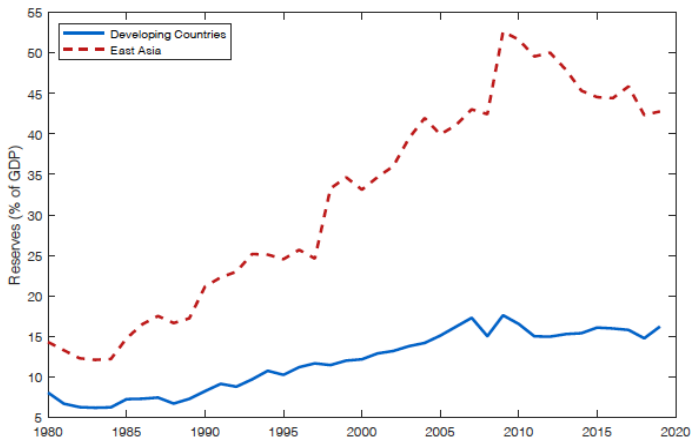


Reserve Accumulation, Growth and Financial Crises

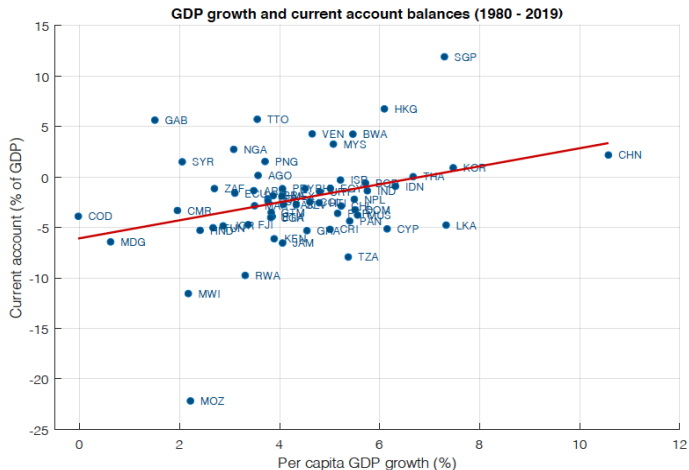
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Conference on Financial Frictions: May, 14th 2021

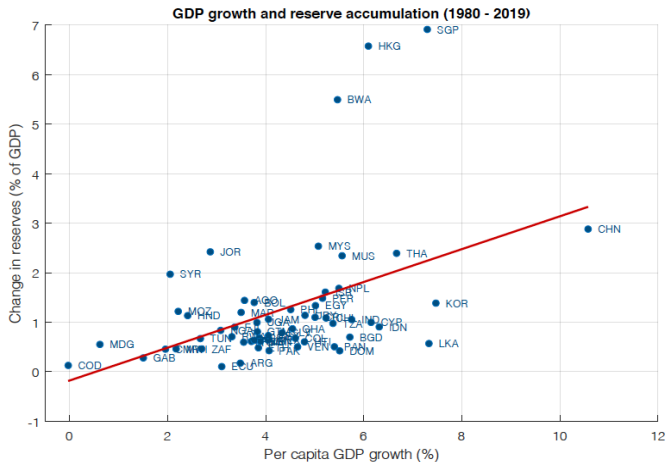
Reserve Accumulation: Facts



Current Account and Growth



Reserve Accumulation and Growth



Motivation

- What explains the spectacular accumulation of foreign exchange reserves in developing countries?
- Why do we observe a positive relationship between growth and current account for developing countries?

Empirical evidence

- Positive correlation between growth and current account surplus (Gourinchas and Jeanne, 2013), mainly due to public flows (Aguilar and Amador (2011), Alfaro et al. 2014)).
- Link between reserve accumulation and growth is restricted to few Asian economies (China, Korea, Thailand, Indonesia, Singapore, HK) who are net importers of private capital flows.
- These facts are difficult to reconcile with the neoclassical growth model where:
 - ▶ Faster Growth is associated with higher current account deficits (higher capital inflows)
 - ▶ The competitive equilibrium is efficient hence there is no role for public intervention in capital flows.

Our contribution:

- Develop a theory of public intervention in capital flows.
- Key elements:
 - ▶ Knowledge externalities in the tradable sector
 - ▶ International borrowing constraint
- The combination of these two elements provides an incentive for the government to accumulate reserves as a device to stimulate growth and eventually to use them during crisis periods.

Our contribution

- Accumulation of reserves is associated with exchange rate undervaluation and faster growth.
- Gross flows with private and public flows that move in opposite directions.
- The possibility of using reserves during crises amplifies the positive link between reserve accumulation and growth
- Welfare gain from appropriate reserve policy could be sizeable
- Model is consistent with negative correlation between foreign aid and growth.

Related literature

- **Theories of Reserve Accumulation:** Durdu et al (2010), Jeanne and Ranciere (2011), Dooley et al (2003), Aizenman and Lee (2007), Rodrik (2009), Korinek and Serven (2010), Bacchetta, Benhima and Kalantzis (2013), Bianchi, Hatchondo and Martinez (2018), Arce, Bengui and Bianchi (2021)
- **Related Empirical Evidence:** Gourinchas and Jeanne (2013), Alfaro, Kalemli-Ozcan and Volosovych (2014), Rodrik (2008).

Outline of presentation

- Model
- Explanation of the mechanism
- Reserve management in an economy opening to capital flows
- Welfare

Model: structure

- Small open economy
- Two sectors: tradable and nontradables
- Household, firms, foreign investors and government

Model: Household

- Expected lifetime utility

$$E_0 \left[\sum_{t=0}^{\infty} \beta^t \frac{C_t^{1-\gamma}}{1-\gamma} \right]$$

- Consumption aggregator

$$C_t = (C_t^T)^\omega (C_t^N)^{1-\omega}$$

- Supply inelastically one unit of labor every period.
- Budget constraint

$$C_t^T + P_t^N C_t^N = W_t + \pi_t^N + \pi_t^T$$

- Real Exchange Rate:

$$P_t^N = \frac{(1-\omega) C_t^T}{\omega C_t^N}$$

Model: Tradable and Non-Tradable Sector

- Non-tradable sectors:

$$\pi_t^N = P_t^N (L_t^N)^{\alpha^N} - W_t L_t^N$$

- Tradable Sector:

- ▶ Production using L_t^T , imported inputs M_t and knowledge X_t

$$Y_t^T = (X_t L_t^T)^{\alpha^T} M_t^{1-\alpha^T}$$

- ▶ Knowledge evolves according to

$$X_{t+1} = \psi X_t + M_t^{\xi} X_t^{1-\xi}$$

Formalization is meant to capture spillovers of foreign knowledge through the imports of intermediate goods. (**Externality:** since knowledge is non-excludable firms do not internalize the impact of their actions on the future stock of knowledge)

Model: Tradable Sector

- Tradable Sector:

- ▶ Firms maximizes

$$E_0 \left[\sum_{t=0}^{\infty} \beta^t \lambda_t \pi_t^T \right]$$

with λ_t is the marginal utility of consumption.

- ▶ Firms is allow to borrow in international markets

$$\pi_t^T = Y^T - W_t L_t^T - P^M M_t - B_{t+1} + R_t B_t - T_t$$

- ▶ Working capital requirements: a fraction ϕ of the imported inputs had to be paid before production takes place

$$\underbrace{\phi P_t M_t}_{\text{work. cap.}} = \underbrace{D_t^G}_{\text{gov loans}} + \underbrace{D_t^P}_{\text{loans from foreigners}}$$

Model: borrowing constraint

- Foreigners limit the amount that can be borrowed:

$$\underbrace{-RB_t}_{\text{bonds maturing in period } t} + \underbrace{D_t^P}_{\text{intratemporal loans in } t} \leq \underbrace{\kappa_t}_{\text{credit shock}} X_t$$

- Binding borrowing constraint interferes with:
 - ▶ intertemporal smoothing
 - ▶ import of intermediate good

Discussion of the growth process

- **Cross-country knowledge spillovers:** Klenow and Rodrigues-Clare (2005);
- **Transmission of knowledge through trade:** Coe, Helpman and Hoffmaister (1997), Amiti and Konings (2007), Blalock and Gertler (2004), Park, Yang Shi and Jiang (2010);
- **Tradable sector as engine of productivity convergence:** Rodrik (2012)
- **Knowledge externalities:** Romer (1990), Grossman and Helpman (1991), Aghion and Howitt (1992).

Government

- Collects taxes to finance reserve accumulation
- Uses reserves to provide working capital loans to firms (efficiency loss as in Gertler and Karadi (2009))

$$Fx_{t+1} = R^{FX}FX_t + T_t - \frac{\theta D^G}{1 - \theta}$$

- Reserves cannot be negative and pay a return lower than the world interest rate.

Market Clearing

- Tradable good:

$$B_{t+1} - RB_t + FX_{t+1} - R^{FX}FX_t = Y_t^T - P^M M_t - C_t^T - \frac{\theta D^G}{1 - \theta}$$

- Nontradable good:

$$C_t^N = Y_t^N$$

- Labor

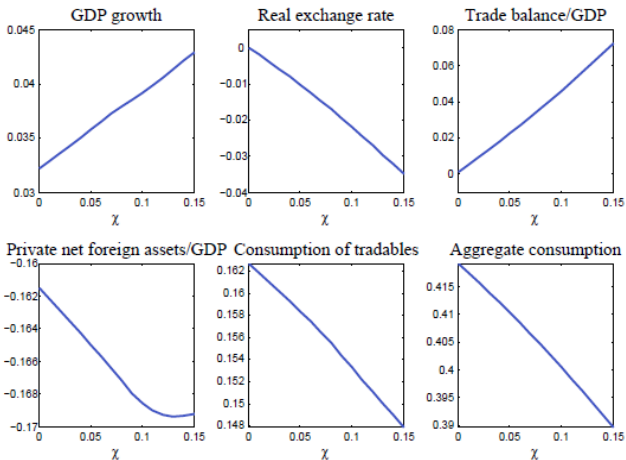
$$L_t^T + L_t^N = 1$$

Tranquil times: intervention

- When firms are not financially constrained, an increase in reserves leads to higher use of imported inputs and faster growth
 - ▶ Increase in the stock of reserves
 - ▶ decrease consumption of tradables
 - ▶ Real exchange rate depreciation
 - ▶ Marginal product of labor in the non-tradable sector decreases: labor shift towards tradable sector
 - ▶ use of imported inputs increases
 - ▶ faster accumulation of knowledge
- Focus on the following rule

$$FX_{t+1} - FX_t = \chi Y_t^T$$

Tranquil times: intervention



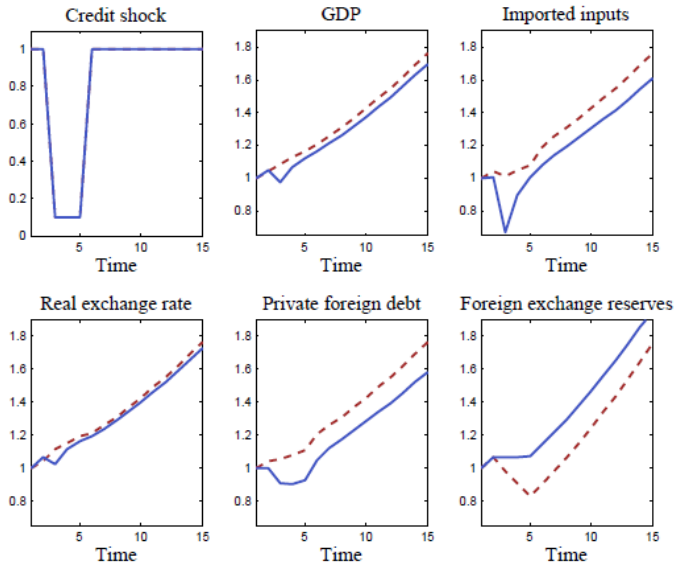
Crises times: intervention

- When firms are financially constrained

$$M_t = \frac{X_t \kappa_t + RB_t + D_t^G}{\phi P^M}$$

- Government can increase use of imported inputs by using foreign exchange reserves to finance working capital
- We assume that the government uses at most a fraction χ^{WK} of its stock of reserves to finance working capital

Crises times: intervention



Policy intervention and financial liberalization

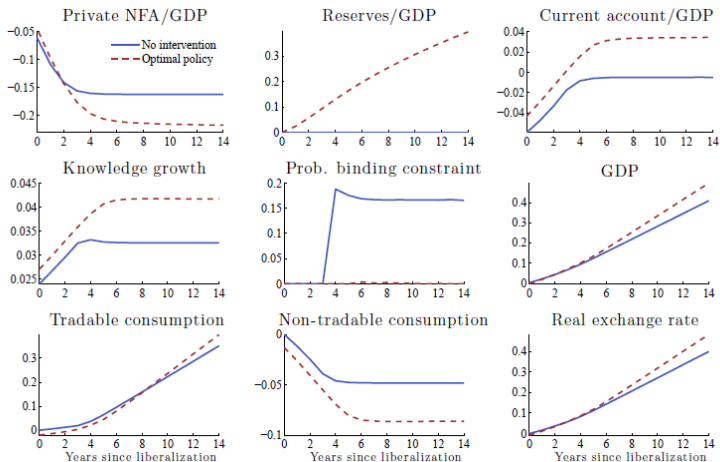
- To illustrate the properties of the model we look at the impact of policy on an economy that is opening to capital flows (i.e. $B_0 = FX_0 = 0$)
- We look at the effect on growth and capital flows by comparing an economy without intervention to one with the optimal policy rule ($\chi = 0.09, \chi^{WK} = 1$)
- We compute the welfare gains from a policy intervention
- We assume two possible realizations for the credit shock $\kappa_H < \kappa_L$

Parametrization

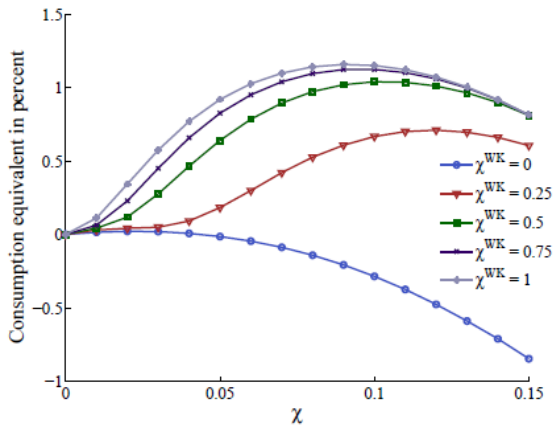
Table 1: Parameters

Parameter	Symbol	Value
Risk aversion	γ	2
Interest rate on private borrowing	R	1.04
Discount factor	β	$1/R$
Labor share in output in tradable sector	α_T	0.65
Labor share in output in non-tradable sector	α_N	0.65
Share of tradable goods in consumption	ω	0.341
Price of imported inputs	P^M	1
Borrowing limit	κ_L	0.1
Probability of bad credit shock	$1 - \rho_H$	0.1
Probability of exiting bad credit shock	$1 - \rho_L$	0.5
Working capital coefficient	ϕ	0.33
Elasticity of TFP w.r.t. imported inputs	ξ	0.15
Constant in knowledge accumulation process	ψ	0.34
Interest rate on reserves	R^{FX}	1
Efficiency of government intervention during crises	θ	0.5

Reserve management, growth and capital flows



Welfare analysis



Social planner problem

- The social planner internalize the knowledge externality
- The social planner does not accumulate reserves
- The first best can be replicated by subsidizing the purchase of intermediate inputs
- Reserve accumulation can be used to circumvent the restrictions imposed by trade agreements.

Conclusion

- Novel framework to replicate the positive correlation between reserve accumulation, current account surpluses and growth as observed in the data.
- Preliminary welfare analysis suggests that precautionary motive is more relevant
- One interesting aspect: global interaction (see Global Financial Resource Curse)