Optimal Capital Account Liberalization in China[1]

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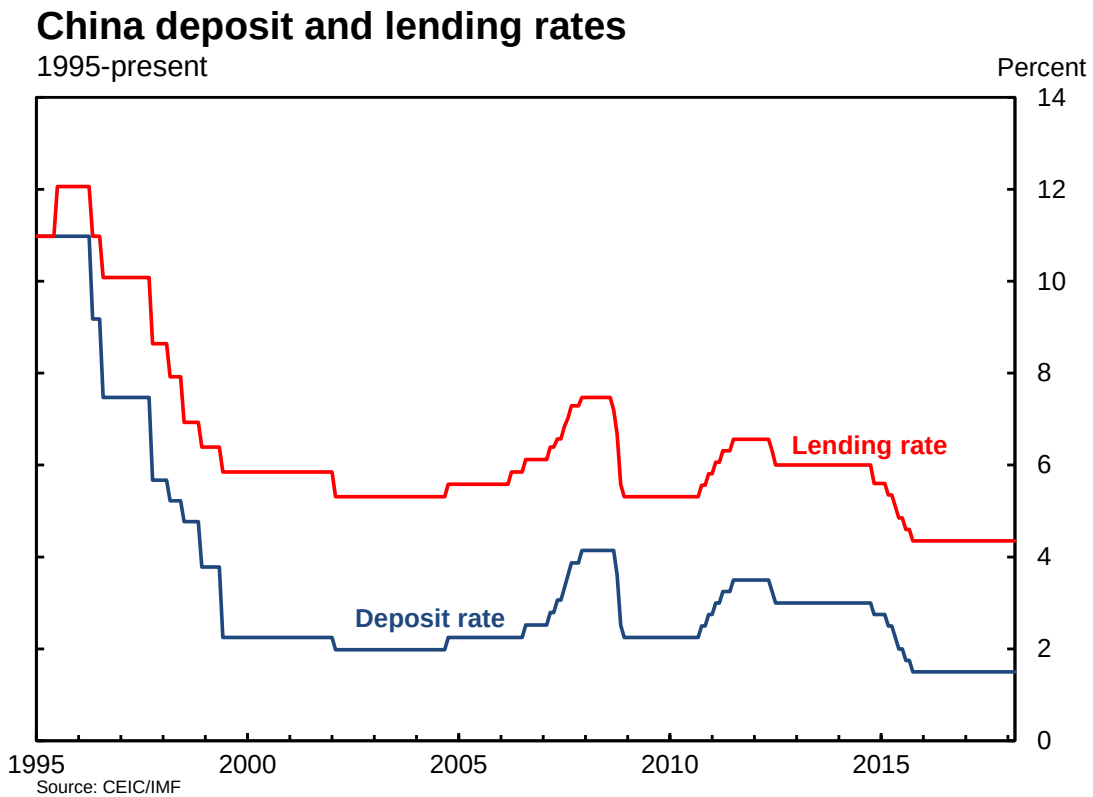
[1]The views expressed herein are those of the authors and do not necessarily reflect the views of the Federal Reserve Bank of San Francisco or the Federal Reserve System.

Domestic financial repression

- Government-favored firms (SOEs) can obtain *directed lending* at below-market rates (Brandt and Zhu, 2000; Lardy, 2014)
- Non-favored firms (POEs) can borrow only at higher market rates
- Preferential lending to SOEs impacts on bank profits
- Banks avoid loss by
  - raising market rates: hurt private firms
  - reducing deposit rates: hurt households

Historic examples



- Late 1990s: SOE restructuring; bank losses passed to households

Strict capital account controls in China

- Domestic investors restricted from investing abroad (QDII very small)
- Foreign investors restricted from investing in China
  - FDI allowed, but share in total investment declined to $< 2\%$ since 2009
  - Financial investment more restrictive (B shares and QFII)
- Capital controls led to persistent deviations of domestic asset returns from (FX-adjusted) foreign returns: UIP wedge

Order of liberalization question: Ease capital account restrictions or financial repression first?

- Literature: Benefits of capital account liberalization not clear under distorted domestic financial system
  - Opening capital account could increase leverage and prob of financial crisis (Eichengreen, et al. (2011); Enchengreen and Leblang (2003); Chinn and Ito (2006))
  - Countries with more developed financial system benefit more than those less developed (Ju and Wei, 2010)
  - Benefits work through "secondary improvements" or "discipline effects" for domestic financial institutions (Kose, et al., 2009; Wei and Tytell, 2004)

Abundant policy discussions, but few formal theories

- Plausible link: capital account liberalization can exacerbate misallocation under distorted domestic financial system
- However, "there is a lack of formal theories that articulate this link" (Wei, 2018)
- We present such a theory to study optimal capital account liberalization under financial repression in China

OLG model

- Households live for two periods: young and old
- The young consumes, works, and saves; and the old consumes accumulated assets
- Goods produced using labor and capital in two sectors: SOEs (monopolistic competition) and POEs (perfect competition)
- SOEs less productive than POEs
- All firms need to borrow to pay their working capital.

Financial repression and capital controls

- Financial repression: domestic banks are required to lend minimum fraction γ of loans to SOEs at below-market rate
- Capital controls: capital inflows and outflows both taxed (two-way capital controls, τ_l and τ_d)

Financial repression raises tradeoffs in capital account liberalization

- Capital outflow liberalization
  - Access to foreign asset market raises returns to household savings $\rightarrow$ improved intertemporal allocations
  - Banks pass through higher deposit rate to market lending rates
  - POE funding costs higher $\rightarrow$ more misallocation and lower aggregate TFP
- Capital inflow liberalization
  - Competition from foreign investors reduces domestic market loan rate, benefiting POEs $\rightarrow$ aggregate TFP $\uparrow$
  - Banks cut deposit rate to remain solvent $\rightarrow$ reducing intertemporal allocation efficiency
- Tradeoff between intertemporal allocation and cross-sector allocation in both cases
  - Capital account and financial liberalization complementary

The Model

Households

- The utility function for household born in period t

$$\mathrm{E}\left\{\ln(C_t^y) - \Psi_h \frac{H_t^{1+\eta}}{1+\eta} + \beta \ln(C_{t+1}^o)\right\}$$

- Budget constraints

$$C_t^y + D_t + B_{ft}^d + q_t^k K_t^o + I_t + \frac{\Omega_k}{2}\left(\frac{I_t}{K_t^o} - \frac{\bar{I}}{\bar{K^o}}\right)^2 K_t^o = w_t H_t + T_t + \Gamma_t$$

$$C_{t+1}^o = R_t D_t + (1-\tau_d) R_t^* B_{ft}^d + d_{t+1} + [q_{t+1}^k(1-\delta) + r_{t+1}^k](K_t^o + I_t) - \Gamma_{t+1}$$

where Γ_{t+1} denotes bequest

- Capital stock law of motion

$$K_t = K_t^o + I_t = (1-\delta)K_{t-1} + I_t$$

- Capital outflow tax drives wedge b/n domestic deposit rate R and world rate R^*

$$R_t = (1-\tau_d)R_t^*$$

Firms

- Final goods production requires intermediate inputs from two sectors: SOE and POE

$$Y_t = Y_{st}^{\phi_t} Y_{pt}^{1-\phi_t}$$

- Intermediate goods production requires labor and capital in each sector $j \in \{s, p\}$

$$Y_{jt} = A_j (K_{jt})^{1-\alpha} (H_{jt})^{\alpha}$$

- Firms face working capital constraint of wage bill and capital rents

$$B_{jt} \geq (w_t H_{jt} + r_t^k K_{jt})$$

- Cost-minimizing condition

$$p_{jt} = \frac{\epsilon_j}{\epsilon_j - 1} \tilde{\alpha} w_t^{\alpha} (r^k)^{1-\alpha} (R_{jt}) / A_{jt}$$

Financial intermediaries (banks)

- Competitive banks take deposits from HHs and lend to firms
- Directed lending: a fraction γ of loans lent to SOEs at below-market rates (normalized to 0), $1-\gamma$ fraction lent at market rate $R_{lt} > 1$

$$B_{gt} \geq \gamma(B_{gt} + B_t)$$

- Bank's break-even condition

$$R_t = \gamma + (1-\gamma)R_{lt}$$

- Financial repression creates interest rate wedges:

$$R_{lt} > R_t > 1$$

where interest on "directed lending" loans is 1.

Capital inflow wedges

- Two wedges on foreign inflows:
  - Capital inflow tax τ_{lt}: returns for foreign investors subject to taxes
  - Risk premia $\Phi(\frac{B^l_{ft}}{Y_t})$: foreign funds supply upward sloping, and increasing in size of foreign debt to domestic output

- No arbitrage for capital inflows

$$(1-\tau_l)R_{lt} = R^*_t \Phi\left(\frac{B^l_{ft}}{Y_t}\right)$$

- Risk premium $\rightarrow$ spillover externality from foreign debt

Reallocation effect of market lending rate

- SOEs' and POEs' funding costs:
  - POEs' funding cost
$$R_{pt} = R_{lt}$$
  - SOEs' funding cost
$$R_{st} = \frac{B_{gt}}{B_{st}} \times 1 + \frac{B_{st} - B_{gt}}{B_{st}} R_{lt}$$
- SOEs' funding cost is less sensitive to changes in market lending rate than POEs'.
- An increase in market lending rate reallocates resources from POEs to SOEs.

Market clearing and equilibrium

- Final goods market clearing

$$NX_t = Y_t - C_t^y - C_t^o - I_t - \frac{\Omega_k}{2}\left(\frac{I_t}{K_t^o} - \frac{\bar{I}}{\bar{K}_t^o}\right)^2 K_t^o$$

- Labor market and capital market clearing

$$H_t = H_{st} + H_{pt} \quad K_{t-1} = K_{st} + K_{pt}$$

- Loanable funds market clearing

$$B_{st} + B_{pt} = B_{gt} + B_t + B_{ft}^l$$

- Balance of payments condition

$$\begin{aligned} NX_t \quad + \quad & (R_{t-1}^* - 1)B_{f,t-1}^d - \left[R_{t-1}^* \Phi\left(\frac{B_{f,t-1}^l}{Y_{t-1}}\right) - 1\right] B_{f,t-1}^l \\ = \quad & (B_{ft}^d - B_{ft}^l) - (B_{f,t-1}^d - B_{f,t-1}^l) + \Delta_t \end{aligned}$$

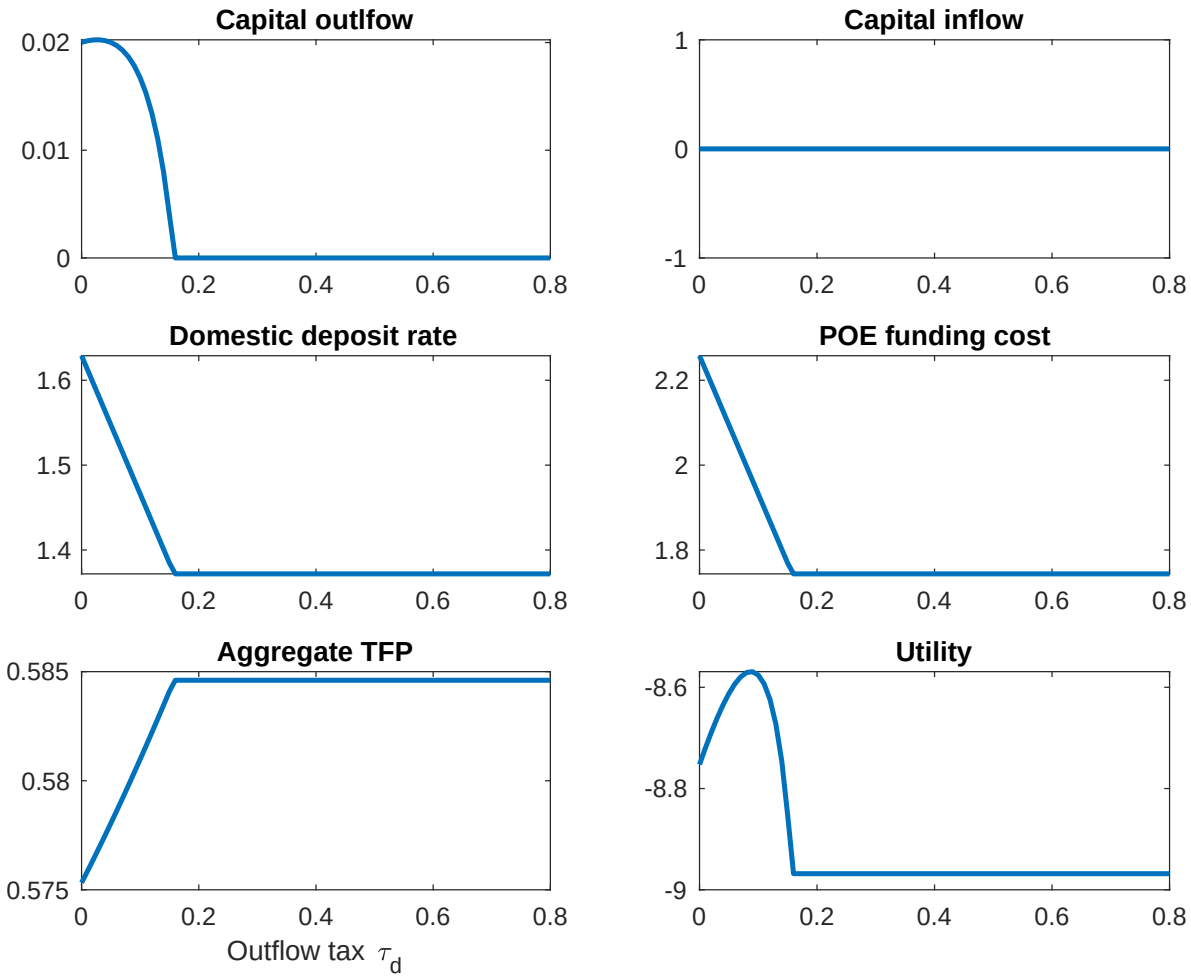
Calibration

Calibrate to Chinese data where possible

- Productivity gap: $A_s = 1$ and $A_p = 1.42$ [Hsieh and Klenow (2009)]
- SOE share: ϕ declines from 0.5 to 0.3 (structural changes)
- Financial repression: $\gamma = 0.5$ to match SOE share in bank loans in 2000
- Capital control taxes: $\tau_d = 16.62\%$ and $\tau_l = 5.09\%$, to match ratios of privately held foreign assets and liabilities to output

Steady State

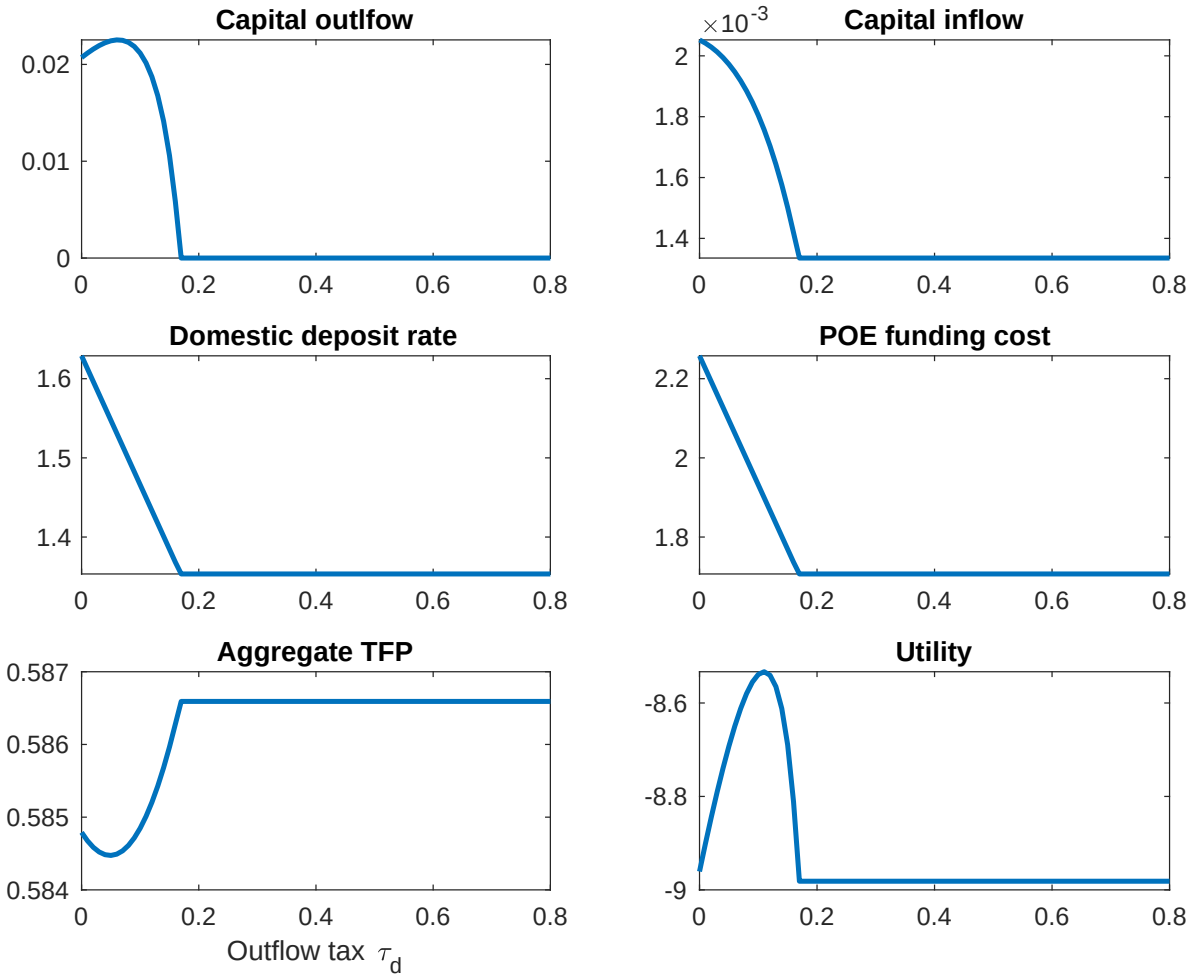
One-way liberalization of capital outflows ($\downarrow \tau_d$, inflows not allowed)



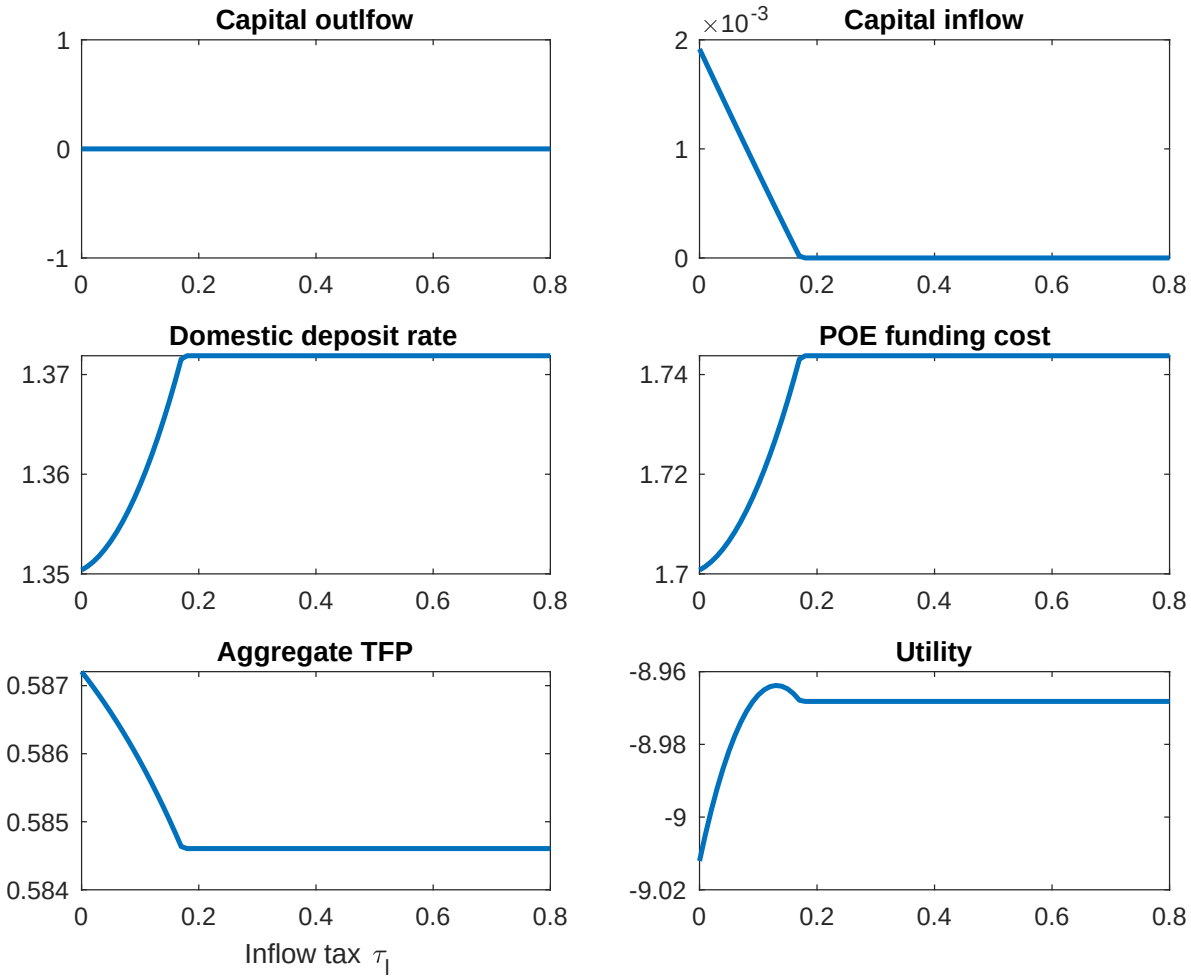
One-way outflow liberalization (no inflows)

- Sufficient reduction in τ_d leads to capital outflows
- No arbitrage raises deposit rate $\rightarrow$ HH returns on savings increased
- Financial repression $\rightarrow$ Banks $\uparrow$ market rate, hurting POEs
- Reallocation to SOEs reduces aggregate TFP
- Tradeoff between higher returns on HH savings and lower TFP $\rightarrow$ interior welfare optimum

One-way liberalization of capital outflows (inflows allowed)



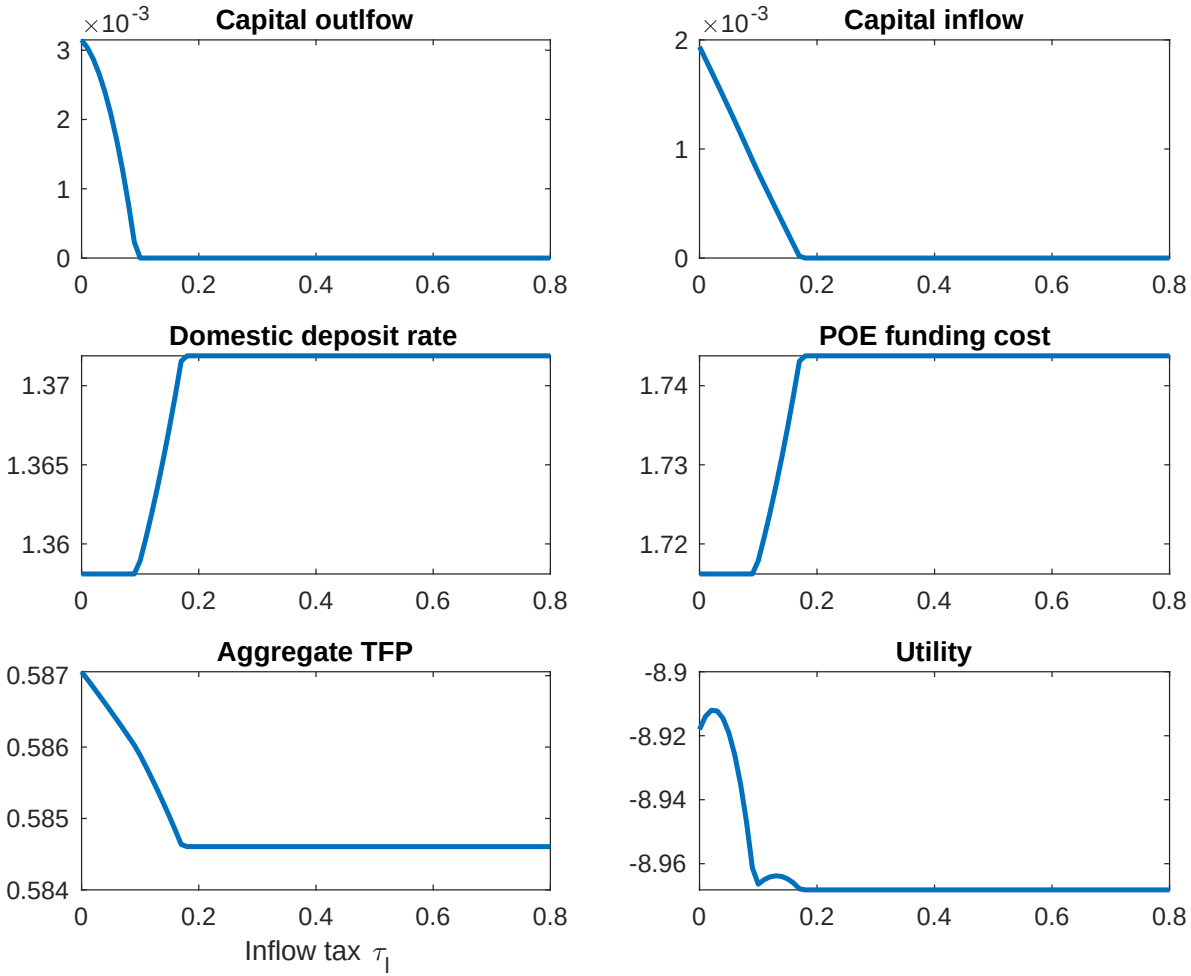
One-way liberalization of capital inflows ($\downarrow \tau_I$, outflows not allowed)



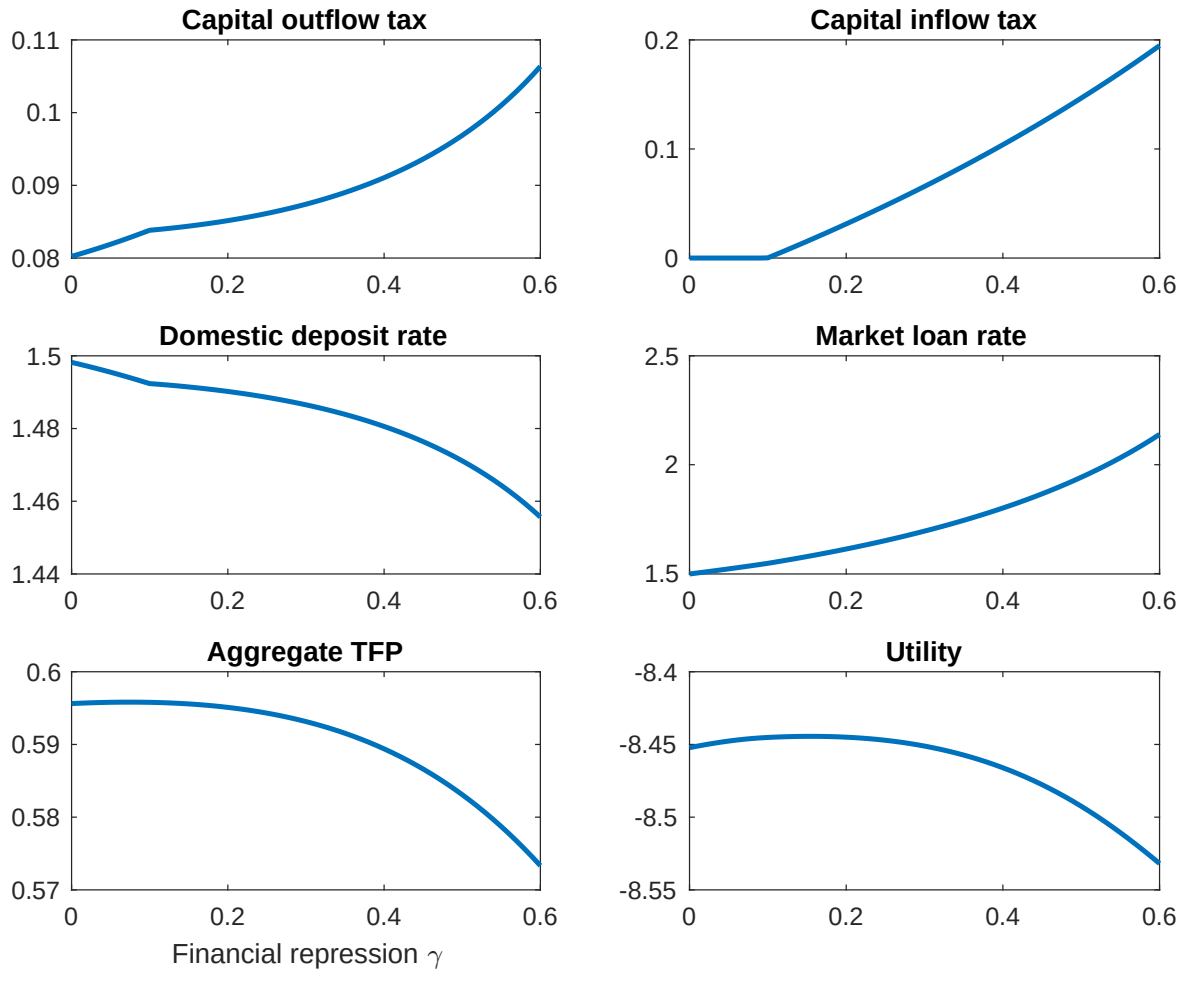
One-way liberalization of capital inflows (no outflows)

- Sufficient reduction in τ_I attracts foreign capital inflows
- Competition from foreign investors reduces market loan rate, benefiting POEs $\rightarrow \uparrow$ aggregate TFP
- Financial repression $\rightarrow$ banks lower deposit rate, reducing HH interest earnings
- Risk premium $\rightarrow$ exacerbate over-borrowing externality
- Tradeoff between higher TFP, lower HH asset returns and over-borrowing externality $\rightarrow$ interior optimum of capital inflow controls

One-way liberalization of capital inflows (outflows allowed)



Optimal capital controls given financial repression (γ)



Liberalizations of capital controls and financial repression are complementary

- Higher γ implies higher optimal capital control taxes on outflows
  - $\uparrow \gamma \rightarrow \uparrow$ market rate, $\uparrow$ misallocation and $\downarrow$ TFP
  - Planner $\uparrow \tau_d$ to lower market rate and to partly undo misallocation
- Higher γ implies higher optimal capital control taxes on inflows
  - $\uparrow \gamma$ raises market rate and attracts more capital inflows $\rightarrow$ more external borrowing
  - To mitigate over-borrowing externality, planner raise τ_l
- Note interior optimal $\gamma > 0$ to partly undo monopoly power of SOEs

Transition Dynamics

Transition dynamics

- SOE share falls from initial steady state $\phi_0 = 0.5$ to new steady state $\phi_1 = 0.3$
- Examine optimal magnitude and speed of capital account liberalization along transition path
- Notation (Example for τ_d)
  - $\tau_{dt} = \tau_{d0} + (\tau_{d1} - \tau_{d0})[1 - (1 - \alpha_d)^t]$ if $t \geq 1$
  - τ_{d0} initial SS value of τ_d
  - τ_{d1} final SS value of τ_d
  - $\alpha_d \in [0, 1]$ pace of liberalization of τ_d
  - Larger values of $\alpha_d \rightarrow$ faster pace of liberalization
- Similar for τ_l and γ
  - $\tau_{lt} = \tau_{l0} + (\tau_{l1} - \tau_{l0})[1 - (1 - \alpha_l)^t]$ if $t \geq 1$
  - $\gamma_t = \gamma_0 + (\gamma_1 - \gamma_0)[1 - (1 - \alpha_\gamma)^t]$ if $t \geq 1$

Transition dynamics

- Welfare along transition path (starting in period 1)

$$V_1(\tau_{d1}, \alpha_d, \tau_{l1}, \alpha_l, \gamma_1, \alpha_\gamma) = \sum_{t=1}^{\infty} \beta^t \left(\ln(C_t^y) - \Psi_h \frac{H_t^{1+\eta}}{1+\eta} + \ln(C_t^o) \right)$$

Liberalizing capital outflows and financial repression along transition paths

Case	0	1	2
Description	Benchmark	Optimal τ_{d1}, α_d	Optimal $\tau_{d1}, \alpha_d, \gamma_1, \alpha_\gamma$
τ_{d1}	16.62%	5.84%	0.00%
α_d	-	15.11%	58.47%
τ_{l1}	5.09%	5.09%	5.09%
α_l	-	-	-
γ_1	50.00%	50.00%	3.09%
α_γ	-	-	88.43%
Welfare gains along transition	0.00%	1.94%	11.26%
Welfare gains at new SS	0.00%	36.84%	58.91%

Case 0: benchmark (initial SS);Case 1: optimal liberalization of outflow controls for transition; Case 2: optimal liberalization of both outflow controls and financial repression for transition.

- Financial liberalization calls for more aggressive capital outflow liberalization
- Optimal (second-best) policy calls for faster financial liberalization than capital outflow liberalization

Liberalizing capital inflows and financial repression along transition paths

Case	0	1	2
Description	Benchmark	Optimal τ_{I1}, α_I	Optimal $\tau_{I1}, \alpha_I, \gamma_1, \alpha_\gamma$
τ_{d1}	16.62%	16.62%	16.62%
α_d	-	-	-
τ_{I1}	5.09%	14.65%	0.01%
α_I	-	36.52%	55.42%
γ_1	50.00%	50.00%	15.21%
α_γ	-	-	100.00%
Welfare gains along transition	0.00%	0.36%	7.73%
Welfare gains at new steady state	0.00%	0.69%	17.82%

Case 0: benchmark (initial SS); Case 1: optimal liberalization of inflow controls for transition; Case 2: optimal liberalization of both inflow controls and financial repression for transition.

- Financial liberalization again calls for more complete and faster capital inflow liberalization.
- Financial liberalization should be instantaneous.

Liberalizing capital account and financial repression along transition paths

Case	0	1	2
τ_{d1}	16.62%	2.37%	1.35%
α_d	-	69.69%	59.94%
τ_{l1}	5.09%	2.37%	2.83%
α_l	-	69.69%	100.00%
γ_1	50.00%	2.39%	2.23%
α_γ	-	91.06%	89.57%
Welfare gains along transition	0.00%	11.27%	11.29%
Welfare gains at new steady state	0.00%	69.33%	64.88%

Case 0: benchmark (initial SS); Case 1: choose $\tau_d = \tau_l$, $\alpha_d = \alpha_l$, γ, and α_γ to maximize transition welfare; Case 2: optimal liberalization policy with no restrictions on policy parameters.

- Financial liberalization should be radical and rapid
- Faster liberalization of capital inflows than outflows: accelerating transition by helping productive private firms

Conclusion

- We present a OLG model to study implications of capital account liberalization under financial repression
- Liberalizing capital controls incurs tradeoff between aggregate productivity and intertemporal allocation
  - Easing capital inflows reduces funding costs for productive POEs and improves TFP, but depresses deposit rate on HH savings
  - Easing capital outflows improves returns on HH savings, but raising funding costs for POEs and reduces TFP
- Along transition path, liberalizing financial repression and easing capital controls are complementary reforms
  - Liberalization of financial repression calls for more aggressive capital account liberalization
  - Second-best policy calls for gradual liberalization of both capital inflows and outflows ...
  - ... but fast liberalization of financial repression

Other calibrated parameters

Parameter	Description	Value
β	Household discount rate	0.665
η	Inverse of labor supply elasticity	2
Ψ_h	Utility weight of labor	38
δ	Capital depreciation rate	0.651
Ω_k	Capital adjustment cost	1
r^*	Foreign interest rate	1.629
Γ	Transfer from old to young	0.75
θ	Fraction of working capital	1
α	Labor income share	0.5
ϵ	Elasticity of substitution between SOE products	20
Φ_b	Elasticity of risk preimum to external debt-to-GDP ratio	3