Household Income Dynamics in Emerging Market Finance: *Limited Participation Banking vs. Crowdfunding*

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1 Introduction

- Most external financing for firms comes from domestic banking, with expcetion of the US
- Japanese and German firms rely on banks for 75% of their financing; US firms less than 20%
- Given pressures of Basel Accord, banks are holding more and more reserves.
- Expectations of increased regulation and scrutiny world wide.
- This means that lending to firms, particular SME startups, will be more risk averse.
- Banks will demand higher risk premiums, from firms, winch do not have accessible and marketable collateral, such as firms in natural resource exports.
- Yet SME in need of financing employ more than 40% of labor force and constitute 40% of GDP in emerging Asia between 2007-2012.
- We examine a small open economy under a limited participation banking (LPB) system, which is the only source of lending to traded and non-traded firms, and under a crowd-funding banking system (CFB), in which worker/households can make deposits in banks and lend directly to non-traded firms, through crowd-funding methods.
- Two questions: in a CFB system, do households face greater downside risks? If there are positive shocks, what are the costs to a delay of a move to a hybrid CFB system?
- Model is a two sector model, households encompass workers and bankers.
- In banking system, banks can borrow internationally and purchase capital and rent this to both types of firms.

- Banks accept deposits from households and lend at the risk free rate, but charge a higher risk premium to the non-traded sector.
- Households save only through deposits in the banking system. This is the key financial friction.
- In the mutual fund regime, households can purchase and rent intermediate goods to the non-traded firms
- Since the households work at these firms, they have great knowledge of the technology of these firms.
- We assume in the CFB regime, that the households will provide a higher quality capital, which depreciates more quickly but improves household productivity more quickly than the capital provided by banks.
- For simplicity we abstract from government spending and taxes and assume a fixed exchange rate.
- Main shocks and source of uncertainty come from changes in the terms of trade. f
- Balduzzi, Brancati, and Schiantarelli found that in Italy, during periods of adverse shocks, increased spreads lead to lower bank lending, as well as investment and employment in younger firms.
- Earlier Galind, Schiantarelli and Weisee found that for 12 lower-income countries, financial deregulation, with less reliance on pure bank financing, increased the efficiency with which firms allocated investment funds.
- A lot of this controvery harkens back to debates about direct vs. indirect finance, and about the disintermediation of the financial system. Is it always more efficient for firms to rely more on banks for their financial needs, than on direct finance?

2 The Model

2.1 Households

- Two households, workers and bankers. Each consume a composite good of traded and non traded goods.
- They differ in their budget constraint.
- Usual utility function

$$V_t^w = \max_{\{C_t^w, L_t, M_t\}} U(C_t^w, L_t) + \beta^w \mathbf{E_0} V_{t+1}^w \tag{1}$$

$$U(C_t^w, L_t) = \frac{1}{1-\eta} (C_t^w)^{1-\eta} - \frac{1}{1+\omega} (L_t)^{1+\omega} \tag{2}$$

$$C_t^w = \left[(1-\gamma)^{\frac{1}{\theta}} \left(C_{h,t}^w\right)^{\frac{\theta-1}{\theta}} + (\gamma)^{\frac{1}{\theta}} \left(C_{h,t}^w\right)^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}} \tag{3}$$

- Minimizing expenditure gives the following expressions for home and traded good consumption as:

$$C_{h,t}^w = (1-\gamma) \left(\frac{P_{h,t}}{P_{c,t}}\right)^{-\theta} C_t^w \tag{4}$$

$$C_{x,t}^w = \gamma \left(\frac{P_{x,t}}{P_{c,t}}\right)^{-\theta} C_t^w \tag{5}$$

- The domestic goods price index $P_{c,t}$ is given by the following formula:

$$P_{c,t} = \left[(1-\gamma) \left(P_{h,t}\right)^{1-\theta} + \gamma \left(P_{x,t}\right)^{1-\theta} \right]^{\frac{1}{1-\theta}} \tag{6}$$

- Budget constraint:

$$W_t L_t + (1 + R_{t-1}^m) M_{t-1} = P_{c,t} C_t^w + M_t \tag{7}$$

- Euler equations for worker household:

$$\lambda_t^w = \frac{(C_t^w)^{-\eta}}{P_{c,t}} \tag{8}$$

$$L^\omega = (C_t^w)^{-\eta} \frac{W_t}{P_t^c} \tag{9}$$

$$\lambda_t^w = \beta^w \mathbf{E}_t \left[(1 + R_t^m) \lambda_{t+1}^w \right] \tag{10}$$

- Banking household:

$$V_t^b = \max_{\{C_t^b\}} U(C_t^b) + \beta \mathbf{E_0} V_{t+1}^b \tag{11}$$

$$U(C_t^b) = \frac{1}{1-\eta} \left(C_t^b\right)^{1-\eta} \tag{12}$$

- Demand function

$$C^{b,}_{h,t} = (1-\gamma)\left(\frac{P_{h,t}}{P_{c,t}}\right)^{-\theta} C^b_t \tag{13}$$

$$C^b_{x,t} = \gamma\left(\frac{P_{x,t}}{P_{c,t}}\right)^{-\theta} C^b_t \tag{14}$$

- Bank lending and risk premia to traded and non–traded goods

$$1 + R^{nx}_t = (1+R_t)(1+\Phi^x) \tag{15}$$

$$1 + R^{nh}_t = (1+R_t)(1+\Phi^h_t) \tag{16}$$

$$\Phi^h_t = \Phi_0 + \Phi_1(I^h_t/Q_t K^h_{t-1} - \delta/\overline{Q}) \tag{17}$$

- Budget constraint for banking household:

$$\begin{gathered} B_b + R_{h,t}K_{h,t-1} + R_{x,t}K_{x,t-1} + (1-\gamma_m)M_t = P^c_t C^b_t + (1+R^{nh}_t)(P^*_t I^h + P^*_t \Psi_t) \\ +(1+R^{nx}_t)P^*_t K_{x,t} + (1+R_t)B_{t-1} + (1+R^m_t)M_{t-1} \end{gathered} \tag{18}$$

- Adjustment costs:

$$\Psi_t = \frac{\psi}{2}\left(\frac{I_{h,t} - \delta\overline{K}_h}{K_{h,t-1}}\right)^2 K_{h,t-1} \tag{19}$$

- Law of motion for capital:

$$K_{h,t} = (1-\delta)K_{h,t-1} + I_{h,t} \tag{20}$$

- Irreversible investment:

$$I_{h,t} \geq 0 \tag{21}$$

- Euler equations for the banking family:

$$\lambda^b_t = \frac{\left(C^b_t\right)^{-\eta}}{P_{c,t}} \tag{22}$$

$$\lambda^b_t = \beta^b \mathbf{E}_t\left[(1+R_t)\lambda^b_{t+1}\right] \tag{23}$$

$$\lambda^b_t(1+R^{nx}_t)P^*_t = \beta^b \mathbf{E}_t\left[R_{xt}\lambda^b_{t+1}\right] \tag{24}$$

$$\lambda^b_t(1-\gamma_m) = \beta^b \mathbf{E}_t(1+R^m_t)\lambda^b_{t+1} \tag{25}$$

$$I_{h,t} = \delta\overline{K}_h + \frac{K_{h,t-1}}{\psi}\left[\frac{Q_t - (1+R^{nh}_t)P^*_t}{(1+R^{nh}_t)P^*_t}\right] \tag{26}$$

$$Q_t = \beta^b \mathbf{E}_t\left[\lambda^b_{t+1}R_{h,t} + \lambda^b_{t+1}\psi(1+R^{nh}_{t+1})P^*_{t+1}\left(\frac{I_{h,t+1} - \delta\overline{K}_h}{K_{h,t}}\right)^2 + Q_{t+1}(1-\delta)\right] \tag{27}$$

- Arbitrage conditions on interest rates and Tobin's Q:

$$(1 + R_t^m) = (1 - \gamma)(1 + R_t) \tag{28}$$

$$\frac{R_{x,t}}{(1 + R_t^{nx})_t P^*} = (1 + R_t) \tag{29}$$

$$\begin{aligned} \overline{Q} &= (1 + \overline{R}^{nh})\overline{P}^* \\ &= \frac{\beta \overline{\lambda}^b \overline{R}_h}{1 - \beta(1 - \delta)} \end{aligned} \tag{30}$$

- The bottom line is that the presence of borrowing costs, $\overline{R}^{nh}$ leads to a higher steady state value of Q. This in turns requires a higher rate of return in capital in this sector, which implies a lower steady-state level of the capital stock.

2.2 Production and Pricing

2.2.1 Export Goods

$$Y_{x,t} = C_{x,t} + X_t \tag{31}$$

$$C_{x,t} = C_{x,t}^w + C_{x,t}^b \tag{32}$$

$$\ln(P_{x,t}) = \rho^p \ln(P_{x,t-1}) + (1 - \rho^p) \ln(\overline{P}_x) + \epsilon_t^p, \tag{33}$$

$$\epsilon^p \tilde{} N(0, \sigma^p) \tag{34}$$

$$Y_{x,t} = A_x \left(z_t L_{x,t}\right)^{1-\alpha^x} \left(K_{x,t}\right)^{\alpha^x} \tag{35}$$

$$\Pi_t^x = P_{x,t} Y_{x,t} - [W_t Lx,_t + R_{x,t} K_{x,t}] \tag{36}$$

$$\frac{\alpha^x W_t}{(1 - \alpha^x) R_{x,t}} = \frac{K_{x,t}}{L_{x,t}} \tag{37}$$

2.2.2 Non-traded Goods

$$Y_{ht} = A_h \left(K_{h,t-1}\right)^{\alpha^h} \left(z_t L_{h,t}\right)^{1-\alpha^h} \tag{38}$$

$$\Pi_t^h = P_t^h Y_t^h - (W_t L_{h,t} + R_{h,t} K_{h,t-1}) \tag{39}$$

$$\frac{\alpha^h W_t}{(1 - \alpha^h) R_{h,t}} = \frac{K_{h,t}}{L_{h,t}} \tag{40}$$

$$P_t^h = \frac{(1 + R_t^{nh}) W_t^{1-\alpha^h}][(Q_t)^{\alpha^h}]}{A^h} \cdot \left(\frac{1}{(\alpha^h)^{\alpha^h} (1 - \alpha^h)^{1-\alpha^h}} \right) \tag{41}$$

2.2.3 Labor Mobility

$$\begin{aligned} W_t &= \frac{(1-\alpha^h)R_{h,t}K_{h,t}}{\alpha^h L_{h,t}} \\ &= \frac{(1-\alpha^x)R_{x,t}K_{x,t}}{\alpha^x L_{x,t}} \end{aligned} \tag{42}$$

2.3 CFB Regime

$$W_t L_t + (1+R_{t-1}^m)M_{t-1} + R_{h,t}K_{h,t-1} = P_{c,t}C_t + M_t + P_t^* I_{h,t} + P_t^* \widetilde{\Psi}_t \tag{43}$$

$$K_{h,t} = (1-\widetilde{\delta})K_{h,t-1} + I_{h,t} \tag{44}$$

$$\widetilde{\Psi}_t = \frac{\widetilde{\psi}}{2}\left(\frac{I_{h,t} - \delta\overline{K}_h}{K_{h,t-1}}\right)^2 K_{h,t-1} \tag{45}$$

$$I_{h,t} \geq 0 \tag{46}$$

$$\ln(z_t) = \rho^z \ln(z_{t-1}) + (1-\rho^z)\ln(\overline{z}) + (1-\rho^z)\rho^{zk}\ln(K_{t-1}^h/\overline{K}^h) \tag{47}$$

- In this regime, adjustment costs are lower, but depreciation is higher.
- Skill-enhancing investment technology.
- A wage premium emerges.
- Trade off in investment dynamics between LPB and worker-owned CFB regimes.
- Euler equations;

$$\lambda_t^w = \frac{(C_t^w)^{-\eta}}{P_{c,t}} \tag{48}$$

$$L^\omega = (C_t^w)^{-\eta}\frac{W_t}{P_t^c} \tag{49}$$

$$\lambda_t^w = \beta \mathbf{E}_t\left[(1+R_t^m)\lambda_{t+1}^w\right] \tag{50}$$

$$\lambda_t^w = \frac{(C_t^w)^{-\eta}}{P_{c,t}} \tag{51}$$

$$L^\omega = (C_t^w)^{-\eta}\frac{W_t}{P_t^c} \tag{52}$$

$$\lambda_t^w = \beta^w \mathbf{E}_t\left[(1+R_t^m)\lambda_{t+1}^w\right] \tag{53}$$

$$I_t^h = \delta\overline{K} + \frac{K_{h,t-1}}{\psi}\left[\frac{Q_t/\lambda_t^w - P_t^*}{P_t^*}\right] \tag{54}$$

$$Q_t = \beta^w \mathbf{E}_t\left[R_{h,t+1}\lambda_{t+1} + \lambda_{t+1}\widetilde{\psi}P_{t+1}^*\left(\frac{I_{h,t+1} - \widetilde{\delta}\overline{K}_h}{K_{h,t-1}}\right)^2 + Q_{t+1}(1-\widetilde{\delta})\right] \tag{55}$$

$$B_b + R_{x,t}K_{x,t-1} + (1-\gamma_m)M_t = P_{c,t}C_t^b + (1+R_t^{nx})P_t^*K_{x,t} + (1+R_t)B_{t-1} + (1+R_t^m)M_{t-1} \quad (56)$$

:

$$\lambda_t^b = \frac{\left(C_t^b\right)^{-\eta}}{P_{c,t}} \quad (57)$$

$$\lambda_t^b = \beta^b \mathbf{E}_t\left[(1+R_t)\lambda_{t+1}^b\right] \quad (58)$$

$$\lambda_t^b(1+R_t^{nx})P_t^* = \beta^b \mathbf{E}_t\left[R_{xt}\lambda_{t+1}^b\right] \quad (59)$$

$$\lambda_t^b(1-\gamma_m) = \beta^b \mathbf{E}_t(1+R_t^m)\lambda_{t+1}^b \quad (60)$$

3 Calibration

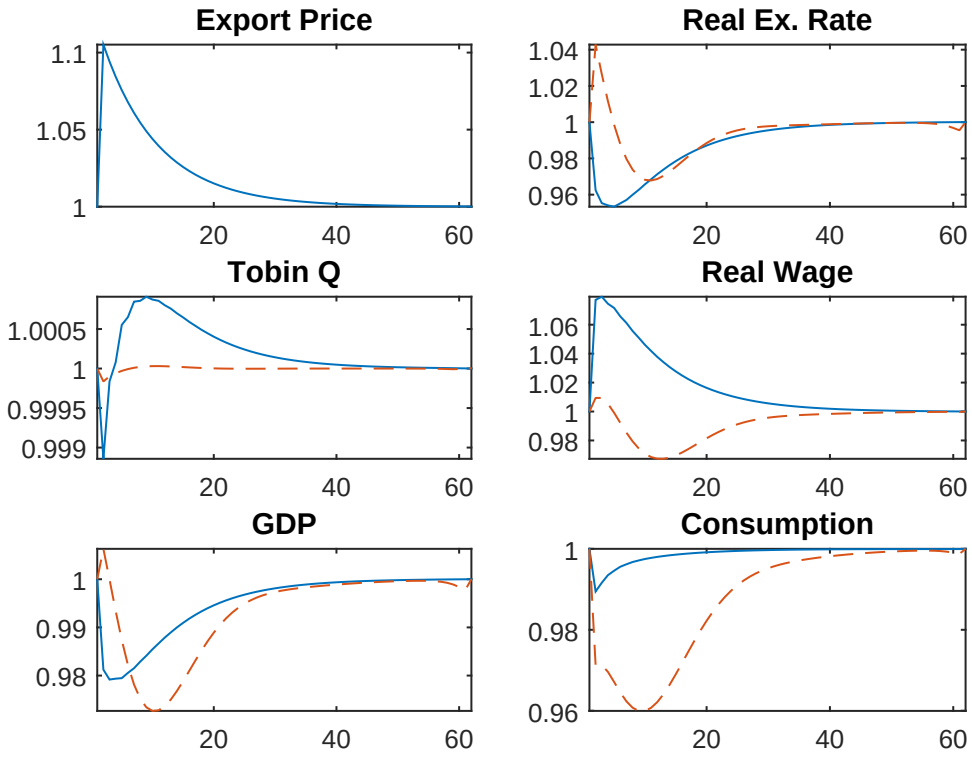
Table 1: Parameter Specification

Parameters	Definitions	Calibrated Values
β^b, β^p	discount factor	.990, .995
η	relative risk aversion	2.5
ω	labor supply elasticity	0.5
γ	share of tradeables in consumption bundle	0.4
θ	intratemporal substitution elasticity	1.25
δ,$\widetilde{\delta}$	depreciation rate on capital	0.025, .05
α^h, α^x	parameters in production function for capital	0.3, 0.4
$\psi, \widetilde{\psi}$	adjustment costs for investment	0.15, .05
γ_m	parameters for deposits	0.05,
Φ^x, Φ_0, Φ_1	risk premium for export and home goods lending	0.05,.15, .01
$\rho^z, \rho^{zk}, \rho^P,$	autoregressive parameters for shocks	.9,...5,....9
σ^p	standard deviation for shocks	.01

Table 2: Steady State Values

Variable	Definition	Calibrated Value
c/y	Consumption/GDP	..364
x/y	Export/GDP	.64
$(M/P)/y$	Real Money/GDP	5.39
$(I^h + K^x)/y$	Total investment/GDP	.55
R, R^*	Risk free rate	.0101
R^m, R^{nx}, R^{nh}	Interest on deposits and loans to firms	0.005, 0.0606,0.1111
P^*, P^x, P^h, P^c	Price indices	1,3.18,2.63,2.83
$N^x/y, N^h/y$	Loans to export and home-goods firms/GDP	..7..07

Figure 1: Adjustment to a Positive Export Price Shock



4 Simulation Results

4.1 Impulse Response Paths

4.2 Stochastic Simulations and Boom/Bust Event Dynamics

- We simulation model for T= 10,000
- We identify boom and bust episodes, when GDP expands or contrasts by 1.67 standard deviations above or below its stochastic mean
- We look at the adjust of key variables for 5 periods before and after the boom or bust points.

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Figure 2: Adjustment to a Negative Export Price Shock

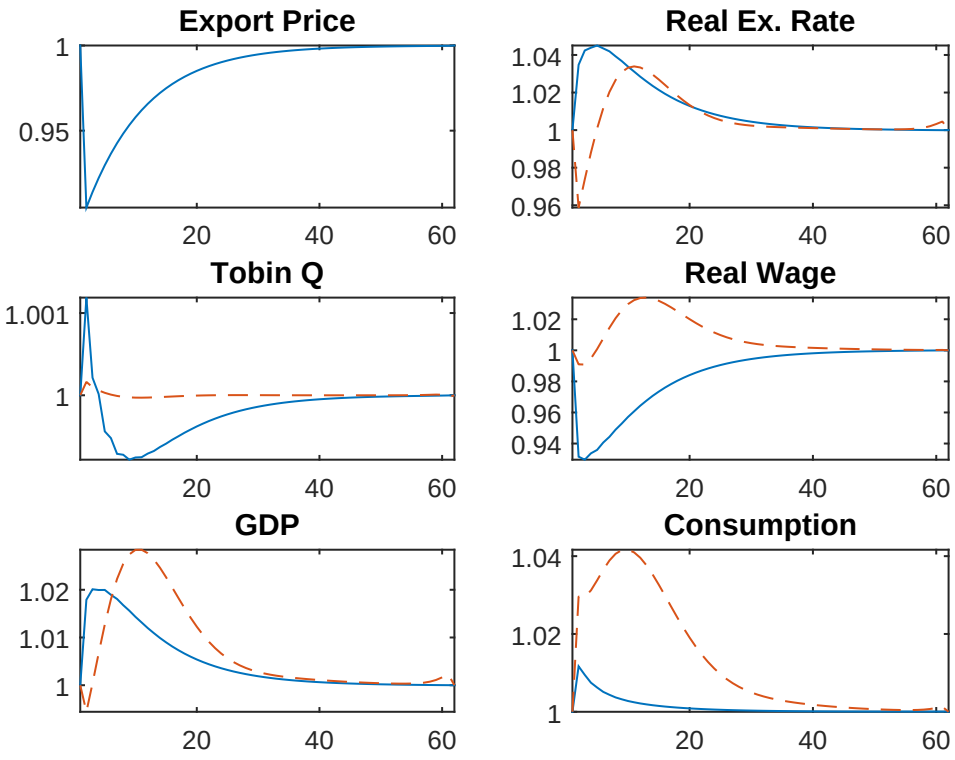


Figure 3: Adjustment During Export Price Boom/Bust Episode

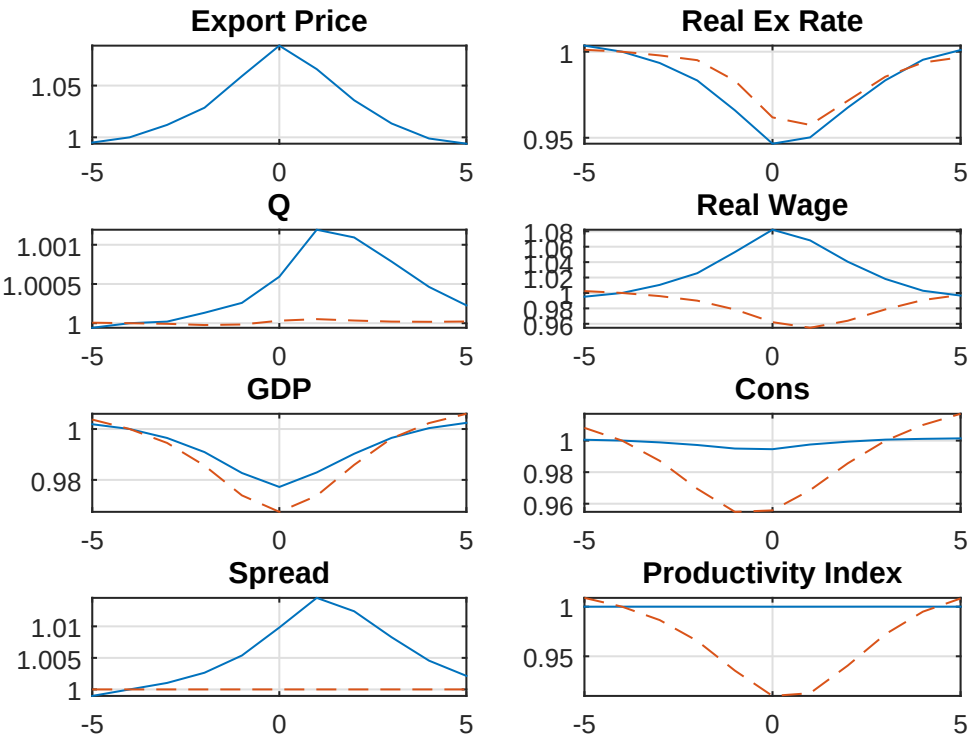
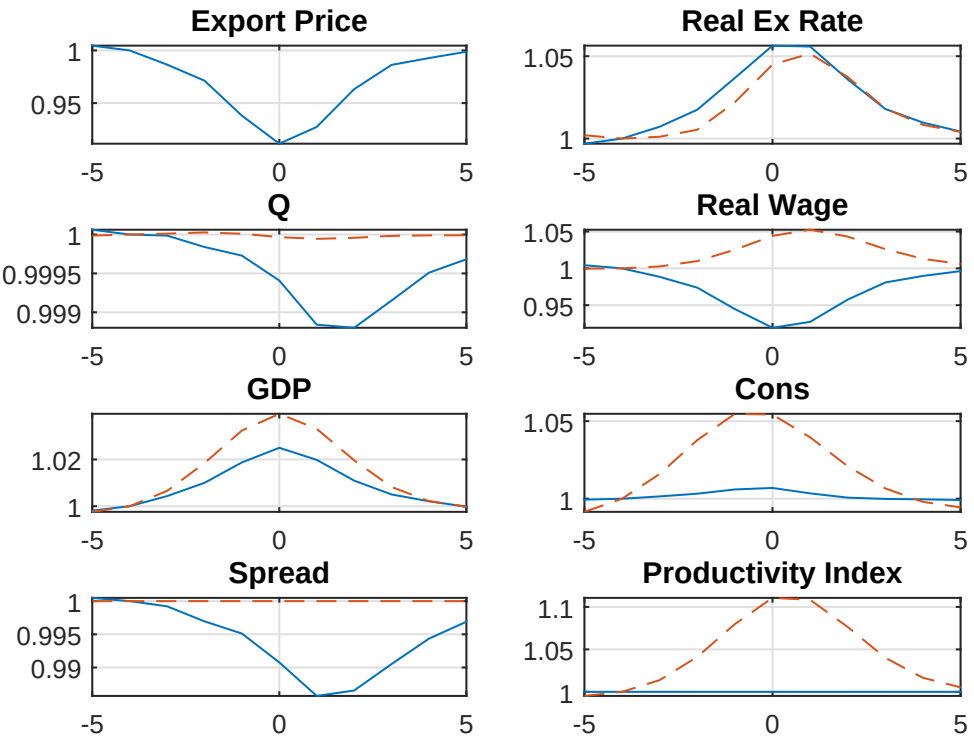


Figure 4: Adjustment During Export Price Bust/Boom Episode



5 Conclusion

- Two regimes, the banking LPB and the less restricted CFB regime.
- Investment is irreversible.
- Workers who lend to firms invest in labor augmenting capital.
- The CFB regimes can generate more upside gains for workers.
- CFB regime also brings bank memories of the free-banking debates.