access to domestic DeFi. Moreover, maximizing seigniorage favors less issuance than maximizing welfare, whereas minimizing taxes preserves almost all the welfare gain. Higher spending obligations nevertheless reduce optimal issuance, limiting its capacity to replace conventional taxation.

These findings also motivate further research. Endogenous entry, pricing, and access in banking and DeFi would clarify how competition shapes adoption, liquidity provision, and rents. Extending the framework to monetary policy and transition dynamics would then connect these responses to government financing needs, informing how policy can guide the evolution of payments, credit, and fiscal capacity.

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A Basic Model: Derivations and Equilibrium

Use Section 2's notation and zero-inflation normalization, $P_t = 1$, with stationary allocations, $G \geq 0$, no transfers, and fixed DeFi access ν_D. The taxed two-round extension is in Section 4 and Appendix C.

A.1 Household Liquidity Demand

To establish Lemma 1, substitute labor from the CM budget into $U(c) - h + \beta J$. Writing inherited wealth as $a = m_-^d + m_-^e + s_-$ gives

$$W = \frac{a + \Delta^B + \Delta^F}{w} + \max_{c, m^d, m^e, s} \left\{ U(c) - \frac{c}{w} - \frac{m^d/R^d + m^e/R^e + s/R^f}{w} + \beta J(m^d, m^e, s) \right\}.$$

An extra unit of inherited wealth replaces $1/w$ units of labor, so $W_1 = W_2 = W_3 = 1/w$. Optimal consumption satisfies $U'(c) = 1/w$, and portfolio choices are wealth-independent. Portfolio optimality requires $\frac{1}{R^d w} \geq \beta J_1$, $\frac{1}{R^e w} \geq \beta J_2$, and $\frac{1}{R^f w} \geq \beta J_3$, with equality for positive holdings. Stationarity equates current and next-period continuation slopes.

To obtain these slopes, let $\hat{x}^j = x^j/w$ denote usable payment balances. Bargaining in Appendix A.2 gives consumption $Y_j(\hat{x}^j)$ and liquidity premium $\lambda_j(\hat{x}) = \max\{u_j'(Y_j(\hat{x}))Y_j'(\hat{x}) - 1, 0\}$. An ordinary buyer retains her coins and uses $x^o = m_-^d + m_-^e$. Both instruments therefore have marginal value $(1 + \lambda_o(\hat{x}^o))/w$. A digital buyer uses only coins, with $x^e = m_-^e + \tilde{m}^e$, and repays $(1 + i^e)\tilde{m}^e$ in the CM. An extra borrowed coin yields $(1 + \lambda_e(\hat{x}^e))/w$ and costs $(1 + i^e)/w$, so

$$\tilde{m}^e \geq 0, \qquad i^e - \lambda_e(\hat{x}^e) \geq 0, \qquad \tilde{m}^e[i^e - \lambda_e(\hat{x}^e)] = 0.$$

Thus positive borrowing implies $i^e = \lambda_e(\hat{x}^e)$; deposits held by digital buyers and non-payment savings have only redemption value $1/w$. Eligible no-meeting buyers lend all coins at positive rates and are indifferent at zero. Averaging over meeting types and access gives

$$wJ_1 = 1 + \alpha_o \lambda_o(\hat{x}^o), \quad wJ_2 = 1 + \alpha_o \lambda_o(\hat{x}^o) + \alpha_e \lambda_e(\hat{x}^e) + \alpha_n \nu_D i^e, \qquad wJ_3 = 1.$$

Substitution yields Lemma 2, combining digital-payment and lending terms on the positive-borrowing branch as $(\alpha_e + \alpha_n \nu_D)\lambda_e(\hat{x}^e)$. At zero yield, market-clearing complementarity permits idle eligible coins.

A.2 Bargaining and the Liquidity Premium

Suppress meeting type j. Hold DFM borrowing and repayment fixed, and let x be post-DFM liquidity: deposits are usable only in ordinary meetings. With buyer bargaining power $\theta \in (0, 1]$ and production cost $c(y)$, Kalai bargaining solves

$$\begin{aligned} \max_{y, \tilde{x}} \quad & u(y) - \tilde{x}/w \\ \text{s.t.} \quad & \theta[\tilde{x}/w - c(y)] = (1 - \theta)[u(y) - \tilde{x}/w], \qquad 0 \leq \tilde{x} \leq x. \end{aligned}$$

The sharing constraint gives $\tilde{x}/w = g(y) \equiv (1 - \theta)u(y) + \theta c(y)$. Let y^* solve $u'(y^*) = c'(y^*)$. Then

$$Y(\hat{x}) = \min\{g^{-1}(\hat{x}), y^*\}, \qquad \tilde{x} = w \min\{\hat{x}, g(y^*)\}, \qquad \hat{x} = x/w.$$

Below satiation, inverse differentiation gives $Y'(\hat{x}) = \frac{1}{g'(Y(\hat{x}))}$ and $\frac{\partial Y(x/w)}{\partial x} = \frac{1}{w g'(Y(\hat{x}))}$; primes refer to normalized liquidity. For the main-text cost $c(y) = y$, efficient consumption satisfies $u'(y^*) = 1$, satiation

occurs at $x^* = wg(y^*)$, and the premium is $\max\{u'(Y(\hat{x}))/g'(Y(\hat{x})) - 1, 0\}$ below satiation and zero thereafter. Full buyer power, $\theta = 1$, gives $g(y) = y$ and $\lambda(\hat{x}) = u'(\hat{x}) - 1$ below satiation.

A.3 Stationary Equilibrium and Debt Maturity

Following Woodford (2001), the fund's long-term bonds pay one unit of the numeraire next CM and leave ρ bonds, with $0 \leq \rho < 1/\beta$. At price p^b, continuation value is ρp^b: claims backed by b_- bonds cost $p^b_- b_-$ last CM and pay $(1 + \rho p^b)b_-$ now. Hence $R^f_- = \frac{1+\rho p^b}{p^b_-}$ at zero inflation; in stationarity, $R^f = \frac{1+\rho p^b}{p^b}$, $\quad p^b = \frac{1}{R^f - \rho}$. This implements Section 2's next-CM payoff convention without tracking bond quantities.

Under the baseline normalization, take G, $\frac{B^b}{R^f}$, $\frac{Z^e}{R^e}$, and the primitives as given. On the branch with positive deposits, stablecoins, and DeFi borrowing, and binding bank lending with $R^L > R^f$ and $\chi(R^L - R^f) < 1$, the ten unknowns are $(c, H, L, Z^d, R^d, R^e, R^L, w, \tau, i^e)$. They satisfy

$$
\begin{aligned}
1 &= \beta R^d[1 + \alpha_o \lambda_o(x^o/w)], \\
1 &= \beta R^e[1 + \alpha_o \lambda_o(x^o/w) + (\alpha_e + \alpha_n \nu_D) i^e], \\
i^e &= \lambda_e(x^e/w), \qquad U'(c) = 1/w, \qquad 2c + G = f(H), \\
\frac{L}{R^L} &= wH, \qquad (1-\tau) f'(H) = R^L w, \\
\frac{L}{R^L} &= \frac{\chi(Z^d/R^d)(R^f - R^d)}{1 - \chi R^L + \chi R^f}, \qquad R^f - R^d = R^f \frac{Z^d}{N R^d} \frac{\partial \mathcal{R}(Z^d; Z^e)}{\partial Z^d}, \\
\tau f(H) &= G + (R^f - 1)\frac{B^b}{R^f} + (1 - 1/R^e) Z^e,
\end{aligned}
$$

where $R^f = 1/\beta$, $R^s = R^e$, $\frac{B^s}{R^s} = \frac{Z^e}{R^e}$, $y^j = Y_j(x^j/w)$, $x^o = Z^d + Z^e$, and $x^e = (\alpha_e + \alpha_n \nu_D) Z^e / \alpha_e$. At zero pool yield, eligible balances may remain idle; the DFM complementarity conditions in Section 2 replace full deployment. The deposit-return derivative holds wages, other returns, and stablecoin supply fixed. Here L is the aggregate loan payoff and L/R^L is principal. Banks' aggregate net bond acquisition value is $b^B/R^f = \frac{Z^d}{R^d} - L/R^L$, with $b^B = \sum_i b(i)$. Long-term debt payoff B^b includes continuation value. Without offsetting gross positions, banks directly hold $\max\{\frac{b^B}{R^f}, 0\}$ of long-term bonds and borrow $\max\{-\frac{b^B}{R^f}, 0\}$ through wholesale time deposits. The household fund holds the residual $\frac{B^b}{R^f} - \max\{\frac{b^B}{R^f}, 0\} \geq 0$ in long bonds. Households own the fund and supply wholesale deposits; their aggregate acquisition spending s/R^f on non-payment savings sums to $\frac{B^b}{R^f} - \frac{b^B}{R^f}$. Offsetting bond purchases and wholesale borrowing substitute time deposits for fund shares without changing net positions, profits, or lending capacity.

A.4 Equilibrium Curves and Fiscal-Capacity Domain

Specialize to $U(c) = \log c$, so $c = w = [f(H) - G]/2$, and write $\xi = 1 + \chi(1 + r)$. Holding normalized issuance $\hat{Z}^e$ fixed, substitute household and firm optimality into the lending constraint and government budget to obtain

$$
\begin{aligned}
\tau_{\mathrm{ME}}(H, G) &= 1 - \frac{[\xi H - \chi \mathcal{P}(\hat{Z}^e)][f(H) - G]}{2\chi f'(H) H}, \\
\tau_{\mathrm{GB}}(H, G) &= \mathcal{D}(\hat{Z}^e) + \frac{G[1 - \mathcal{D}(\hat{Z}^e)] + r B^b / R^f}{f(H)}.
\end{aligned}
$$

For power production $f(H) = H^{\varpi}$, fix $0 \leq \hat{Z}^e < \hat{\bar{x}}^o$, $\chi > 0$, $r > 0$, and $0 < \varpi \leq 1$. Define $\bar{H} = \frac{\chi\mathcal{P}(\hat{Z}^e)+2\chi\varpi[1-\mathcal{D}(\hat{Z}^e)]}{\xi}$, and

$$\underline{H} = \max\{G^{1/\varpi}, \chi\mathcal{P}(\hat{Z}^e)\}, \qquad \mathcal{Q}(H,G) = \frac{\xi}{2\chi\varpi}(H^{\varpi} - G)(\bar{H} - H).$$

Equilibrium hours solve $\mathcal{Q}(H,G) = rB^b/R^f$, where $\mathcal{Q}(H,G)$ measures financeable inherited debt service. Notice that both τ_{ME} and τ_{GB} are decreasing functions in H on $(\underline{H}, \infty)$.

Positive consumption and strict binding lending require $\underline{H} < H < \bar{H}$. Define $\mathcal{Q}_{\max}(\hat{Z}^e, G)$ as the domain supremum (maximum on its closure), or zero if empty, distinct from issuance resources $\mathcal{F}(\hat{Z}^e)$.

Additional equilibrium restrictions. The capacity calculation imposes positive private consumption and $R^L > 1 + r$, with $\xi - \chi R^L = \chi\mathcal{P}(\hat{Z}^e)/H > 0$; it also implies $\tau < 1$. Appendix A.3's asset-market restrictions apply separately:

$$\frac{B^b}{R^f} \geq \max\left\{w\left[\frac{\hat{Z}^d}{R^d} - H\right], 0\right\}$$

ensures nonnegative household-fund bond holdings under the stated portfolio implementation. Along with any $\tau \geq 0$ restriction, this can bind before capacity and break nesting as G changes. ME/GB bounds therefore apply to full equilibrium only where these restrictions hold. The comparisons concern normalized issuance: actual $Z^e/R^e = \hat{Z}^e w/R^e$ changes with wages and returns, so its mapping depends on G and need not be monotone. Nor is fiscal capacity a welfare ranking.

A.5 Tax Roots and Local Existence

With $G = 0$, $f(H) = H$, and $\theta_e = 1$ (allowing $\theta_o \in (0, 1]$), $H = 2w$. Equations ME and GB imply

$$w = \frac{\chi\mathcal{P}(\hat{Z}^e) + 2\chi(1-\tau)}{2\xi}, \tag{19}$$

$$[\tau - \mathcal{D}(\hat{Z}^e)][\chi\mathcal{P}(\hat{Z}^e) + 2\chi(1-\tau)] = \xi r\frac{B^b}{R^f}. \tag{20}$$

Solving (20) for the smaller tax root gives

$$\begin{aligned}\tau(\hat{Z}^e) = {} & \frac{\chi\mathcal{P}(\hat{Z}^e) + 2\chi[1 + \mathcal{D}(\hat{Z}^e)]}{4\chi} \\ & - \frac{\sqrt{\{\chi\mathcal{P}(\hat{Z}^e) + 2\chi[1 - \mathcal{D}(\hat{Z}^e)]\}^2 - 8\chi\xi r\frac{B^b}{R^f}}}{4\chi}.\end{aligned} \tag{21}$$

For local existence with small positive inherited debt, start from $\frac{B^b}{R^f} = \hat{Z}^e = 0$, which has $\tau(0) = 0$, $H(0) = \frac{\chi\mathcal{P}(0)+2\chi}{\xi}$, $w(0) = H(0)/2$. Consequently,

$$R^L(0) = \frac{2\xi}{\chi\mathcal{P}(0) + 2\chi} > 1 + r \quad \Longleftrightarrow \quad \chi\mathcal{P}(0) < \frac{2}{1+r},$$

and the lending denominator is $\xi - \chi R^L(0) = \frac{\xi\chi\mathcal{P}(0)}{\chi\mathcal{P}(0)+2\chi} > 0$. The discriminant is strictly positive. By continuity, these conditions, $\tau < 1$, and $\hat{Z}^e < \hat{\bar{x}}^o$ hold for sufficiently small $\frac{B^b}{R^f} > 0$ and $\hat{Z}^e \geq 0$. With the asset-market restrictions, this establishes local existence on the smaller-tax branch, with larger w and H

by (19), without ruling out a second algebraic root. At zero debt, nonnegative-tax restrictions can exclude beneficial issuance requiring negative taxes.

Eliminating the tax rate from ME and GB gives

$$\xi H + \frac{2\chi r B^b}{R^f H} = \chi \mathcal{P}(\hat{Z}^e) + 2\chi[1 - \mathcal{D}(\hat{Z}^e)]. \tag{22}$$

The smaller-tax solution is the larger positive hours root. Its positive discriminant implies $\Delta = \xi - 2\chi r B^b/(R^f H^2) > 0$; when inherited debt is zero, $\Delta = \xi$. Hence the left-hand side of (22) increases with hours on the selected branch.

A.6 Digital Satiation and Payment Regimes

With $\theta_e = 1$, write $\alpha_s = \alpha_e + \alpha_n \nu_D$. Ordinary liquidity satiates at $\hat{\bar{x}}^o = g_o(\bar{y}^o)$, while digital consumption reaches $\bar{y}^e$ at $\hat{Z}^e_{\text{sat}} = \frac{\alpha_e \bar{y}^e}{\alpha_s}$. Below this threshold, $y^e = \alpha_s \hat{Z}^e/\alpha_e$ and $i^e = \lambda_e(y^e) > 0$. At and above it, $y^e = \bar{y}^e$, $i^e = 0$, and eligible balances may remain idle. Ordinary buyers remain constrained for $\hat{Z}^e < \hat{\bar{x}}^o$. Throughout this interval,

$$\Lambda(\hat{Z}^e) = \alpha_o \lambda_o(\hat{Z}^d(\hat{Z}^e) + \hat{Z}^e) + \alpha_s \lambda_e\Big(\min\{\alpha_s \hat{Z}^e/\alpha_e, \bar{y}^e\}\Big), \qquad \mathcal{D}(\hat{Z}^e) = \frac{\beta \hat{Z}^e}{2}[r - \Lambda(\hat{Z}^e)].$$

Both Λ and $\mathcal{D}$ are continuous through digital satiation. Ordinary payment constraints keep Λ strictly decreasing afterward, with limit $\alpha_s \lambda_e\big(\min\{\alpha_s \hat{\bar{x}}^o/\alpha_e, \bar{y}^e\}\big)$. At deposit exhaustion, $\bar{y}^e \le \alpha_s \hat{\bar{x}}^o/\alpha_e$ makes this limit zero, ensuring the crossing in Section 3.2 if $\Lambda(0) > r$. Larger satiation quantities need not allow a crossing before deposits vanish; feasibility up to it is separately required. Equations (20) and (21) remain valid on both sides of digital satiation.

Digital utility specification. The digital shifted-CRRA specification following Corollary 1 is

$$u_e(y) = \begin{cases} A_e[(y+\zeta_e)^{1-\sigma_e} - \zeta_e^{1-\sigma_e}]/(1-\sigma_e), & \sigma_e \neq 1, \\ A_e \log[(y+\zeta_e)/\zeta_e], & \sigma_e = 1. \end{cases}$$

Here $\sigma_e, \zeta_e > 0$, $A_e \zeta_e^{-\sigma_e} > 1$, $\gamma_e = A_e \zeta_e^{-\sigma_e} - 1$, and $\bar{y}^e = A_e^{1/\sigma_e} - \zeta_e$.

A.7 Utility Specializations for the Simple Model

For Section 3.3's examples, set $\theta_o = 1$: normalized ordinary liquidity equals consumption and $p(N)$ is relative prudence. Primes differentiate N; Appendix B.7 establishes CARA and quadratic uniqueness.

For CARA, $\lambda_o = M_o e^{-a_o y} - 1$ and $p = z = a_o \hat{Z}^d(0)$. The Cournot condition gives $M_o e^{-z}(N - z) = N$, hence $0 < z < N$, $d = N + 1 - z > 1$, and $z' = z/(Nd) > 0$. Since $2Nd > N + 1$,

$$Q(N) = \frac{(N-1)(2-z')}{N+1-z} > \frac{2(N-1)}{N+1}, \qquad N > 1.$$

Thus the unique CARA cutoff solves $Q(N^*) = \beta = 1/(1+r)$ and lies below the quadratic cutoff. For quadratic utility, $\lambda_o = \gamma_o - b_o y$, $p = 0$, and $d = N + 1$; for CRRA, $\lambda_o = A_o y^{-\sigma_o} - 1$, $p = 1 + \sigma_o$, and $d = N - \sigma_o$. Solving $Q(N^*) = \beta$ gives

$$N^*_{\text{quad}} = \frac{3 + 2r}{1 + 2r}, \qquad N^*_{\text{CRRA}} = 1 + \frac{1 - \sigma_o}{1 + 2r} \in (1, 2).$$

All three elasticities rise strictly to infinity, from zero for CARA and quadratic utility and $\sigma_o < 1$ for CRRA. Appendix A.6's digital specification affects access thresholds through γ_e, not these cutoffs.

At positive issuance, $dy^o/d\hat{Z}^e$ is the inverse of $N + 1 + (y^o - \hat{Z}^e)\lambda_o''/\lambda_o'$. This denominator is $N + 1$ for quadratic utility, $N + 1 - a_o(y^o - \hat{Z}^e) > 1$ for CARA by the Cournot condition, and at least $N - \sigma_o > 1$ for CRRA when $N \geq 2$. Thus normalized deposits fall in these cases.

A.8 DeFi Access at Positive Issuance

For Section 3.4, use $G = 0$, linear production, fixed inherited debt market value, and Appendix A.5's feasible binding-lending branch with $\Delta > 0$. Unless stated otherwise, assume positive issuance and meeting shares, unsatiated payment markets, and differentiable digital marginal utility.

Normalized issuance. Hold $\hat{Z}^e$ and α_o fixed. From $y^e = \alpha_s \hat{Z}^e/\alpha_e$, $y^e_{\nu_D} = \alpha_n \hat{Z}^e/\alpha_e > 0$ and $y^e_{\alpha_e} = -\nu_D(1 - \alpha_o)\hat{Z}^e/\alpha_e^2 \leq 0$, while ordinary consumption and $\mathcal{P}$ are unchanged. Therefore

$$\Lambda_{\nu_D} = \alpha_n[\lambda_e(y^e) + y^e\lambda_e'(y^e)], \qquad \Lambda_{\alpha_e} = (1 - \nu_D)\lambda_e(y^e) - \frac{\nu_D(1 - \alpha_o)}{\alpha_e} y^e\lambda_e'(y^e) \geq 0.$$

For $\theta \in \{\nu_D, \alpha_e\}$, $\mathcal{D}_\theta = -\beta\hat{Z}^e\Lambda_\theta/2$; differentiating (22) and GB yields

$$H_\theta = \frac{\chi\beta\hat{Z}^e}{\Delta}\Lambda_\theta, \qquad \tau_\theta = -\frac{\beta\xi\hat{Z}^e}{2\Delta}\Lambda_\theta.$$

Thus hours and lending $H^2/2$ move with Λ_θ, taxes and the required issuer return oppositely. At $\Lambda_{\nu_D} = 0$, these responses vanish but digital consumption rises. Beyond digital satiation all direct responses vanish; boundary derivatives are one-sided. General utility guarantees neither unique reversals nor welfare rankings.

Utility examples. Write $K(y) = \lambda_e(y) + y\lambda_e'(y)$, so the access sign is the sign of K. Below satiation,

$$K(y) = \begin{cases} \gamma_e - 2b_e y, & \text{quadratic,} \\ M_e e^{-a_e y}(1 - a_e y) - 1, & \text{CARA,} \\ A_e[\zeta_e + (1 - \sigma_e)y]/(y + \zeta_e)^{1+\sigma_e} - 1, & \text{shifted CRRA.} \end{cases}$$

Here $\gamma_e, b_e > 0$; $M_e > 1$, $a_e > 0$; and $\sigma_e, \zeta_e > 0$, $A_e\zeta_e^{-\sigma_e} > 1$, respectively. For CARA and shifted CRRA,

$$K'(y) = a_e M_e e^{-a_e y}(a_e y - 2), \qquad K'(y) = \frac{A_e\sigma_e[(\sigma_e - 1)y - 2\zeta_e]}{(y + \zeta_e)^{\sigma_e+2}},$$

respectively. Each K starts positive, decreases wherever nonnegative, and reaches $\bar{y}^e\lambda_e'(\bar{y}^e) < 0$ at satiation (left derivative), giving one reversal. Strict convexity of these two premiums implies $0 = \lambda_e(\bar{y}^e) > K(\bar{y}^e/2)$: they reverse before half-satiation, versus exactly half for quadratic utility. In all three cases $\Lambda_{\alpha_e} > 0$ at positive unsatiated consumption. These comparisons require feasibility through the relevant range.

Actual issuance. Let $S = Z^e/R^e = \beta\hat{Z}^e H(1 + \Lambda)/2$; primes now differentiate $\hat{Z}^e$ at fixed parameters. On a branch with $S' > 0$,

$$\left.\frac{d\hat{Z}^e}{d\theta}\right|_S = -\frac{S_\theta}{S'}, \qquad S_\theta = \frac{\beta\hat{Z}^e H}{2}\left[1 + \frac{\chi\beta\hat{Z}^e(1 + \Lambda)}{\Delta H}\right]\Lambda_\theta.$$

Combining this adjustment with (28) gives

$$\left.\frac{dH}{d\theta}\right|_S = \frac{\chi\beta\hat{Z}^e H(1-\mathcal{P}')}{2\Delta S'}\Lambda_\theta, \qquad \left.\frac{d\Lambda}{d\theta}\right|_S = \Lambda_\theta - \Lambda'\frac{S_\theta}{S'}.$$

Since $\mathcal{P}' < 0$ and $\Lambda' < 0$, output, lending, and required-return signs persist. Differentiating $\tau H = rB^b/R^f + (R^e-1)S$ gives

$$\left.\frac{d\tau}{d\theta}\right|_S = \frac{S\, dR^e/d\theta|_S - \tau\, dH/d\theta|_S}{H},$$

so the tax sign persists if $\tau \geq 0$. Adverse access ($\Lambda_{\nu_D} < 0$) raises normalized issuance, reinforcing the direct rise in digital consumption. Since $S'(0) = w(0)/R^e(0) > 0$ and the three digital families satisfy $y\lambda_e'(y) \to 0$, $S' > 0$ near zero issuance. Global monotonicity is not assumed; turning points and equilibrium switches are excluded.

A.9 Extension: Collateralized DeFi Lending

Extend the stationary one-round, zero-inflation model with $\nu_D = 1$ and $\theta_o = \theta_e = 1$, separately from the quantitative two-round model. Use Appendices A.1–A.2's premium $\lambda_j(y^j)$. A Lucas tree has fixed supply A^c, real ex-dividend price p^c, CM-goods dividend δ, and pledgeable share φ of next-CM value. Symmetric buyers each hold A^c; sellers can hold none when the collateral premium raises prices above dividend-only value.

Borrowing and market clearing. Tree purchases cost $p^c a^c$; inherited holdings pay $(p^c+\delta)a^c_-$, with stationary $a^c_- = a^c$. Define normalized repayment $\hat{\ell}^e = \ell^e/w$ and collateral $K = \varphi(p^c+\delta)A^c/w$. The bound $\hat{\ell}^e \leq K$ covers principal plus interest, excluding own coins. With positive borrowing, the multiplier $\mu \geq 0$ (utility per unit of normalized collateral) satisfies

$$\lambda_e(y^e) - i^e = \mu(1+i^e), \qquad \mu[K - \hat{\ell}^e] = 0, \qquad x^e = w\left(\hat{Z}^e + \frac{\hat{\ell}^e}{1+i^e}\right). \tag{23}$$

Only no-meeting buyers supply loans; digital buyers retain their coins. Thus

$$\alpha_e\frac{\hat{\ell}^e}{1+i^e} \leq \alpha_n\hat{Z}^e, \qquad i^e\left[\alpha_n\hat{Z}^e - \alpha_e\frac{\hat{\ell}^e}{1+i^e}\right] = 0. \tag{24}$$

Lending regimes. With $\mu = 0$, $\lambda_e(y^e) = i^e$. Positive yields imply full lending, $\hat{\ell}^e/(1+i^e) = \alpha_n\hat{Z}^e/\alpha_e$, and collateral is strictly slack if $K > (1+i^e)\alpha_n\hat{Z}^e/\alpha_e$. At satiation, zero yields permit idle coins even with slack collateral; $R^e < 1/\beta$ does not exclude this because ordinary payments can sustain its premium.

With $\mu > 0$ and full lending, $\hat{\ell}^e = K$ and $1 + i^e = \alpha_e K/(\alpha_n\hat{Z}^e)$, requiring $i^e \geq 0$ and $\lambda_e(y^e) > i^e$. If instead $K < \alpha_n\hat{Z}^e/\alpha_e$ and $\lambda_e(\min\{\hat{Z}^e + K, \bar{y}^e\}) > 0$, collateral binds with idle coins: $i^e = 0$ and $\hat{\ell}^e = K$. Boundary equalities connect these regimes.

Portfolios and resources. Deposit and fund Euler conditions remain those in Appendix A.1. With positive holdings, stablecoins and trees satisfy

$$1 = \beta R^e[1 + \alpha_o\lambda_o(y^o) + \alpha_e\lambda_e(y^e) + \alpha_n i^e], \qquad p^c = \beta(p^c+\delta)[1+\alpha_e\varphi\mu].$$

At zero holdings, acquisition cost weakly exceeds discounted benefit. Own coins relax payments; trees support digital buyers' borrowing, with premium $\alpha_e\varphi\mu = \alpha_e\varphi[\lambda_e(y^e) - i^e]/(1+i^e)$. This equals $\alpha_e\varphi\lambda_e(y^e)$ at zero interest and vanishes with slack collateral, giving dividend-only value.

Resources satisfy $C + G = f(H) + \delta A^c$, with $C = 2c$. Slack collateral recovers baseline deposit, stablecoin, and borrowing conditions at given allocations; dividends remain, so equilibrium can differ from the tree-free economy.

B Proofs

B.1 Proof of Proposition 1

Write $Z^d = z_j^d + Z_{-j}^d$. As in Section 2, bank j chooses z_j^d holding Z_{-j}^d, wages, other returns, and stablecoin supply fixed. The funding raised is $z_j^d/R^d = z_j^d\mathcal{R}(Z^d;Z^e)^{-1}$. When $R^L > R^f$, the lending constraint binds. Substituting $b_j/R^f = z_j^d/R^d - \ell_j/R^L$ into profits gives

$$\Delta_j^B = (R^L - R^f)\frac{\ell_j}{R^L} + z_j^d[R^f\mathcal{R}(Z^d;Z^e)^{-1} - 1],$$
$$\frac{\ell_j}{R^L} = \frac{\chi z_j^d[R^f\mathcal{R}(Z^d;Z^e)^{-1} - 1]}{1 - \chi R^L + \chi R^f}, \qquad \frac{b_j}{R^f} = z_j^d\mathcal{R}(Z^d;Z^e)^{-1} - \frac{\ell_j}{R^L}.$$

The bank's reduced problem is

$$\max_{z_j^d \geq 0} \quad \frac{z_j^d[R^f\mathcal{R}(z_j^d + Z_{-j}^d;Z^e)^{-1} - 1]}{1 - \chi R^L + \chi R^f}.$$

The positive, fixed denominator gives the interior condition

$$R^f\left[\mathcal{R}(Z^d;Z^e)^{-1} + z_j^d\frac{\partial\mathcal{R}(Z^d;Z^e)^{-1}}{\partial Z^d}\right] = 1.$$

With $z_j^d = Z^d/N$,

$$(R^d)^{-1} = (R^f)^{-1} - \frac{Z^d}{N}\frac{\partial\mathcal{R}(Z^d;Z^e)^{-1}}{\partial Z^d}.$$

Using $\partial\mathcal{R}^{-1}/\partial Z^d = -(R^d)^{-2}\partial\mathcal{R}/\partial Z^d$ and multiplying by R^fR^d yields the deposit-rate markdown in (2). Aggregating with $Z^d = \sum_j z_j^d$ yields (3); accounting is unchanged by the strategic quantity.

If $R^L = R^f$, the bank can choose any feasible loan $0 \leq \ell_j/R^L \leq \chi z_j^d[R^f\mathcal{R}^{-1} - 1]$. If $R^L < R^f$, it chooses $\ell_j/R^L = 0$. Both objectives are proportional to $z_j^d[R^f\mathcal{R}^{-1} - 1]$, hence the same interior FOC.

The household Euler equation gives

$$\mathcal{R}(Z^d;Z^e)^{-1} = \beta[1 + \alpha_o\lambda_o(\hat{x}^o)], \qquad \frac{\partial\mathcal{R}^{-1}}{\partial Z^d} = \frac{\beta\alpha_o}{w}\lambda_o'(\hat{x}^o).$$

Here $\hat{x}^o = (Z^d + Z^e)/w$ on the constrained branch. Primes differentiate normalized liquidity; the claim-price derivative at fixed w therefore includes $1/w$. Since $\lambda_o'(\hat{x}^o) < 0$, this derivative is negative; it differs from a return derivative with respect to deposit principal. □

B.2 Proof of Lemma 3

For existence and uniqueness, including zero issuance, use $\varepsilon(x) = -x\lambda_o'(x)/\lambda_o(x)$ and ordinary liquidity $\hat{x}^o = \hat{Z}^d + \hat{Z}^e$. The symmetric Cournot condition is $\varepsilon(\hat{x}^o)\left(1 - \frac{\hat{Z}^e}{\hat{x}^o}\right) = N$, with its left-hand side strictly increasing in $\hat{x}^o > \hat{Z}^e$. Its lower limit is zero for $\hat{Z}^e > 0$ and $\varepsilon(0+) < 1$ for $\hat{Z}^e = 0$; its upper limit is infinite. There is exactly one root. For normalized choice $\hat{z}^d(i)$, write $\hat{x}^o = \hat{z}^d(i) + \hat{Z}^d(-i) + \hat{Z}^e$, with $\hat{Z}^d(-i)$ denoting rival normalized claims. The derivative of $\hat{z}^d(i)\lambda_o(\hat{x}^o)$ has the sign of $1 - [\hat{z}^d(i)/\hat{x}^o]\varepsilon(\hat{x}^o)$. Since the product $[\hat{z}^d(i)/\hat{x}^o]\varepsilon(\hat{x}^o)$ increases strictly, the derivative crosses zero once from above. Profits vanish beyond satiation, making the symmetric root globally optimal.

Writing $\Psi = N\lambda_o + (\hat{x}^o - \hat{Z}^e)\lambda_o'$, the root satisfies $\Psi_{\hat{x}^o} < 0$, since $\Psi = \lambda_o[N - \varepsilon(\hat{x}^o)(1 - \hat{Z}^e/\hat{x}^o)]$. Implicit differentiation gives

$$\frac{d\hat{x}^o}{d\hat{Z}^e} = \frac{\lambda_o'(\hat{x}^o)}{(N+1)\lambda_o'(\hat{x}^o) + (\hat{x}^o - \hat{Z}^e)\lambda_o''(\hat{x}^o)} > 0.$$

Ordinary consumption $Y_o(\hat{x}^o)$ rises with liquidity. Deposits fall if $N + (\hat{x}^o - \hat{Z}^e)\lambda_o''/\lambda_o' > 0$, ensured by the lemma's condition $x\lambda_o''/\lambda_o' > -N$. The deposit premium falls and R^d rises. Symmetry also gives

$$\mathcal{P}'(\hat{Z}^e) = \alpha_o\lambda_o(\hat{x}^o)\left[(1-N)\frac{d\hat{x}^o}{d\hat{Z}^e} - 1\right] < 0.$$

At fixed issuance, the Cournot condition implies that liquidity increases with N and approaches satiation as $N \to \infty$. Hence $\hat{x}^o \to \hat{\bar{x}}^o$, $\lambda_o(\hat{x}^o) \to 0$, and $R^d \to 1/\beta$. □

B.3 Proof of Proposition 2

Because $G = 0$, the global maximizer of $\mathcal{Q}$ is $\tilde{H}_* = \varpi\bar{H}/(1+\varpi)$. Let H_* maximize $\mathcal{Q}(H, 0)$ over $H \geq \underline{H}$ and define

$$\bar{\mathcal{P}} = \frac{2\varpi^2[1 - \mathcal{D}(\hat{Z}^e)]}{1 + (1+\varpi)\chi(1+r)}. \tag{25}$$

We distinguish two cases.

Case 1: Suppose $\mathcal{P}(\hat{Z}^e) < \bar{\mathcal{P}}$, which implies $H_* = \tilde{H}_* > \underline{H} = \chi\mathcal{P}(\hat{Z}^e)$. Combine ME and GB to eliminate τ and rearrange. One can show that an H is an equilibrium if it delivers a binding lending constraint and solves

$$rB^b/(1+r) = \mathcal{Q}(H, 0). \tag{26}$$

Because $\mathcal{Q}(H, 0) = \xi H^{\varpi}(\bar{H} - H)/(2\chi\varpi)$ is concave in H, if

$$\mathcal{Q}(\underline{H}, G) \equiv \frac{r}{1+r}\underline{B}^b < \frac{rB^b}{1+r} < \mathcal{Q}(H_*, G) \equiv \frac{r}{1+r}\bar{B}^b, \tag{27}$$

(26) has two solutions on $(\underline{H}, \infty)$. Notice that if $H > \underline{H} = \chi\mathcal{P}(\hat{Z}^e)$, the loan rate $R^L = 1 + r + 1/\chi - \mathcal{P}(\hat{Z}^e)/H > 1 + r$ and the lending constraint binds. By the ME, it also ensures $\tau < 1$ when $G = 0$. Therefore, each solution yields an equilibrium in which the lending constraint binds. The high-H equilibrium of the two has a higher wage and a lower tax rate because output is higher. It also has higher lending because it is equal to wH.

Case 2: Suppose $B^b < \underline{B}^b$. Then if $\mathcal{P}(\hat{Z}^e) < \bar{\mathcal{P}}$, (26) still has two solutions but the smaller solution falls below $\underline{H}$ and hence cannot be an equilibrium. Similarly, if $\mathcal{P}(\hat{Z}^e) \geq \bar{\mathcal{P}}$, $\tilde{H}_* \leq \underline{H}$ and $\mathcal{Q}(H, 0)$ is

decreasing on $[\underline{H}, \infty)$ and again the smaller solution cannot be an equilibrium. Therefore, only the larger solution yields an equilibrium and the lending constraint binds. This proves the proposition.

We next show the high H equilibrium is locally stable. At fixed normalized issuance, let $H_{\mathrm{ME}}(\tau)$ be ME's local inverse and consider $\dot{\tau} = \eta\big[\tau_{\mathrm{GB}}(H_{\mathrm{ME}}(\tau)) - \tau\big]$, $\eta > 0$, where the dot denotes adjustment time. The local slope is $\eta[\tau'_{\mathrm{GB}}(H)/\tau'_{\mathrm{ME}}(H) - 1]$. At the higher-hours root, $\mathcal{Q}'(H) < 0$ implies $\tau'_{\mathrm{ME}}(H) < \tau'_{\mathrm{GB}}(H) < 0$, giving local asymptotic stability. At the lower-hours root, $\mathcal{Q}'(H) > 0$ gives a positive slope and instability. This stability result concerns the stated adjustment rule, not full intertemporal dynamics or fixed actual issuance.

For the curve-shift discussion, notice that $\mathcal{P}'(\hat{Z}^e) < 0$, which implies that $\partial_{\hat{Z}^e}\tau_{\mathrm{ME}} < 0$ for all $H > \underline{H}$, whereas $\partial_{\hat{Z}^e}\tau_{\mathrm{GB}} = \mathcal{D}'(\hat{Z}^e)$. If $\mathcal{D}'(\hat{Z}^e) > 0$, the GB curve moves up as $\hat{Z}^e$ grows and equilibrium τ is higher and H lower. If $\mathcal{D}'(\hat{Z}^e) < 0$, the relative shifts determine the three cases described in the text. □

B.4 Proof of Proposition 3

Use the selected branch and $\Delta > 0$ defined in Appendix A.5, with $G = 0$, $f(H) = H$, and $\theta_e = 1$. Differentiating (22) and $\tau = \mathcal{D}(\hat{Z}^e) + rB^b/(R^f H)$ yields

$$H' = \frac{\chi(\mathcal{P}'(\hat{Z}^e) - 2\mathcal{D}'(\hat{Z}^e))}{\Delta}, \qquad \tau' = \frac{\xi\mathcal{D}'(\hat{Z}^e) - \chi r B^b \mathcal{P}'(\hat{Z}^e)/(R^f H^2)}{\Delta}. \tag{28}$$

Use one-sided versions at satiation kinks. Otherwise, output rises exactly when $-2\mathcal{D}'(\hat{Z}^e) > -\mathcal{P}'(\hat{Z}^e)$; the level $\mathcal{D}(\hat{Z}^e) < 0$ alone does not ensure that further issuance is expansionary.

At zero issuance, continuity of digital marginal utility suffices for $\mathcal{D}'(0) = \beta[r - \Lambda(0)]/2$; no digital second derivative at zero is needed. Substitution into (28) gives

$$H'(0) = \frac{\chi\beta}{\left[\xi - \frac{2\chi r B^b}{R^f[H(0)]^2}\right]}[\Lambda(0) - \kappa_H], \qquad \tau'(0) = -\frac{\beta\xi}{2\left[\xi - \frac{2\chi r B^b}{R^f[H(0)]^2}\right]}[\Lambda(0) - \kappa_\tau].$$

Since $\mathcal{F}(\hat{Z}^e) = -\mathcal{D}(\hat{Z}^e)H$ and $\mathcal{D}(0) = 0$, $\mathcal{F}'(0) = \beta H(0)[\Lambda(0) - r]/2$. These prove the three local conditions. Their ordering follows from $\mathcal{P}'(0) < 0$ and

$$\kappa_H - \kappa_\tau = -\frac{\mathcal{P}'(0)\left[\xi - \frac{2\chi r B^b}{R^f[H(0)]^2}\right]}{\beta\xi} > 0, \qquad \kappa_\tau > r,$$

where the latter inequality uses $B^b > 0$. Wages $H/2$ and lending principal $H^2/2$ move with hours. The conversion $d(Z^e/R^e)/d\hat{Z}^e|_0 = w(0)/R^e(0) > 0$ preserves these local signs.

For the global conclusions, if $\Lambda(0) \leq r$, strict decrease of $\Lambda(\hat{Z}^e)$ implies $\mathcal{D}(\hat{Z}^e) > 0$ and $\mathcal{P}(\hat{Z}^e) < \mathcal{P}(0)$ at every positive issuance. Equation (22) then gives $H < H(0)$, and GB gives $\tau > \tau(0)$. This establishes the stated tax, lending, and output optima at zero issuance.

If $\Lambda(0) > \kappa_\tau$, the tax rate initially falls. At the cost threshold, $\mathcal{D}(\hat{Z}^e_c) = \mathcal{D}(0) = 0$ but $\mathcal{P}(\hat{Z}^e_c) < \mathcal{P}(0)$, so hours are lower and the tax rate is at least its zero-issuance value. Continuity on the maintained compact interval gives an interior tax minimum. Fiscal resources $-\mathcal{D}(\hat{Z}^e)H$ are positive inside and zero at both endpoints, giving an interior maximum that need not minimize taxes. Beyond the crossing, $\mathcal{D}'(\hat{Z}^e) > 0$ and $\mathcal{P}'(\hat{Z}^e) < 0$ imply falling hours and rising taxes on any feasible continuation. Section 3.2 gives the crossing argument; Appendix A.6 supplies its endpoint and satiation details. □

B.5 Proof of the fiscal-capacity and spending results

Use Appendix A.4's capacity domain, positive inherited debt, and additional full-equilibrium restrictions. On this domain, $\mathcal{Q}_G = -\xi[\bar{H}(\hat{Z}^e) - H]/(2\chi\varpi) < 0$. Higher G weakly raises $\underline{H}$, shrinking the domain. Evaluating the old objective at the new maximizer shows $\mathcal{Q}_{\max}$ falls weakly, strictly if the new capacity is positive. Strict concavity of $\mathcal{Q}$ in H and $\mathcal{Q}(\bar{H}; \hat{Z}^e, G) = 0$ give a regular higher-hours solution in the strict domain exactly when $\frac{rB^b}{R^f} < \mathcal{Q}_{\max}(\hat{Z}^e, G)$. Hence the normalized issuance set shrinks weakly with G. Equality merges roots at an interior maximum; a lower-boundary supremum violates strict lending.

For interior limits and issuance boundaries, consider an interior maximizer $H_*(\hat{Z}^e, G)$, $H_*^{\varpi} - G = \varpi H_*^{\varpi-1}[\bar{H}(\hat{Z}^e) - H_*]$. The envelope theorem gives

$$\partial_G \mathcal{Q}_{\max}(\hat{Z}^e, G) = -\frac{\xi}{2\chi\varpi}[\bar{H}(\hat{Z}^e) - H_*] < 0,$$
$$\partial_{\hat{Z}^e} \mathcal{Q}_{\max}(\hat{Z}^e, G) = \frac{\xi}{2\chi\varpi}(H_*^{\varpi} - G)\bar{H}'(\hat{Z}^e).$$

At a regular issuance boundary $\hat{Z}_b^e(G)$, $\mathcal{Q}_{\max}(\hat{Z}_b^e(G), G) = rB^b/R^f$ and $\bar{H}'(\hat{Z}_b^e) \neq 0$ imply $\frac{d\hat{Z}_b^e}{dG} = \frac{1}{\varpi H_*^{\varpi-1}\bar{H}'(\hat{Z}_b^e)}$. Spending raises ascending lower boundaries and lowers descending upper boundaries. With single-peaked capacity and interior boundaries, contraction occurs at both ends; otherwise the local signs and set inclusion allow multiple components. Issuance tangencies and boundaries set by other constraints are excluded.

For power production, the corresponding crowding-in threshold is

$$\bar{H}'(\hat{Z}^e) = \frac{\chi}{\xi}[\mathcal{P}'(\hat{Z}^e) - 2\varpi\mathcal{D}'(\hat{Z}^e)], \qquad \bar{H}'(0) = \frac{\chi\beta\varpi}{\xi}[\Lambda(0) - \kappa_H], \quad \kappa_H = r - \frac{\mathcal{P}'(0)}{\beta\varpi},$$

so initial crowding in and higher interior fiscal capacity share a criterion, reducing to the main-analysis threshold at $\varpi = 1$.

With linear production, $\varpi = 1$, and an interior maximum,

$$H_* = \frac{\bar{H}(\hat{Z}^e) + G}{2}, \qquad \mathcal{Q}_{\max}(\hat{Z}^e, G) = \frac{\xi}{8\chi}[\bar{H}(\hat{Z}^e) - G]^2.$$

These formulas require $\bar{H}(\hat{Z}^e) > G$ and $[\bar{H}(\hat{Z}^e) + G]/2 > \chi\mathcal{P}(\hat{Z}^e)$. Solving $rB^b/R^f < \mathcal{Q}_{\max}$ gives the spending ceiling $G < \bar{H}(\hat{Z}^e) - \sqrt{\frac{8\chi}{\xi}\frac{rB^b}{R^f}}$, and the higher-hours root is

$$H_+ = \frac{\bar{H}(\hat{Z}^e) + G + \sqrt{[\bar{H}(\hat{Z}^e) - G]^2 - \frac{8\chi}{\xi}\frac{rB^b}{R^f}}}{2}.$$

At or below $\chi\mathcal{P}(\hat{Z}^e)$, the unconstrained maximizer must be replaced by the constrained supremum; the discriminant alone is insufficient.

To see when positive issuance becomes necessary, take $\hat{Z}_1^e > 0$ with $\bar{H}(\hat{Z}_1^e) > \bar{H}(0)$ and interior capacity at both issuance levels. If

$$\bar{H}(0) - \sqrt{\frac{8\chi}{\xi}\frac{rB^b}{R^f}} < G < \bar{H}(\hat{Z}_1^e) - \sqrt{\frac{8\chi}{\xi}\frac{rB^b}{R^f}},$$

only $\hat{Z}_1^e$ of these two issuance levels supports ME/GB equilibrium. Further issuance loses support if $\bar{H}(\hat{Z}^e)$ falls below the required level; calibrations need not reach both boundaries. Capacity decline, nesting, and

regular boundary directions extend to concave power production.

For spending-induced shifts and responses on a feasible, regular higher-hours branch, hold $\hat{Z}^e$ and $B^b/R^f > 0$ fixed; derivatives at $G = 0$ are from the right. The unchanged deposit equilibrium and liquidity premium make $\mathcal{P}(\hat{Z}^e)$, $\mathcal{D}(\hat{Z}^e)$, and $\bar{H}$ independent of G. Appendix A.4's curves therefore shift by

$$\partial_G \tau_{\mathrm{ME}} = \frac{\xi H - \chi \mathcal{P}(\hat{Z}^e)}{2\chi f'(H) H} > 0, \qquad \partial_G \tau_{\mathrm{GB}} = \frac{1 - \mathcal{D}(\hat{Z}^e)}{f(H)} > 0.$$

At an equilibrium, ME gives $\partial_G \tau_{\mathrm{ME}} = (1-\tau)/(f(H) - G)$, while GB gives $(1-\tau)f(H) = [1 - \mathcal{D}(\hat{Z}^e)][f(H) - G] - rB^b/R^f$. Substitution gives $\partial_G \tau_{\mathrm{GB}} - \partial_G \tau_{\mathrm{ME}} = \frac{rB^b/R^f}{f(H)[f(H)-G]} > 0$.

For $f(H) = H^{\varpi}$, write $H_G = dH/dG$ along the selected branch. Since $\mathcal{Q}(H, G) = rB^b/R^f$ and $\mathcal{Q}_H < 0$ there, $H_G = \frac{\xi(\bar{H} - H)}{2\chi\varpi \mathcal{Q}_H}$. Positive inherited debt implies $H < \bar{H}$, hence $H_G < 0$. Wages and consumption satisfy $\frac{dw}{dG} = \frac{dc}{dG} = \frac{f'(H)H_G - 1}{2} < 0$, while

$$\frac{d\tau}{dG} = \frac{1 - \mathcal{D}(\hat{Z}^e)}{f(H)} - \frac{\{G[1 - \mathcal{D}(\hat{Z}^e)] + rB^b/R^f\} f'(H)}{[f(H)]^2} H_G > 0,$$
$$\frac{d(L/R^L)}{dG} = \frac{f(H) - G + Hf'(H)}{2} H_G - \frac{H}{2} < 0.$$

Output falls because $df(H)/dG = f'(H)H_G < 0$.

For initial issuance thresholds, fix G and evaluate issuance derivatives with respect to $\hat{Z}^e$ at zero, with $H(0)$ depending on G. Since $\mathcal{D}(0) = 0$,

$$\mathcal{D}'(0) = \frac{\beta}{2}[r - \Lambda(0)], \qquad \mathcal{F}'(0) = \frac{\beta}{2}[f(H(0)) - G][\Lambda(0) - r],$$

where $\mathcal{F}(\hat{Z}^e) = -\mathcal{D}(\hat{Z}^e)[f(H) - G]$. At fixed hours, the issuance shifts are

$$\partial_{\hat{Z}^e} \tau_{\mathrm{ME}} = \frac{f(H(0)) - G}{2f(H(0))} \frac{\mathcal{P}'(0)}{\varpi}, \qquad \partial_{\hat{Z}^e} \tau_{\mathrm{GB}} = \frac{\beta[f(H(0)) - G]}{2f(H(0))}[r - \Lambda(0)].$$

Define the slope ratio and thresholds

$$\omega(G) = \frac{\tau_{\mathrm{GB},H}}{\tau_{\mathrm{ME},H}} \in (0, 1), \qquad \kappa_R = r, \qquad \kappa_H = r - \frac{\mathcal{P}'(0)}{\beta\varpi}, \qquad \kappa_\tau(G) = r + \omega(G)(\kappa_H - r).$$

The regular higher-hours branch and positive inherited debt imply this slope ordering. Differentiation gives

$$H'(0) = -\frac{\beta[f(H(0)) - G]}{2f(H(0))[\tau_{\mathrm{ME},H} - \tau_{\mathrm{GB},H}]}[\Lambda(0) - \kappa_H],$$
$$\tau'(0) = -\frac{\beta[f(H(0)) - G]}{2f(H(0))[1 - \omega(G)]}[\Lambda(0) - \kappa_\tau(G)].$$

At fixed G, wages, lending, and output move with hours, since $w = (f(H) - G)/2$ and $L/R^L = H[f(H) - G]/2$. Hence the initial sign conditions retain the ordering $\kappa_R < \kappa_\tau(G) < \kappa_H$. At $G = 0$ and $\varpi = 1$, these formulas reduce to the main-analysis thresholds.

Across spending levels at fixed primitives, the unchanged deposit equilibrium, $\mathcal{P}'(0)$, and $\Lambda(0)$ keep κ_R and κ_H independent of G. At zero issuance, $\tau_{\mathrm{GB},H} = -\varpi(G + rB^b/R^f)[H(0)]^{-\varpi-1}$. Its magnitude rises

with G because $H_G < 0$. By contrast, ME becomes flatter along the equilibrium: $\tau_{\mathrm{ME},HH} \leq 0$ and

$$\tau_{\mathrm{ME},HG} = \frac{\xi(1-\varpi)}{2\chi\varpi}[H(0)]^{-\varpi} + \frac{\mathcal{P}(0)}{2}[H(0)]^{-\varpi-1} > 0$$

imply $d\tau_{\mathrm{ME},H}/dG = \tau_{\mathrm{ME},HG} + \tau_{\mathrm{ME},HH}H_G > 0$. Thus $\omega'(G) > 0$ and $d\kappa_\tau(G)/dG > 0$ on this branch, raising the access threshold ν_τ as well, whereas ν_R and ν_H remain unchanged. Finally, $d(Z^e/R^e)/d\hat{Z}^e|_0 = w(0)/R^e(0) > 0$ transfers these initial signs to actual issuance, but not necessarily their magnitudes. □

B.6 Proof of Proposition 4

Without requiring $\theta_o = 1$, the normalized-liquidity premium below satiation, with $x = g_o(y)$, satisfies

$$\lambda_o(x) = \frac{\theta_o[u_o'(y) - 1]}{g_o'(y)}, \qquad \lambda_o'(x) = \frac{\theta_o u_o''(y)}{[g_o'(y)]^3}.$$

Thus $p(N)$ incorporates bargaining and utility curvature; with $\theta_o = 1$, $x = y$ and $\lambda_o = u_o' - 1$, it reduces to relative prudence.

For λ_o, C^3 gives continuous $p'(N)$ and C^4 supplies part 3's $p''(N)$. Sufficient primitives are $u_o \in C^4$ and $u_o \in C^5$, respectively, on the relevant range, with $g_o' > 0$ and the maintained endpoint restrictions. The fifth derivative is needed only for the smooth unique-turning-point condition, not financing thresholds or local competition signs.

The responses in Appendix B.4 and $\Lambda(0) = \alpha_o\lambda_o(\hat{Z}^d(0)) + \alpha_s\gamma_e$ give the access conditions and their ordering. Access raises each sign margin at rate $\alpha_n\gamma_e$. Write $d = d(N)$. Differentiating $\varepsilon(\hat{Z}^d(0)) = N$ gives $\varepsilon'(\hat{Z}^d(0)) = Nd/\hat{Z}^d(0)$, hence

$$\frac{d\hat{Z}^d(0)}{dN} = \frac{\hat{Z}^d(0)}{Nd}, \qquad \frac{d\lambda_o(\hat{Z}^d(0))}{dN} = -\frac{\lambda_o(\hat{Z}^d(0))}{d}, \qquad \mathcal{P}'(0) = -\alpha_o\lambda_o(\hat{Z}^d(0))\left[1 + \frac{N-1}{d}\right].$$

Therefore $d\nu_R/dN = \alpha_o\lambda_o(\hat{Z}^d(0))/(\alpha_n\gamma_e d) > 0$. Define $Q(N) = \frac{(N-1)[2-p'(N)]}{d}$. Direct differentiation yields $\frac{d\nu_H}{dN} = \frac{\alpha_o\lambda_o(\hat{Z}^d(0))}{\alpha_n\gamma_e d}[1 - (1+r)Q(N)]$, which proves the decreasing-threshold criterion. Equivalently, the crowding-in margin is

$$\Lambda(0) - \kappa_H = \alpha_s\gamma_e - r - \alpha_o\lambda_o(\hat{Z}^d(0))\left[r + (1+r)\frac{N-1}{d(N)}\right].$$

Beyond N^* the last term decreases with competition.

For the unique peak, write $A = (N-1)/d$, $B = 2 - p'$, and $W = 2 - p + (N-1)p'$. Then $A' = W/d^2$ and $Q - 1 = (N - 1 - W)/d$. Whenever $0 < Q \leq 1$, $W \geq N - 1 > 0$ and $B > 0$. Since $B' = -p'' \geq 0$, $Q' = A'B + AB' > 0$ there. Smoothness at satiation gives a finite limit of p and $p' \to 0$, so $Q(1) = 0$ and $Q \to 2$. Thus Q crosses $\beta \in (0,1)$ exactly once, upward.

The threshold definitions imply $\nu_\tau = (1-\vartheta_N)\nu_R + \vartheta_N\nu_H$, where $\vartheta_N = 2\chi r B^b/(R^f\xi[H(0)]^2) \in (0,1)$ on the selected branch. As $N \to \infty$, $\lambda_o(\hat{Z}^d(0)) \to 0$, $d/N \to 1$, and $\mathcal{P}'(0) \to 0$. The common threshold limit follows, conditional on feasibility. □

B.7 Proof of Corollary 1

The digital utility and its parameter restrictions are given in Appendix A.6. Write $x = g_o(y)$, where $g_o(y) = (1-\theta_o)u_o(y) + \theta_o y$ and $y = Y_o(\hat{Z}^d(0))$ at zero issuance. The preceding derivatives give

$$p(N) = -\frac{g_o(y)u_o'''(y)}{g_o'(y)u_o''(y)} + \frac{3(1-\theta_o)g_o(y)u_o''(y)}{[g_o'(y)]^2}.$$

Substituting the three utility specifications gives

$$p(N) = \begin{cases} \dfrac{a_o g_o(y)[\theta_o - 2(1-\theta_o)u_o'(y)]}{[g_o'(y)]^2}, & \text{CARA}, \\ -\dfrac{3(1-\theta_o)b_o g_o(y)}{[g_o'(y)]^2}, & \text{quadratic}, \\ \dfrac{g_o(y)[(1+\sigma_o)\theta_o + (1-2\sigma_o)(1-\theta_o)u_o'(y)]}{y[g_o'(y)]^2}, & \text{CRRA}. \end{cases}$$

Consumption and the competition derivative are determined by

$$N = -\frac{g_o(y)u_o''(y)}{[g_o'(y)]^2[u_o'(y)-1]}, \qquad \frac{dy}{dN} = \frac{g_o(y)}{Nd(N)g_o'(y)}, \qquad p'(N) = \frac{dp}{dy}\frac{g_o(y)}{Nd(N)g_o'(y)}.$$

These distinguish liquidity from consumption and define cutoffs at each admissible bargaining power.

For deposit regularity below satiation, $x\varepsilon'(x) = \varepsilon(x)[1+\varepsilon(x)-p(x)]$, where $p(x) = -x\lambda_o''(x)/\lambda_o'(x)$ here. For CARA, writing $v = u_o'(y) > 1$ gives $\frac{p(x)}{\varepsilon(x)} = (v-1)\left[\frac{\theta_o}{v} - 2(1-\theta_o)\right] < 1$. For quadratic utility, $p(x) \leq 0$. Both elasticities thus rise strictly from zero to infinity, giving $d(N) > 0$ and a unique symmetric deposit root for every $N \geq 1$.

For CRRA, write $\theta = \theta_o$, $q = 1-\theta$, and $v = u_o'(y) > 1$. Then $\varepsilon(g_o(y)) = \frac{\sigma_o v[\theta+qv/(1-\sigma_o)]}{[\theta+qv]^2(v-1)}$. Since v decreases with liquidity, elasticity increases precisely when $q^2v^3 - q\theta(2\sigma_o-1)v^2 + q\theta(1+\sigma_o)v + \theta^2(1-\sigma_o) > 0$. This holds for $\sigma_o \leq 1/2$ or $\theta = 1$, but fails, for example, at $\sigma_o = 0.9$, $\theta = 0.99$, and $v = 10$. The lower elasticity limit is zero when $\theta < 1$ and σ_o when $\theta = 1$; the upper limit is infinite. Under the maintained strict elasticity condition the root is unique and $d(N) > 0$.

For all three utilities, smoothness up to satiation from below and $\lambda_o'(\hat{\tilde{x}}^o) < 0$ give a finite limit of $p(N)$ and $p'(N) \to 0$ as $N \to \infty$. Thus $Q(N) = \frac{(N-1)[2-p'(N)]}{N+1-p(N)}$ satisfies $Q(1) = 0$ and $Q(N) \to 2$. Continuity gives at least one crossing of $\beta = 1/(1+r) \in (0,1)$; boundedness ensures a largest crossing N^*, with $Q(N) > \beta$ for every $N > N^*$. Proposition 4 gives the competition signs and uniqueness under its additional shape restrictions. CARA and quadratic utility need no such restrictions at any bargaining power, as shown next.

Quadratic utility. Write $z = g_o'(y) - 1 \geq 0$, so $p(N) = -3Nz$, $d(N) = 1 + N(1+3z)$, and $z' = -z(1+z)/d(N)$. Substitution gives $Q(N) = \frac{(N-1)[2+3z+N(2+6z+6z^2)]}{[1+N(1+3z)]^2}$. Differentiating gives

$$\begin{aligned} d(N)^4 Q'(N) &= 4(N+1)^2 + 6z(N+1)(N^2+3N+3) \\ &\quad + 3z^2(4N^3+20N^2+27N+5) + 3Nz^3(2N^2+30N+19) + 54N^2z^4 > 0. \end{aligned}$$

Thus Q increases strictly from zero to two and crosses β exactly once. This includes $\theta_o = 1$, for which $z = 0$. For $\theta_o < 1$, the sufficient shape conditions are unnecessary: $p'(N) = -3z[1+2Nz]/d(N) < 0$.

CARA utility. Write $n = N-1 \geq 0$, $z = u_o'(y) - 1 > 0$, and $q = 1-\theta_o \geq 0$. Define

$$\begin{aligned} A &= 1 + 3qz + 2qz^2, \quad B = z(1+qz), \quad D = 1 + z + NA, \\ K &= (1+z)A_z - A, \quad S = (N-1)[(1+z+A)D - NKB]. \end{aligned}$$

The equilibrium identities imply $d(N) = D/(1+z)$, $z' = -B(1+z)/D$, and $Q = S/D^2$. Consequently, with subscripts denoting partial derivatives in N and z, $D^4Q' = [S_N D - S_z B(1+z)]D - 2S[AD - D_z B(1+z)]$. Direct expansion gives the bound $D^4Q' \geq 2nz(D^2 - S) + U_0(n,z)$, where

$$U_0(n,z) = (1+z)(2+z)^2(4+z) \\ + n(16 + 22z + 11z^2 + 3z^3) + 2n^2(1+z^2)(2+z) + 2n^3z^2 > 0.$$

Expanding D^4Q' minus this bound in n, z, q cancels terms independent of q and leaves nonnegative coefficients. For $Q \leq 1$, $D^2 - S \geq 0$, hence $Q' > 0$. Although not necessarily increasing globally, Q starts at zero, approaches two, and crosses each $\beta \in (0,1)$ only upward: CARA therefore has a unique N^* with the stated signs.

CRRA: cutoffs with two or more banks. First take $0 < \theta_o < 1$ and write $s = \sigma_o$, $k = (1-\theta_o)/\theta_o > 0$, and $t = ku_o'(y) > k$. The zero-issuance deposit condition and curvature are

$$N(t) = \frac{s(1+k)t(1-s+t)}{(1-s)(1+t)^2(t-k)}, \qquad p(N(t)) = \frac{(1-s+t)[1+s+(1-2s)t]}{(1-s)(1+t)^2}.$$

Differentiating along the deposit equilibrium, then differentiating again, gives

$$\frac{dt}{dN} = -\frac{st(1-s+t)}{(1-s)(1+t)Nd(N)}, \qquad \frac{dp}{dt} = \frac{2s[2s-1-(1+s)t]}{(1-s)(1+t)^3}, \\ p''(N) = -\frac{p'(N)[2-p'(N)]}{d(N)} - \frac{6s^4t^2(1-s+t)^2}{(1-s)^3(1+t)^6N^2[d(N)]^2}.$$

At a cutoff $Q(N) = \beta \in (0,1)$, $p'(N) < 2$. If $p'(N) \leq 0$, the derivatives imply $s > 1/2$ and $t \leq (2s-1)/(1+s)$. Here curvature increases from $1+s$ at $t = 0$, giving $p(N) > 1$ and $d(N) < N$. Hence, for $N \geq 2$, $Q(N) = \frac{(N-1)[2-p'(N)]}{d(N)} > \frac{2(N-1)}{N} \geq 1$, a contradiction. Thus every cutoff in this range has $0 < p'(N) < 2$, and the identity gives $p''(N) < 0$. Differentiating Q and evaluating at a cutoff now gives $Q'(N) = \frac{\beta}{d(N)} + \frac{\beta(1-\beta)}{N-1} - \frac{N-1}{d(N)}p''(N) > 0$. Thus at most one crossing exists on $[2,\infty)$, necessarily upward and, since $Q(N) \to 2 > \beta$, the largest; all others lie in $(1,2)$. For $\theta_o = 1$, $p = 1+s$ and $Q(N) = 2(N-1)/(N-s) > 1$ for $N \geq 2$, so there is no cutoff in that range. Only the maintained increasing-elasticity and $d(N) > 0$ conditions are needed.

CRRA: multiple-cutoff counterexample. Take $\sigma_o = 731/1000$, $\theta_o = 50/51$, and $\beta = 19/20$ (hence $r = 1/19$). The scale $A_o > 0$ is arbitrary. With the preceding notation, $s = 731/1000$ and $k = 1/50$. Define $J(t) = t^3 - (2s-1)t^2 + k(1+s)t + k(1-s)$ and $\rho = (2s-1)/(1+s)$. The identity $J(t) = (t-\rho)^2[t + (1-s)\rho] + (k-\rho^3)[(1+s)t + 1 - s]$ shows that $J(t) > 0$ for every $t > k$, since $k - \rho^3 = 9486833/9605001650 > 0$. Moreover,

$$\frac{dN}{dt} = -\frac{s(1+k)J(t)}{(1-s)(1+t)^3(t-k)^2} < 0, \qquad d(N(t)) = \frac{sJ(t)}{(1-s)(1+t)^2(t-k)} > 0.$$

Ordinary liquidity falls with t, so premium elasticity strictly increases and deposits are globally regular.

Nevertheless, substituting $p'(N) = (dp/dt)/(dN/dt)$ into $Q(N)$ gives, to six decimal places:

t	$N(t)$	$Q(N(t))$	$\text{sign}[Q(N(t)) - \beta]$
$1/4$	1.000748	0.739153	$-$
$11/50$	1.001722	1.022779	$+$
$4/25$	1.009947	0.915072	$-$
$3/25$	1.031478	0.971401	$+$

Exact rational evaluation confirms the signs. Continuity gives at least three distinct cutoffs, approximately $N = 1.001008$, 1.003860, and 1.024365. All lie between monopoly and two banks: increasing elasticity ensures unique deposits at each N, not a unique crossing of $Q(N) = \beta$. CRRA therefore uses the largest cutoff absent additional shape restrictions. □

C Full Model: Derivations, Calibration, and Measurement

For Sections 4–6, R^j denotes a nominal gross return and $1 + r^j = R^j/\Pi$ its real counterpart; claims are real repayment values and hats divide them by w. Nominal margins in bank profits and issuer costs retain Section 4's calibrated units.

C.1 Endogenous DeFi Participation and Utility Costs in Section 4.2

Timing and individual costs. After choosing portfolios and drawing meetings, no-meeting households draw an independent nonnegative coefficient κ. Lending $\hat{Z}_D^e$ costs $\kappa \hat{Z}_D^e$ in utility, based on own normalized holdings rather than the average portfolio; coins lent are unchanged. Households take wages, yields, and the cost distribution as given. Foreign access and automatic redeposit follow Section 4.

Participation and portfolio incentives. Because lending rather than retaining a coin yields $i^e - \kappa$, a household lends all eligible balances if $\kappa < i^e$ and none if $\kappa > i^e$; indifference has zero probability. Let

$$F_\kappa(\kappa) = \frac{\kappa^\eta}{\kappa^\eta + \kappa_0^\eta}, \qquad \kappa_0 = \bar{i}^e \left(\frac{1 - \bar{\nu}_D}{\bar{\nu}_D} \right)^{1/\eta}, \qquad \eta > 0.$$

With identical ex ante portfolios and independent draws, participation and eligible-balance deployment shares coincide. Hence $\nu_D(i^e) = F_\kappa(i^e)$ gives (8), while larger η reduces log-cost dispersion at fixed $(\bar{i}^e, \bar{\nu}_D)$. Conditional expected incremental utility with no meeting is

$$\Phi(\hat{Z}_D^e; i^e) = \hat{Z}_D^e \int_0^{i^e} (i^e - \kappa)\, dF_\kappa(\kappa) = \hat{Z}_D^e M_D(i^e).$$

Differentiating with respect to own balances gives $M_D(i^e)$ and therefore the lending term $\alpha_n M_D(i^e)$ in (15). Integration by parts yields $M_D(i^e) = \int_0^{i^e} F_\kappa(q)\, dq$: participation costs separate this net payoff from gross interest $i^e F_\kappa(i^e)$. At fixed prices, participation value remains linear in own holdings and adds no portfolio convexity. Decreasing marginal utility along each payment schedule makes digital borrowing value concave in own liquidity: linear while coins replace borrowing, concave after borrowing stops. This supports the interior portfolio conditions, subject to nonnegativity and borrowing-corner checks.

Social cost. For welfare, integrate the costs incurred by participating households:

$$\mathcal{C}_D = \alpha_n \hat{Z}_D^e \int_0^{i^e} \kappa \, dF_\kappa(\kappa) = \alpha_n \hat{Z}_D^e \left[i^e \nu_D(i^e) - \int_0^{i^e} \nu_D(q) \, dq \right].$$

Welfare deducts this cost once in (29); it entails no payment, goods use, or tax revenue. The finite participation threshold bounds incurred costs, so the truncated moment exists even without a finite unconditional mean. Both holdings and participation vary across steady states.

C.2 Banking in the Full Model

The bank problem in Section 2 carries over with adjusted deposit demand and inflation accounting. Retaining its payoff notation, let $R^d = \mathcal{R}(Z^d; Z_D^e)$ and define lending-constraint profit as $\Delta^B(i) = \Pi[\ell(i) + b(i) - z^d(i)]$, so $\Delta^B(i)/\Pi$ is real settlement profit. The constraints become

$$\frac{\ell(i)}{1+r^L} + \frac{b(i)}{1+r^f} = \frac{z^d(i)}{1+r^d}, \qquad \frac{\ell(i)}{1+r^L} \le \chi \Delta^B(i).$$

The markdown condition (2) therefore applies with Z_D^e replacing Z^e and the taxed premium $\lambda_{o,\tau}$ from (15). Its derivative holds wages, taxes, inflation, other returns, and Z_D^e fixed; foreign balances do not enter ordinary payments. Under $R^L > R^f$ and $\chi(R^L - R^f) < 1$, lending binds and aggregation gives

$$\frac{L}{1+r^L} = \frac{\chi Z^d}{1+r^d} \frac{R^f - R^d}{1 - \chi R^L + \chi R^f}.$$

The nominal profit convention preserves calibrated χ.

Portfolio accounting follows Appendix A.3, now with the fund's short-debt share ω_f and return R^f on both bank portfolios and wholesale deposits. Write banks' net acquisition value as $b^B/(1+r^f) = \frac{Z^d}{1+r^d} - \frac{L}{1+r^L}$, where $b^B = \sum_i b(i)$. Without offsetting gross positions, banks hold $\max\{\frac{b^B}{1+r^f}, 0\}$ and the household fund holds $\frac{B^f}{1+r^f} - \max\{\frac{b^B}{1+r^f}, 0\} \ge 0$, both with short-debt share ω_f. Households own the fund and supply $\max\{-\frac{b^B}{1+r^f}, 0\}$ in wholesale deposits. Offsetting bond purchases and wholesale borrowing leave profits, lending capacity, and total debt holdings unchanged.

Fixed household equity. With equity principal E in Section 5.2, lending-constraint profit becomes

$$\pi^B = \Pi(L + b^B - Z^d) - R^f E = (R^L - R^f)\frac{L}{1+r^L} + (R^f - R^d)\frac{Z^d}{1+r^d}.$$

After paying $R^f E$ (equity principal plus its normal fund return), real settlement profit is π^B/Π. With $E = 0$, $\pi^B = \sum_i \Delta^B(i)$. Both $L/(1+r^L) \le \chi\pi^B + E$ and the reported margin retain baseline inflation-scaled units.

C.3 Calibration Targets and Empirical Mappings

Fiscal and bond-market parameters. The target $\left(\frac{B^s}{1+r^s} + \frac{B^b}{1+r^b}\right)/Y = 0.852$ rounds the approximately 99.00% federal public-debt ratio net of roughly $4.2 trillion of Fed Treasury holdings (U.S. Department of the Treasury, 2026). Subtracting benchmark reserves of one percent of GDP gives $\frac{B^f}{1+r^f} = 0.852 - 0.010 = 0.842$. Likewise, the gross short-debt target of 21.30% of GDP (Treasury Borrowing Advisory Committee, 2025a) includes Fed-held bills of $195.493 billion near fiscal year-end 2025, or 0.64% of

the \$30.762 trillion benchmark GDP.[22] Netting these out gives short debt outside the Fed of 20.66% of GDP; subtracting the 1.00 percentage point in stablecoin reserves yields $\omega_f = \frac{0.2130-0.006355-0.0100}{0.8420} = 0.2335$. As in Appendix C.2, $\frac{B^f}{1+r^f}$ and its short-debt component $\omega_f \frac{B^f}{1+r^f}$ include both funds' and banks' holdings.

The interest-cost target consolidates Treasury and Fed interest payments over average liabilities, including monetary liabilities, so its coverage differs from Treasury debt outside the Fed. The twenty-year yield target is the FY2025 average of GS20. Given debt composition, the targets imply $R^s - 1 = 1.67\%$ and $R^b - 1 = 4.75\%$. The fund portfolio condition and $R^f = \Pi/\beta$ give $\beta = 0.9804$, while $\Delta_s = R^s - R^e = 0.0167$ at the benchmark $R^e = 1$.

Banking. Both adjusted profit margins in Section 5.1 sum 2024Q4–2025Q3 flows over average quarterly loans and leases, without deducting credit losses.

Against model deposits/GDP of 35.28%, the 2025 SCF puts household checking, savings, and money-market deposit accounts at 22.85% of GDP. Adding Financial Accounts business checking and time-and-savings balances gives 38.72%, before excluding business time deposits. Different timing and coverage make this indicative, not an exactly matched stock–return pair.

Meeting incidence and markups. Subtracting the Euler conditions in (15) gives

$$\alpha_n M_D(i^e) = \beta^{-1}[(1+r^e)^{-1} - (1+r^d)^{-1}] - \alpha_e i^e.$$

Using $\alpha_n = 1 - \alpha_o - \alpha_e$ with the benchmark returns and participation schedule yields $\alpha_o = 0.3210$.

The ordinary and digital producer-markup targets impose

$$\mu^{DM,o} = \frac{(1-\tau)\hat{p}^o}{y^o} = 1.25, \qquad \mu^{DM,e} = \frac{(1-\tau)\sum_k \alpha_{e,k}\hat{p}^e_k}{\sum_k \alpha_{e,k} y^e_k} = 1.25.$$

CM pricing similarly gives $\varepsilon_c/(\varepsilon_c - 1) = 1.25$, hence $\varepsilon_c = 5$.

C.4 Activity Responses and Digital Curvature

Section 5.1's exercise estimates monthly stablecoin activity responses to monetary-policy surprises:

$$\Delta_h \log Q_{t+h} = a_h + \beta_h P_t + \gamma_h I_t + \Gamma_h X_t + \varepsilon_{t+h}.$$

Here Q_t measures Artemis daily active users or P2P transaction counts; dollar volumes serve as robustness measures because portfolio transfers need not reflect goods-market activity. The policy and information shocks use the San Francisco Fed monetary-policy event-study data and a Jarocinski–Karadi-style sign split; one unit of P_t is a 25 basis point contractionary surprise (Federal Reserve Bank of San Francisco, 2025; Bauer and Swanson, 2023).

The reduced-form conversion uses a 4.8% average lending yield and assumes a 25 basis point change in that yield: $\Delta \log i = \log[(0.048+0.0025)/0.048] = 0.0508$. The nine-month daily-active-user specification gives $\widehat{\beta}_9 = -0.5160$ with $t = -2.30$, and hence the reduced-form curvature index $-\Delta \log i/\widehat{\beta}_9 = 0.0984$. Notice that this activity-based index assumes yield pass-through and does not measure per-meeting consumption. A structural interpretation must also account for gross repayment, taxes, bargaining, and equilibrium deployment. For this reason, we retain $\sigma_e = 0.4662$ as a benchmark informed by the nine-to-twelve-month exercise, not a new structural estimate. In particular, the untaxed, full-buyer-power formula

[22] See the Federal Reserve's October 2, 2025 H.4.1 release, which reports holdings on October 1. We use bills as the empirical proxy for short debt and retain the original gross short-debt target.

$1 + i^e = (y + \zeta)^{-\sigma_e}$ does not apply: each digital window now satisfies

$$(y_k^e + \zeta)^{-\sigma_e} = \frac{\theta_e(1 + i^e)}{D_k^e - (1 - \theta_e)(1 + i^e)}, \qquad k = 1, 2,$$

where D_k^e is defined in (11). Joint calibration with resource clearing, portfolio equations, markup targets, and the government budget therefore yields $\zeta = 0.1960$, rather than the underlying one-window shifters. Estimating a structural LP would additionally require mapping monetary-policy shocks into the full revised equilibrium, beyond this calibration.

C.5 Domestic Deployment and Payment Incidence

At the reference yield, the aggregate allocation satisfies $0.1720 = s_D\bar{\nu}_D + (1 - s_D)\nu_F$. Thus the holdings split and foreign-access proxy in Section 5.1 imply $\bar{\nu}_D = \frac{0.1720 - (1 - s_D)\nu_F}{s_D} = 0.4847$. The deployment schedule has local share elasticity $\partial \log \nu_D / \partial \log i^e = \eta(1 - \nu_D)$, equal to 0.2577 at the benchmark.

To illustrate, halving the yield from 6.40% to 3.20% lowers domestic deployment from the common reference share of 48.47% to 46.74%, 39.94%, and 31.98% for $\eta = 0.10$, 0.50 (the benchmark), and 1.00, respectively. These cases span relatively sticky deployment through deployment odds proportional to yield. Notice that the fixed reference pair isolates the schedule response, not a full equilibrium response.

Because equation (8) allocates existing domestic holdings, η measures deployment-odds elasticity rather than issuance or turnover responses. A level elasticity ϵ at fixed eligible holdings would map to $\eta = \epsilon/(1 - \bar{\nu}_D)$ only if the empirical yield matches i^e. If supplier yield r_s differs from the common model rate, the mapping also requires $d \log r_s / d \log i^e$.

Accordingly, individual deposit transactions in Cornelli et al. (2025) inform the yield-response sign rather than the aggregate domestic stock response. Likewise, bank-deposit elasticities in Jiang et al. (2026) provide an indirect comparison, not a confidence interval for η. We therefore maintain the benchmark $\eta = 0.50$ and report the sensitivity scenarios in Table 2.

Separately, digital-meeting incidence is fixed at $\alpha_e = 0.03$. The household financial-transaction margin in Board of Governors (2026b) informs its scale; business use is adjusted explicitly, not inferred from household coverage. The implied DM meeting share is 8.55%; it is not the share of stablecoin holders using DeFi. For measurement, output includes all modeled digital production but excludes loan principal, redeposits, repayments, and financial transfers. Payment flows accordingly use (17), not geographic holdings shares.

C.6 Output and Welfare Measurement

$$Y^R = Y^{CM} + P^o \alpha_o y^o + P^e \sum_k \alpha_{e,k} y_k^e, \qquad P^o = \frac{V^o}{\alpha_o y^o}, \quad P^e = \frac{V^e}{\sum_k \alpha_{e,k} y_k^e}.$$

Reference prices P^o and P^e are fixed across counterfactuals at the calibrated positive-stock steady state, where $Y = Y^R = 1$. Output gains use Y^R to isolate quantity changes; stocks and fiscal targets use market-valued benchmark GDP. Section 4.4's resource accounting gives welfare:

$$\mathcal{W} = 2 \log c - H + \alpha_o[u_o(y^o) - y^o] + \sum_{k=1}^{2} \alpha_{e,k}[u_e(y_k^e) - y_k^e] - \mathcal{C}_D. \tag{29}$$

With $\mathcal{C}_D$ from Appendix C.1, the consumption-equivalent gain is $100[\exp((\mathcal{W} - \mathcal{W}_0)/2) - 1]$, where $\mathcal{W}_0$ denotes reference welfare (zero stablecoins with the same parameters in Section 5.2). The factor of two reflects both groups' logarithmic CM utility.