Capital Controls and Income Inequality[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.

Recent studies link capital surges to income inequality

- Liberalizing capital controls found to exacerbate income inequality in EMEs (Furceri and Loungani 2018)
- Theoretical explanations of the channels between capital flows and income inequality are scarce in literature
- Assessment of impact of capital account policy complicated by financial frictions and presence of other policy distortions
- Policymakers' view on capital controls has evolved
  - Surges seen as destabilizing
  - If flows are transitory, then "...use of capital controls——in addition to both prudential and macroeconomic policy——is justified as part of the policy toolkit to manage inflows." (Ostry, et al. 2010)

Capital account policies and income distribution in a GE framework

- OLG model of small open economy
  - Heterogeneous agents (households and entrepreneurs)
  - Intermediation by costly banks
  - Capital account restrictions: taxes on inflows and outflows
- SR and LR capital control impact differs:
  - Short-run transitions: shocks that boost inflows exacerbate inequality; shocks that induce outflows lower inequality
  - Long-run steady state: relaxing controls on either inflows or outflows reduces income inequality

Confirm SR predictions in cross-country panel

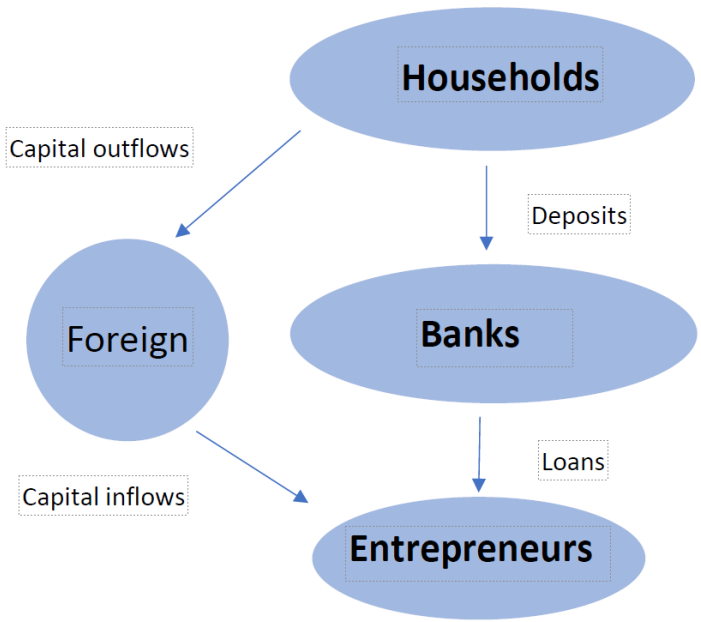
- 87 EMEs from 2000-2018
  - Examine impacts of private inflows and outflows on income distribution, measured by GINI
  - Instrument through changes in 2-year treasuries interacted with "remoteness," proxied by great-circle distance from New York
- Results show statistically and economically significant impact of private inflows (+) and outflows (-) on income distribution
- Robust to a large variety of sensitivity tests

Relation to literature

- Distortions from capital account restrictions
  - Financial markets [Edwards (1999), Jeanne (2012)]; Trade [Wei and Zhang (2007)]; Costinot, et al (2014)], Growth [Jeanne (2013)]
- Restrictions as macro policy tool
  - Stabilization policy [Ostry, et al (2010), Farhi and Werning (2012)]; Ease trilemma issues [Chang, et al (2015), Liu and Spiegel (2015)]; Tax [Davis, et al. (2020)]
- Impact of capital account liberalization
  - Undeveloped financial markets [Eichengreen, et al (2011), Ju and Wei (2010)]; Discipline financial markets [Aoki, et al (2009)]; Productivity [Liu, et al (2019)]; Distribution [Bumann and Lesink (2016)]; Furceri and Loungani (2018); Li and Su (2020)]

Small OLG open economy model

- Heterogeneous agents: OLG of households and entrepreneurs
- Costly financial intermediation: banks
- Capital account restrictions: taxes on inflows and outflows



Households (H)

- Household consumes, works, and saves through domestic or foreign bank deposits when young; consumes assets when old
- Utility function

$$U_{ht} = \ln(C^y_{ht}) + \beta \ln(C^o_{h,t+1})$$

- Budget constraints

$$C^y_{ht} + D_t + B^d_{ft} = w_t H_{ht} + \Gamma_{ht},$$

$$C^o_{h,t+1} = R_t D_t + (1 - \tau_d) R^*_t B^d_{ft} + T_{h,t+1} - \Gamma_{h,t+1}.$$

where $T_{h,t+1}$ denotes bank dividends and government transfers and $\Gamma_{h,t+1}$ denotes bequest

- Capital outflow tax creates wedge between domestic deposit rate R and world rate R^*

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

Entrepreneurs (E)

- Entrepreneur consumes, works, invests, and borrows from domestic or foreign banks when young; consumes assets when old
- Utility function

$$U_{et} = \ln(C^y_{et}) + \beta \ln(C^o_{e,t+1})$$

- Budget constraints

$$C^y_{et} + q^k_t K^o_t + I_t + \frac{\Omega_k}{2}\left(\frac{I_t}{K^o_t} - \frac{\bar{I}}{\bar{K}^o}\right)^2 K^o_t = w_t H_{et} + B_{et} + \Gamma_{et},$$

$$C^o_{e,t+1} = \left[q^k_{t+1}(1-\delta) + r^k_{t+1}\right](K^o_t + I_t) - R_{lt} B_{et} + T_{e,t+1} - \Gamma_{e,t+1}.$$

- Capital stock follows the law of motion

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

where $K_t \equiv K^o_t + I_t$ denotes end-of-period capital stock

Banks

- Competitive; take deposits D_t from H and lend B_t to E

$$R_{lt} B_t = R_t D_t$$

- Financial intermediation costs (Curdia-Woodford): $\Xi(\frac{B_t}{Y_t}) Y_t$
- Profits are returned as dividends (Π_t^b), where

$$\Pi_t^b = D_t - B_t - \Xi\left(\frac{B_t}{Y_t}\right) Y_t$$

- Bank optimization implies a credit spread

$$R_{lt} = R_t \left[1 + \Xi'\left(\frac{B_t}{Y_t}\right)\right]$$

Production technology and foreign investors

- Production function

$$Y_t = AK_{t-1}^{1-\alpha}(H_{ht} + H_{et})^{\alpha}$$

- Foreign investors break even:

$$(1-\tau_l)z_{lt}R_{lt} = R_t^*\Phi\left(\frac{B_{ft}^l}{Y_t}\right)$$

  - Capital inflow control: τ_l
  - Capital inflow shock: z_{lt}
  - Sovereign risk premium: $\Phi(\cdot)$

Impact of foreign capital flow shocks

- Capital inflow shock $\uparrow$ inequality
  - Inflows $\downarrow$ lending rate, $\uparrow$ P of capital $\Rightarrow$ $\uparrow$ E capital income
  - Inflow shock no effect on H capital income
  - $\Rightarrow$ skews income in favor of E

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- Capital outflow shock $\downarrow$ inequality
  - Outflows raise return on deposits, $\uparrow$ capital income for H
  - Partial passthrough to lending rate: outflow $\downarrow B/Y$, lowering credit spread
  - Outflows benefit H more than E

Impact of foreign capital flow shocks

- Capital inflow shock ↑ inequality
  - Inflows ↓ lending rate, ↑ P of capital ⇒ ↑ E capital income
  - Inflow shock no effect on H capital income
  - ⇒ skews income in favor of E
- Capital outflow shock ↓ inequality
  - Outflows raise return on deposits, ↑ capital income for H
  - Partial passthrough to lending rate: outflow ↓ B/Y, lowering credit spread
  - Outflows benefit H more than E
- Net capital inflow shock ↑ inequality
  - Decline in R^* ↓ outflows and financial income for H
  - It also induces capital inflows, benefiting E
  - Net capital inflows skew income distribution in favor of E

Cross-country empirics

- 87 EMEs from 2002-2018
  1. Income distribution measured by GINI coefficient
  2. Private capital flows from Lane and Milesi-Ferretti (updated)
  3. Exclude OFCs
- Endogeneity an issue
  1. IV with 2-year treasury interacted with distance to NYC as first instrument
  2. Need 2 instruments for both inflows and outflows; also use 3 regional dummies, ASIA, AFRICA, and WESTHEM
- Also include battery of conditioning variables in 2nd stage
- Standard errors clustered by year

Baseline specification

- Baseline specification

$$GGINI_{i,t} = c + \beta_1 PINFLOWS_{i,t} + \beta_2 POUTFLOWS_{i,t} + \beta X_{i,t} + \theta_t + \epsilon_{i,t}$$

  - *GGINI*: Growth in Gini coefficients (YoY changes)
  - *PINFLOWS*: (Δ national liabilities $-$ gov. borrowing)/GDP
  - *POUTFLOWS*: (Δ national assets $-$ Δ official reserves)/GDP
  - $X_{i,t}$ is vector of conditioning variables: *CAPOPEN*, *TRDOPEN*, *LOWCORR*, *GDPCAP*, *POP*

- Also consider a specification with *net* private inflows alone

Baseline regression results

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
PINFLOWS	0.107***		0.083***		0.116***	
	(0.042)		(0.028)		(0.026)	
POUTFLOWS	-0.263***		-0.315***		-0.338***	
	(0.100)		(0.056)		(0.109)	
NPINFLOWS		0.141***		0.086***		0.112***
		(0.031)		(0.024)		(0.023)
Observations	968	968	1,165	1,165	968	968
CLR	12.76	12.12	14.00	13.60	13.07	12.37
P-value	0.01	0.01	0.01	0.01	0.01	0.01

- One std ↑ in gross inflows raises Gini by 1.35 percentage pts
- One std ↑ in gross outflows reduces Gini by 1.56 percentage pts
- One std ↑ in net inflows raises Gini by 1.80 percentage pts
- Conditioning variable coefficients in paper
- Similar results with conditioning variables dropped
  - Col (3) and (4)) full sample (1,165 obs)
  - Col (5) and (6) baseline sample (968 obs)

Splitting samples by saving rates and labor shares

VARIABLES	High Savings		Low Savings		High Labor Share		Low Labor Share	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PINFLOWS	0.004		0.020***		0.004*		0.030***	
	(0.004)		(0.004)		(0.002)		(0.004)	
POUTFLOWS	-0.040***		-0.003		0.003		-0.087***	
	(0.009)		(0.004)		(0.005)		(0.010)	
NPINFLOWS		0.005		0.017***		0.004*		0.025***
		(0.004)		(0.005)		(0.002)		(0.004)
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Observations	485	485	487	487	578	578	587	587

- Capital flows impact on inequality through capital returns
  - High-saving: less sensitive to inflows, but sensitive to outflows
  - Low-saving: less sensitive to outflows, but sensitive to inflows
- High labor share: less importance of capital income, less sensitive to inflows or outflows

Optimal policy following persistent decline in R^*

	Benchmark policy	Optimal inflow tax			Optimal outflow tax		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ω (weight on H)	0.5	0.3	0.5	0.7	0.3	0.5	0.7
	Optimal capital flow tax rates						
τ_{l1}	10.17%	15.35%	18.43%	20.69%	-	-	-
τ_{l2}	10.17%	27.07%	22.60%	19.16%	-	-	-
τ_{d1}	1.64%	-	-	-	22.81%	8.68%	−30.98%
τ_{d2}	1.64%	-	-	-	10.07%	1.74%	−27.27%

- Allow planner to choose optimal 1st pd taxes, τ_{l1}, τ_{d1}, and 2nd set of tax rates for all pds after first, τ_{l2}, τ_{d2},
- Inflow taxes
  - Planner $\uparrow$ SR tax τ_{l1}; $\uparrow \omega$ leads to stronger tightening
  - LR tax τ_{l2} also $\uparrow$, $\uparrow \omega$ leads to weaker tightening
- Outflow taxes
  - Optimal SR outflow tax τ_{d1} $\uparrow$, $\downarrow$ domestic rates and $\uparrow$ loan demand.
  - Base case $\omega = 0.5$: LR outflow tax τ_{d2} much lower than τ_{d1}

Conclusion

- In a small open economy with heterogeneous agents and financial frictions, capital account liberalization impacts income distribution
- In the long run, permanent reductions in taxes on both inflows and outflows raise household income share and reduce inequality
- In the short run, changes in inflows and outflows have opposite effects on inequality: inflows raise inequality but outflows reduce it
  - Temporary declines in world interest rate lead to surges in inflows, skewing distribution in favor of entrepreneurs
  - Tightening inflow restrictions mitigates this effect
- Model's predictions about short-run effects of capital flows on income inequality are supported by data.

Market clearing and equilibrium

- Goods market clearing implies that

$$NX_t = Y_t - C^y_{ht} - C^o_{ht} - C^y_{et} - C^o_{et} - I_t - \frac{\Omega_k}{2}\left(\frac{I_t}{K^o_t} - \frac{\bar{I}}{\bar{K^o}}\right)^2 K^o_t - \Xi(\frac{B_t}{Y_t})Y_t$$

- Loan market clearing

$$B_t + B^l_{ft} = B_{et}$$

- Labor market clearing

$$H_{ht} = \theta, \quad H_{et} = 1 - \theta$$

- Balance of payments equation:

$$NX_t + (R^*_{t-1} - 1)B^d_{f,t-1} - \left[R^*_{t-1}\Phi\left(\frac{B^l_{f,t-1}}{Y_{t-1}}\right) - 1\right]B^l_{f,t-1} = (B^d_{ft} - B^l_{ft}) - (B^d_{f,t-1} - B^l_{f,t-1}$$

Capital flow taxes and interest rates

- Deposit rate decreases with outflow tax, and indep. of inflow tax

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

- Loan rate

$$R_l = R \left[1 + \xi \eta \left(\frac{B}{Y} \right)^{\eta - 1} \right]$$

  - Cutting τ_l: foreign inflows crowd out domestic lending, lowering credit spread and R_l
  - Cutting τ_d raises $R \rightarrow R_l \uparrow$; but effects partly offset by declines in domestic lending and credit spread

Proposition VI.1

Denote by $\mathcal{R}(\tau_d, \tau_l)$ the steady-state lending interest rate as a function of the policy parameters τ_d and τ_l. The lending rate $\mathcal{R}(\tau_d, \tau_l)$ decreases with τ_d $(\frac{\partial \mathcal{R}}{\partial \tau_d} < 0)$ and increases with τ_l $(\frac{\partial \mathcal{R}}{\partial \tau_l} > 0)$.

Capital flow taxes and steady-state aggregate output

- Aggregate output

$$Y = \left(\frac{1-\alpha}{R_l - 1 + \delta} \right)^{\frac{1-\alpha}{\alpha}}.$$

Proposition VI.2

Denote by $\mathcal{Y}(\tau_d, \tau_l)$ the aggregate output as a function of the policy parameters τ_d and τ_l. In the steady state equilibrium, aggregate output $\mathcal{Y}(\tau_d, \tau_l)$ increases with τ_d $(\frac{\partial \mathcal{Y}}{\partial \tau_d} > 0)$ and decreases with τ_l $(\frac{\partial \mathcal{Y}}{\partial \tau_l} < 0)$.

Capital flow taxes and income distribution

- Labor income

$$W_h^l = \alpha\theta Y, \quad W_e^l = \alpha(1-\theta)Y \quad \Rightarrow \quad \frac{W_h^l}{W_e^l} = \frac{\theta}{1-\theta}$$

- Household capital income

$$W_h^c = [(1-\tau_d)R^* - 1]\frac{\beta\alpha\theta}{1+\beta}\mathcal{Y}(\tau_d, \tau_l)$$

- Entrepreneur capital income

$$W_e^c = [\mathcal{R}(\tau_d, \tau_l) - 1]\frac{\beta\alpha(1-\theta)}{1+\beta}\mathcal{Y}(\tau_d, \tau_l)$$

- Household capital income share

$$\frac{W_h^c}{W_e^c} = \frac{\theta}{1-\theta}\frac{(1-\tau_d)R^* - 1}{\mathcal{R}(\tau_d, \tau_l) - 1}$$

Capital flow taxes and income distribution in steady state

- Household share of labor income invariant to policy, focus on share of capital income

Proposition VI.3

Denote by $\mathcal{W}_c(\tau_d, \tau_l)$ the household-to-entrepreneur capital income ratio as a function of the policy parameters τ_d and τ_l. The household's relative capital income $\mathcal{W}_c(\tau_d, \tau_l)$ decreases with both τ_d and τ_l (i.e., $\frac{\partial \mathcal{W}_c}{\partial \tau_d} < 0$ and $\frac{\partial \mathcal{W}_c}{\partial \tau_l} < 0$).

Parameter calibration

Parameter	Description	Value
β	Household discount rate	0.665
δ	Capital depreciation rate	0.651
Ω_k	Scale of capital adjustment cost	5
r^*	Foreign interest rate	1.480
Γ	Transfer from old to young	0.53
α	Labor income share	0.5
θ	Household labor income share	0.67
Φ_b	Elasticity of risk premium on external debt	3
κ_f	Steady-state ratio of external debt to output	0.04
ξ	Scale of intermediation cost	0.57
η	Elasticity of intermediation cost	1.6
ω	Pareto weight on household welfare	0.5
τ_d	Tax rate on foreign asset	1.64%
τ_l	Tax rate on foreign debt	10.17%

Analytic steady-state results

- Relative labor income of HH invariant to capital account policy

$$\frac{W_h^l}{W_c^l} = \frac{\theta}{1-\theta}$$

- Relative capital income of HH does depend capital account policy

$$\frac{W_h^c}{W_e^c} = \frac{\theta}{1-\theta} \frac{(1-\tau_d)R^* - 1}{\mathcal{R}(\tau_d, \tau_l) - 1}$$

  where $\mathcal{R}(\tau_d, \tau_l)$ denotes equilibrium lending rate R_l

- Capital account liberalization affects steady-state income distribution through capital income

Steady-state effects of capital account liberalization

- Inflow liberalization ($\tau_l \downarrow$)
  - More inflows reduce lending rate R_l and entrepreneur capital income
  - No effect on deposit rate $R = (1 - \tau_d)R^*$: HH capital income unchanged
  - Inflow liberalization raises HH share of capital income
- Outflow liberalization ($\tau_d \downarrow$)
  - More outflows raise deposit rate R and boost interest earnings for HH
  - Partial pass-through to lending rate R_l, because outflows reduce B/Y such that credit spread declines
  - Outflow liberalization also raises HH share of capital income
- Liberalizing capital account reduces income inequality by raising HH share of capital income

Calibration

- Calibrate OLG model to correspond to period duration of 10 years
- Set annual depreciation to 10%
- Foreign interest rate to 4% annual
- Set financial friction parameter to yield 2% credit spread
- Set labor income share to $\alpha = 0.5$
- Set population share of H to $\theta = 2/3$, to match average share of self-employment in EMEs such as Brazil and Mexico
- Baseline case with equal Pareto weights on H and E utilities
- Other parameters in paper