Assessing Capital Regulation in a Macroeconomic Model with Three Layers of Defaults

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MaRs

- MaRs (Macro-prudential Research network) launched in Spring 2010 by the European System of Central Banks

- Three areas of research:
  - WS1: Macro-financial models linking financial stability and the performance of the economy (MaRs' primary research topic)
  - WS2: Early warning systems and systemic risk indicators
  - WS3: Assessing contagion risks

- $\Longrightarrow$ Cross-country project in WS1 of MaRs

The Project

- Aim: Build a decision-support tool to provide valuable feedback to policymakers
  - state of the art research: dynamic stochastic general eqm
  - central role of default (Bank **d**efault, Firm **d**efault, Household **d**efault – **3D**)
  - policy analysis framework: welfare analysis + cost/benefits macroprudential policy

- Collective ESCB effort: Laurent Clerc (Banque de France), Caterina Mendicino (Banco de Portugal), Stephane Moyen (Bundesbank), Alexis Derviz (Czech National Bank), Kalin Nikolov and Livio Stracca (ECB) and Alex Vardoulakis (now FRB).
- Consultant: Javier Suarez (CEMFI)

- Project output
  - Dynare code/User manual which has been distributed to the ESCB

Overview of policy conclusions

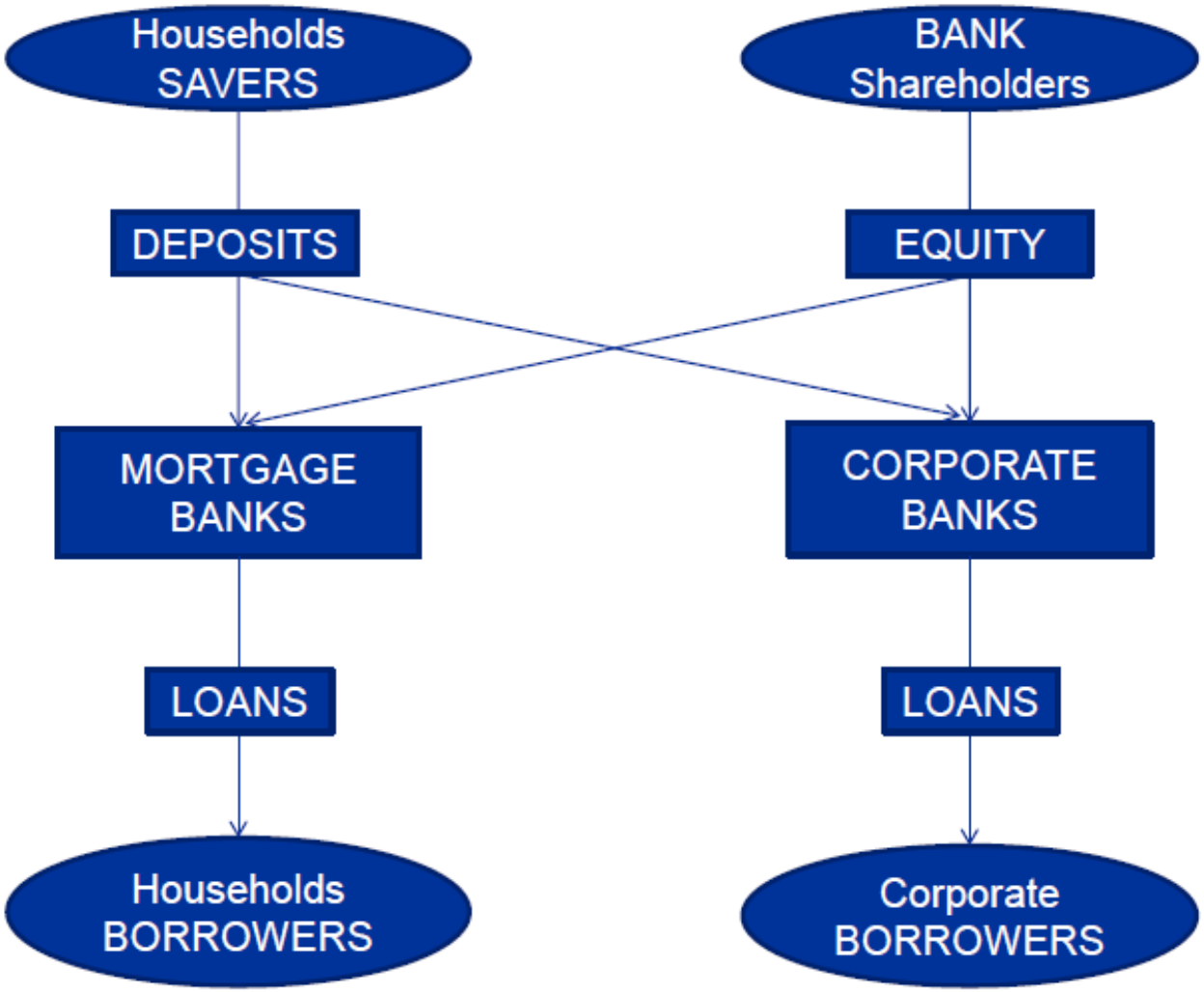
- Policy focus on capital requirements
- Steady state CRs
  - Large gains from raising CRs when risk of bank failure is significant
- Model dynamics under different CRs
  - Bank-related amplification channels are strong when risk of bank failure is high
  - CRs effective at shutting these amplification channels down
- Countercyclical adjustments
  - Mitigate the impact of shocks when low bank failure risk
  - Counterproductive otherwise

Outline

- Overview of the 3D model
- Model details and parameterization
- Policy Exercises
- Conclusions

Overview of the 3D Model

3D Model Structure



Costs of financial instability

- **Bank risk arises from borrower default risk**:
  - idiosyncratic risk: due to imperfect diversification
  - aggregate risk: due to aggregate (real and financial) shocks
  - Default causes bankruptcy costs
- **Why are bank defaults excessive?**
  - bailout expectations $\Longrightarrow$ implicit subsidy to lending made by risky banks
  - default externality of bank funding costs: despite DI, depositors suffer transaction costs when banks fail

  $\Longrightarrow$ not taken into account by individual banks
- **As a result**

  $\Longrightarrow$ banks target maximum leverage $\Longrightarrow$ costly defaults are excessive

  $\Longrightarrow$ steady state output and lending may be too high or too low when CRs are low

Amplification channels in the model

- **Bank capital amplification channel**
  - Aggregate (-) shocks hit bank borrowers, raising defaults and reducing bank capital
  - Bank capital reduction limits credit supply $\Longrightarrow$ further real economy deterioration + more defaults
  - Bank capital reduced further ...
- **Bank funding costs amplification channel**
  - Large aggregate (-) shocks lead to a reduction of bank capital and some banks default
  - Fear of bank defaults raises bank funding costs $\Longrightarrow$ further real economy deterioration + more defaults
  - Bank funding costs increase further ...
- **Amplification channels stronger when CRs are low**

Related Literature

- **Bank capital channel in models without bank default**: Gertler and Kiyotaki (2010), Meh and Moran (2010), Gertler and Karadi (2011), Brunnermeier and Sannikov (2014) [*no focus on capital requirements*]
- **Models emphasizing 'fire sale' or investment externalities**: Bianchi and Mendoza (2011), Gersbach and Rochet (2012), Korinek and Jeanne (2012) [*quantitatively small effects on welfare*]
- **Policy-oriented assessments of capital requirements**: Admati and Hellwig (2013), Miles, Yang and Marcheggliano (2012), MAG's Final Report (2010) [*either no dynamics or poor microfoundations*]
- Martinez-Miera and Suarez (2012): effect of capital requirements on banks' temptation to lend to systemic borrowers
- Boissay, Collard and Smets (2012): unique in generating endogenous crises
- **Parallel efforts**: Benes, Kumhof and Laxton (2014), Nguyên (2014) [*related insights*]

3D Model details and parameterization

Households

- Grouped in two distinct dynasties which provide risk-sharing to their members: the saving dynasty ($j = s$) and the borrowing dynasty ($j = m$).

$$\max E_t \left[\sum_{i=0}^{\infty} \left(\beta^j\right)^{t+i} \left[\log\left(c^j_{t+i}\right) + v^j_{t+i} \log\left(h^j_{t+i}\right) - \frac{\varrho^j_{t+i}}{1+\eta} \left(l^j_{t+i}\right)^{1+\eta} \right] \right]$$

- derive utility from:

- a *consumption* good (c^j_t)
- a durable good, *housing* (h^j_t)

- suffer disutility from hours worked (l^j_t)

Patient Households (Savers)

- Intertemporal budget constraint

$$c_t^s + q_t^H h_t^s + d_t \leq w_t l_t^s + \left(1 - \delta^H\right) q_t^H h_{t-1}^s + \widetilde{R}_t^D d_{t-1} - T_t^s + \Pi_t + \Lambda_t$$

- where d_{t-1} are saving deposits whose (risky) return is given by

$$\widetilde{R}_t^D = \left(1 - \gamma PD_t^B\right) R_{t-1}^D$$

- where γ is a transaction cost incurred when banks default and PD_t^B is the average bank failure rate $\Longrightarrow$ motivates depositors' aversion to bank default and a risk premium
- T_t^s is a lump-lum tax used by the DIA to ex-post balance its budget, Π_t profits from production sector and Λ_t are transfers from bankers and entrepreneurs

Impatient Households (Borrowers)

- Dynamic budget constraint

$$\begin{aligned} & c_t^m + q_t^H h_t^m - b_t^m \\ \leq \quad & w_t l_t^m + \int_0^\infty \max\left\{\omega_t^m q_t^H \left(1-\delta^H\right) h_{t-1}^m - R_{t-1}^m b_{t-1}^m, 0\right\} dF^m(\omega^m) \end{aligned}$$

where b_t^m: conventional (uncontingent) debt

- Default whenever house value is less than required repayment

$$\omega_t^m q_t^H \left(1-\delta^H\right) h_{t-1}^m < R_{t-1}^m b_{t-1}^m$$

where ω_t^m : beginning-of-the-period idiosyncratic (mean $= 1$) shock to their housing value

- Default in t occurs for

$$\omega_t^m \leq \overline{\omega}_t^m = \frac{x_{t-1}^m}{R_t^H}$$

where

- $R_t^H \equiv q_t^H \left(1-\delta^H\right) / q_{t-1}^H$: realized gross return on housing at t,

The Impatient Household Problem

- Choose consumption, housing, leverage and labour supply subject to:
- Budget constraint of the dynasty

$$c_t^m + q_t^H h_t^m - b_t^m \leq w_t l_t^m + \left(1 - \Gamma^m\left(\overline{\omega}_t^m\right)\right) q_t^H h_{t-1}^m - T_t^m,$$

- Participation constraint of the bank

$$E_t \max\left[\omega_{t+1}^H \widetilde{R}_{t+1}^H b_t^m - R_t^D d_t^m, 0\right] \geq \rho_t e^H.$$

where the loan return

$$\widetilde{R}_{t+1}^H b_t^m \equiv \left[\left(\Gamma^m\left(\overline{\omega}_{t+1}^m\right) - \mu^m G^m\left(\overline{\omega}_{t+1}^m\right)\right) q_{t+1}^H\right] h_t^m$$

and ρ_t is the required rate of return on equity for the bank.

Banks and Bankers

Banker (Risk neutral agents: 2 period-OLG)

- A banker born at time t receives a bequest from the previous generation of bankers.
- t: decides how to allocate his wealth as inside equity into the 2 class of banks (mortgages & business loans)
- $t+1$: values leaving gifts/ transfers to firms' owners (savers) and bequests

Banks:

- one-period lived firms which raise equity from bankers and deposits from patient households
- specialize in either mortgage (j=H) or corporate loans (j=F).
- insured deposits

Bankers

- In the second period of life maximizes

$$\max_{c^b_{t+1}, n^b_{t+1}} \left(c^b_{t+1}\right)^{\chi^b} \left(n^b_{t+1}\right)^{1-\chi^b}$$

subject to:

$$c^b_{t+1} + n^b_{t+1} \leq W^b_{t+1}$$

W^e_{t+1} : final wealth
n^b_{t+1} : net worth left to next cohort of bankers
c^b_{t+1} :transfers to savers

- Optimizing behavior yields

$$c^b_{t+1} = \chi^b W^b_{t+1}$$

and

$$n^b_{t+1} = (1-\chi^b) W^b_{t+1}.$$

Bankers (cont'd)

Hence in first period of life, solves portfolio problem

$$\max_{e_t^F} E_t(W_{t+1}^b) = E_t(\widetilde{\rho}_{t+1}^F e_t^F + \widetilde{\rho}_{t+1}^M \left(n_t^b - e_t^F\right)).$$

where $\widetilde{\rho}_{t+1}^F$: ex post gross return on the inside equity invested in each bank
First order condition wrt e_t^F:

$$E_t\widetilde{\rho}_{t+1}^F = E_t\widetilde{\rho}_{t+1}^M = \rho_t,$$

where ρ_t : bankers required gross rate of return on equity investments
Aggregate evolution of bankers' net worth:

$$N_{t+1}^b = \left(1-\chi^b\right)\left(\widetilde{\rho}_{t+1}^F E_t^F + \widetilde{\rho}_{t+1}^M \left(N_t^b - E_t^F\right)\right).$$

Banks

- Mortgage banks' profits:

$$\pi^F_{t+1} = \max\left[\omega_{t+1}\tilde{R}^H_{t+1} b^m_t - R^D_t d^m_t, 0\right],$$

- Regulatory capital constraint is

$$e^H_t \geq \phi^H_t b^m_t,$$

- The default threshold is

$$\overline{\omega}^H_{t+1} = (1-\phi^H_t)\frac{R^D_t}{\tilde{R}^H_{t+1}}, \tag{1}$$

- The ex post rate of return on equity is

$$\widetilde{\rho}^H_{t+1} = \frac{\left(1-\Gamma^H(\overline{\omega}^H_{t+1})\right)\tilde{R}^H_{t+1}}{\phi^H_t}. \tag{2}$$

Credit Supply to Households

- Competitive banks supply loans to households, b_t^m, using deposit funding d_t and equity funding e^H as long as lending yields the market required expected return ρ_t on bank equity

$$E_t \max\left[\omega_{t+1}^H \widetilde{R}_{t+1}^H b_t^m - R_t^D d_t^m, 0\right] \geq \rho_t e^H.$$

where ω_{t+1}^H is a mortgage-bank-specific loan quality shock and $\widetilde{R}_{t+1}^H$ is the loan return (after loan losses).

- Compare to BGG

$$E_t \widetilde{R}_{t+1}^H \geq R_t.$$

- Several frictions:
  - $\rho_t \geq R_t$ due to scarcity of bank equity holder wealth (as in GK)
  - R_t^H includes compensation for HH default costs (as in BGG)
  - DI subsidy reduces the necessary $E_t \widetilde{R}_{t+1}^H$ to achieve required equity return ρ_t
  - $R_t^D \geq R_t$ due to bank funding cost channel

Entrepreneurs

- Risk neutral agents
- OLG-founded version of BGG: Entrepreneurs live for two periods and transmit net worth through bequests
- own physical capital stock
- capital financed partly with corporate loans and partly with inhereted net worth
- default when value of the firm less than debt repayment
- value leaving gifts/transfers to firm's owners

Entrepreneurs

- In second period of life, maximize

$$\max_{c^e_{t+1}, n^e_{t+1}} \left(c^e_{t+1}\right)^{\chi^e} \left(n^e_{t+1}\right)^{1-\chi^e} \tag{3}$$

subject to:

$$c^e_{t+1} + n^e_{t+1} \leq W^e_{t+1} - T^e_t$$

where W^e_{t+1} : final wealth

n^e_{t+1} : net worth left to next cohort of entrepreneurs

- c^e_{t+1} : transfers to savers
- Optimizing behavior yields

$$c^e_{t+1} = \chi^e W^e_{t+1} \tag{4}$$

$$n^e_{t+1} = (1-\chi^e) W^e_{t+1}. \tag{5}$$

Entrepreneurs (cont'd)

- Hence in first period of life maximize:

$$\max_{k_t, b_t^e, R_t^F} E_t(W_{t+1}^e) \tag{6}$$

where

$$W_{t+1}^e = \max\left[\omega_{t+1}^e \left(r_{t+1}^k + (1-\delta)\, q_{t+1}^K\right) k_t - R_t^F\, b_t^e, 0\right] \tag{7}$$

and their period t resource constraint is

$$q_t^K\, k_t - b_t^e = n_t^e \tag{8}$$

R_t^F : contractual gross interest rate on loans
$\left(r_{t+1}^k + (1-\delta)\, q_{t+1}^K\right) k_t$: gross returns on capital investment

The corporate contracting problem

Entrepreneurs choose capital (k_t) and leverage $\left(x_t^e = \left(R_t^e b_t^e\right) / \left(q_t^K k_t\right)\right)$ to maximize:

$$\max_{x_t^e, k_t} E_t \left[\left(1 - \Gamma^e\left(\overline{\omega}_{t+1}^e\right)\right) R_{t+1}^K q_t^K k_t\right]$$

subject to the participation constraint of the bank:

$$E_t\left(1 - \Gamma^F\left(\overline{\omega}_{t+1}^F\right)\right)\widetilde{R}_{t+1}^F = \rho_t \phi_t^F, \tag{9}$$

where

$$\widetilde{R}_{t+1}^F = \left(\Gamma^e\left(\overline{\omega}_{t+1}^e\right) - \mu^e G^e\left(\overline{\omega}_{t+1}^e\right)\right) R_{t+1}^K q_t^K k_t$$

$$\overline{\omega}_{t+1}^e = \frac{x_t^e}{R_{t+1}^K}$$

Remark: $R_{t+1}^K = \frac{\left(r_{t+1}^k + (1-\delta) q_{t+1}^K\right) k_t}{q_t^K}$ affects entrepreneurial default rate (debt repayment not contingent on R_{t+1}^K!)

Product Markets (Standard)

- **Consumption Goods**
  - Combine capital rented from entrepreneurs with household and entrepreneurial labour inputs.

- **Physical Capital**
  - Firms optimize intertemporally in response to changes in the price of capital
  - Subject to investment adjustment costs

- **Housing**
  - Similar to Physical Capital Production

$\Longrightarrow$ Perfectly competitive sector made up of **firms owned by the savers**.

$\Longrightarrow$ These sectors are not directly affected by financial frictions.

Capital production firms

- Investment

$$I_t = k_t - (1-\delta)\, k_{t-1}$$

requires resources

$$\left[1 + g\left(\frac{I_t}{I_{t-1}}\right)\right] I_t$$

where $g\left(\frac{I_t}{I_{t-1}}\right)$ is the investment adjustment cost function.

- Firm is owned by the patient households $\Longrightarrow$ choose investment I_t in order to maximize

$$E_t \sum_{t=\tau}^{\infty} \frac{\lambda_\tau^s}{\lambda_t^s} \left\{ q_\tau^K I_\tau - \left[1 + g\left(\frac{I_\tau}{I_{\tau-1}}\right)\right] I_\tau \right\},$$

- FOC:

$$q_t^K = 1 + g\left(\frac{I_t}{I_{t-1}}\right) + \frac{I_t}{I_{t-1}} g'\left(\frac{I_t}{I_{t-1}}\right) - E_t \varphi_{t,t+1}^P \left(\frac{I_{t+1}}{I_t}\right)^2 g'\left(\frac{I_{t+1}}{I_t}\right).$$

- Same for the production of Housing

Market clearing conditions

- Bank capital market

$$(1-\chi^b)W_t^b = \phi_t^F\left[q_t^K k_t - (1-\chi^e)W_t^e\right] + \phi_t^M\left(\frac{q_t^H h_t^m x_t^m}{R_t^m}\right).$$

- Deposit market

$$d_t = (1-\phi_t^F)\left[q_t^K k_t - (1-\chi^e)W_t^e\right] + (1-\phi_t^M)\left(\frac{q_t^H h_t^m x_t^m}{R_t^m}\right).$$

- Labour market

$$(1-\alpha)\frac{y_t}{w_t} = l_t^s + l_t^m.$$

- Physical capital market: entrepreneur demand equals capital-producing firm supply

$$q_t^K k_t = n_t^e + b_t^e$$

- Housing market

$$H_t = H_t^s + H_t^m$$

- Goods market: long and ugly expression

Baseline Parameters Setting

- Baseline capital requirements: $\left(\phi^M, \phi^F\right) = (0.04, 0.08)$
- Default (annualized):
  - Banks: 2%
  - Entrepreneurs: 3%
  - Households: 0.35%
- Leverage Entrepreneurs & Households: 75%
- Risk Weight: 50% on housing loans
- Transaction cost incurred when banks default (γ): 0.1
- Annual equity return: 20%
- Standard choices for other conventional parameters

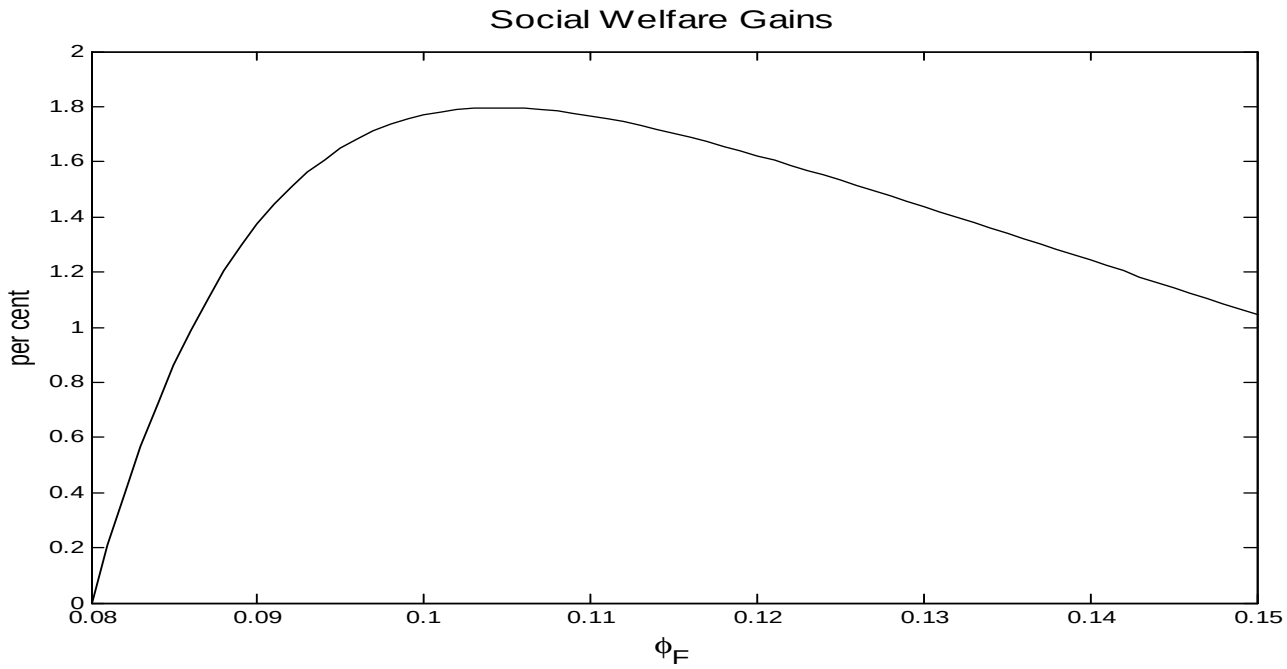
Policy Exercise: Higher steady state capital requirements

Higher steady state capital requirements

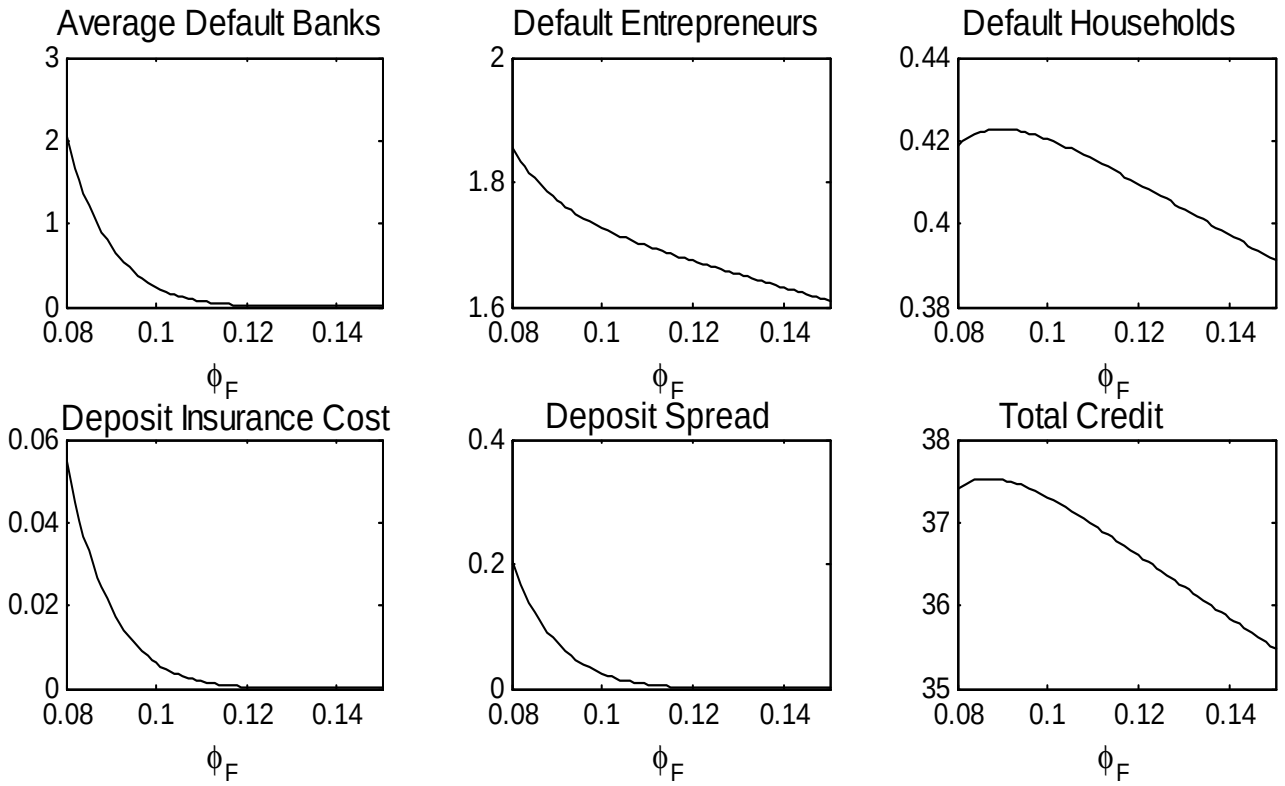
- Reduce bank leverage and the risk of bank failure
  - Reduce implicit DI subsidies
  - Reduce the intensity of the bank funding channel
- Increase the share of equity in total bank liabilities:
  - Increase banks ' weighted average cost of funding (except when CRs are very low)
  - Tighten credit supply and reduce borrowers' leverage
- Higher capital ratio:
  - Corrects risk-taking incentives (reduces excessive lending and defaults)
  - Tightens credit supply

- Caveats:
  - Banks cannot raise equity yet!
  - Transitional costs not taken into account
  - Work under way to relax these assumptions

Social Welfare

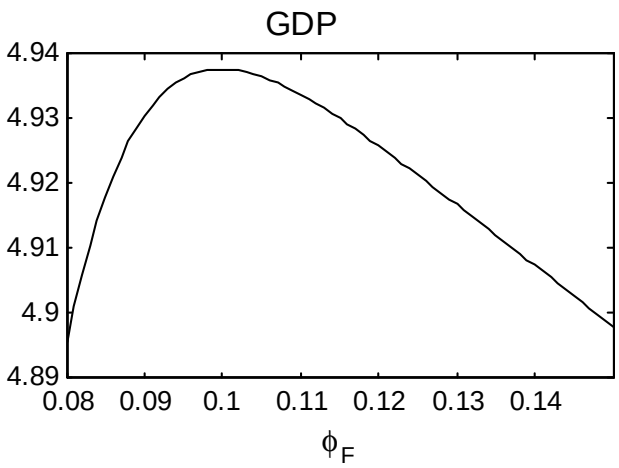


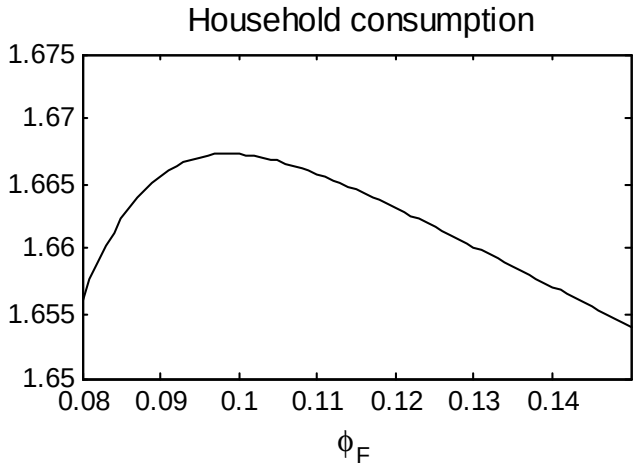
- Individual Households Welfare function: conditional expectation of lifetime utility as of time t.
- Individual Welfare Gains: consumption-equivalent measure (percentage increase in SS consumption that would make welfare under the baseline policy $(\phi^F = 0.08; \phi^H = 0.04)$ equal to welfare under alternative ϕ.
- Social W. G. : HH gains weighted by their consumption shares

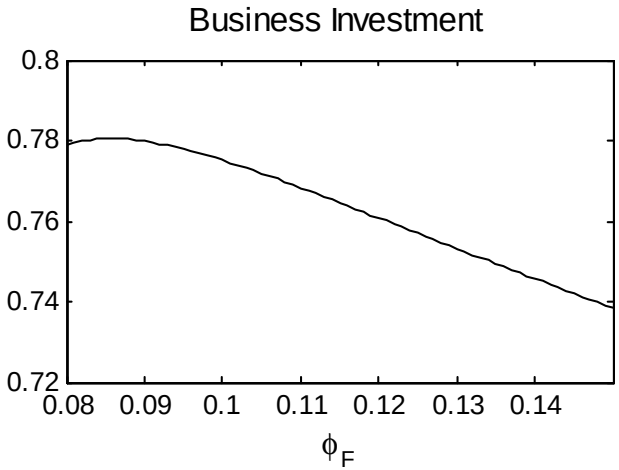


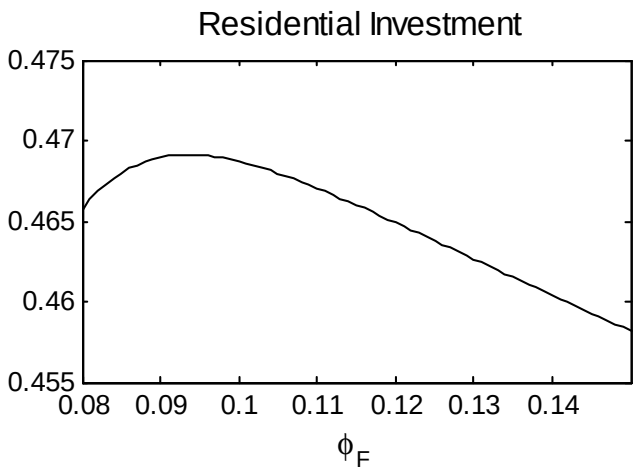
Higher $\phi \Longrightarrow \downarrow$ implicit subsidy to banks$\Longrightarrow$ (1) $\downarrow$ lending (at moderate levels aligns credit supply to what it should be); (2) $\downarrow$ bank default

- (+) EFFECT: $\downarrow$ default cost for the agents & $\downarrow$ cost of deposits for banks ($\uparrow$ hhs perception of safer banks)$\Longrightarrow$ dominates initially!
- (-) EFFECT: $\downarrow$ credit supply to the economy (at higher interest rates)$\Longrightarrow$ dominates when bank default is close to zero!

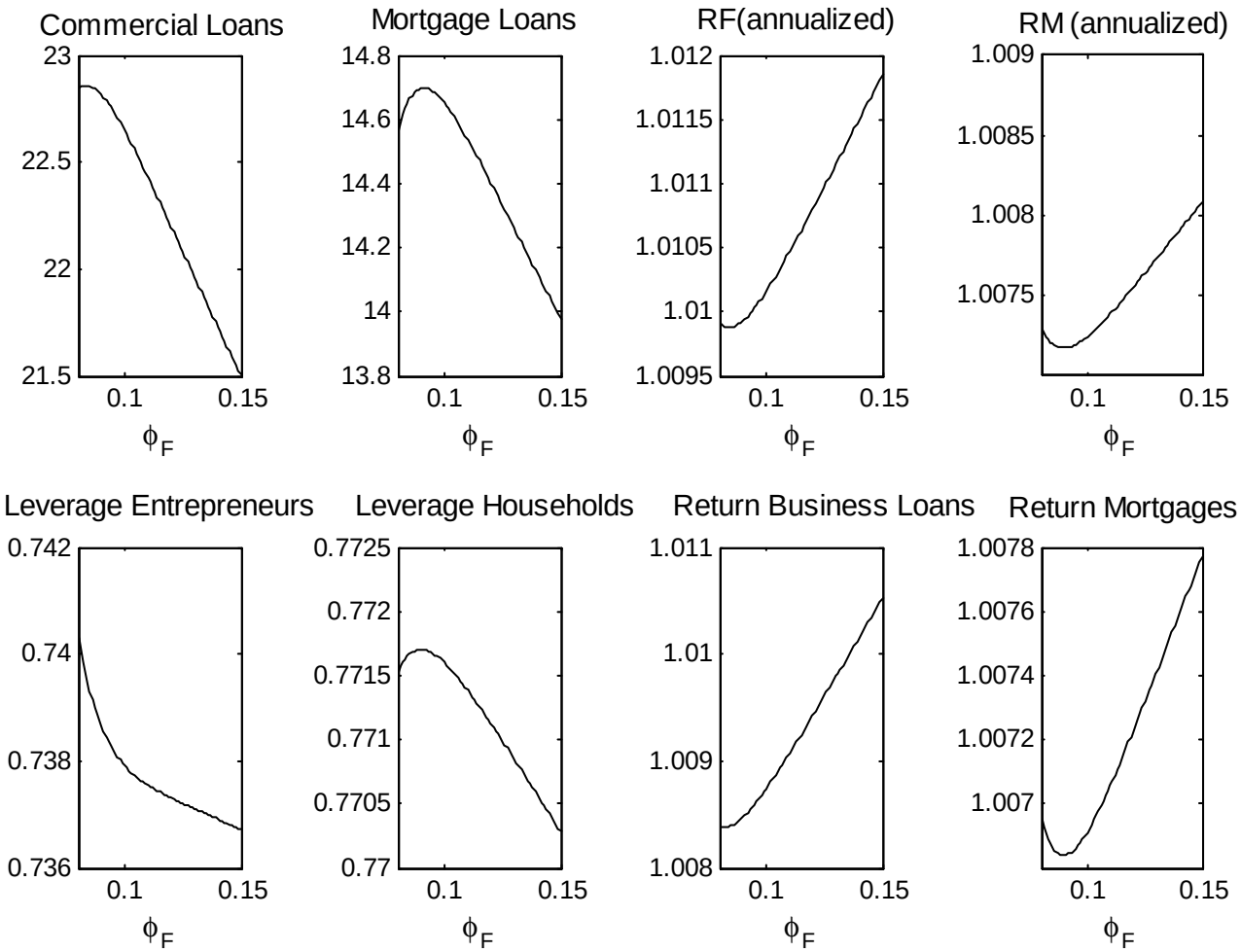








- reduction in the social cost of bank default$\Longrightarrow \uparrow$ private consumption and investment$\Longrightarrow \uparrow$ GDP (dominates at first!)
- reduction in credit supply$\Longrightarrow \downarrow$ GDP (dominates when CR is too large)



Remark:Initial increase in loans is due to the reduction in banks' cost of funds.

Spreads

- Literature has focused on spread $E_t R^K_{t+1} - R_t$
  - BGG: external finance premium due to expected default costs
  - KM/GK: no default - spread due to binding borrowing/capital constraint
  - Spreads a measure of credit frictions but little room for CR policy
- In our model:

$$\begin{aligned} E_t R^K_{t+1} - R_t \quad = \quad & E_t R^K_{t+1} - R^F_t + \\ & R^F_t - R^D_t + \\ & R^D_t - R_t \end{aligned}$$

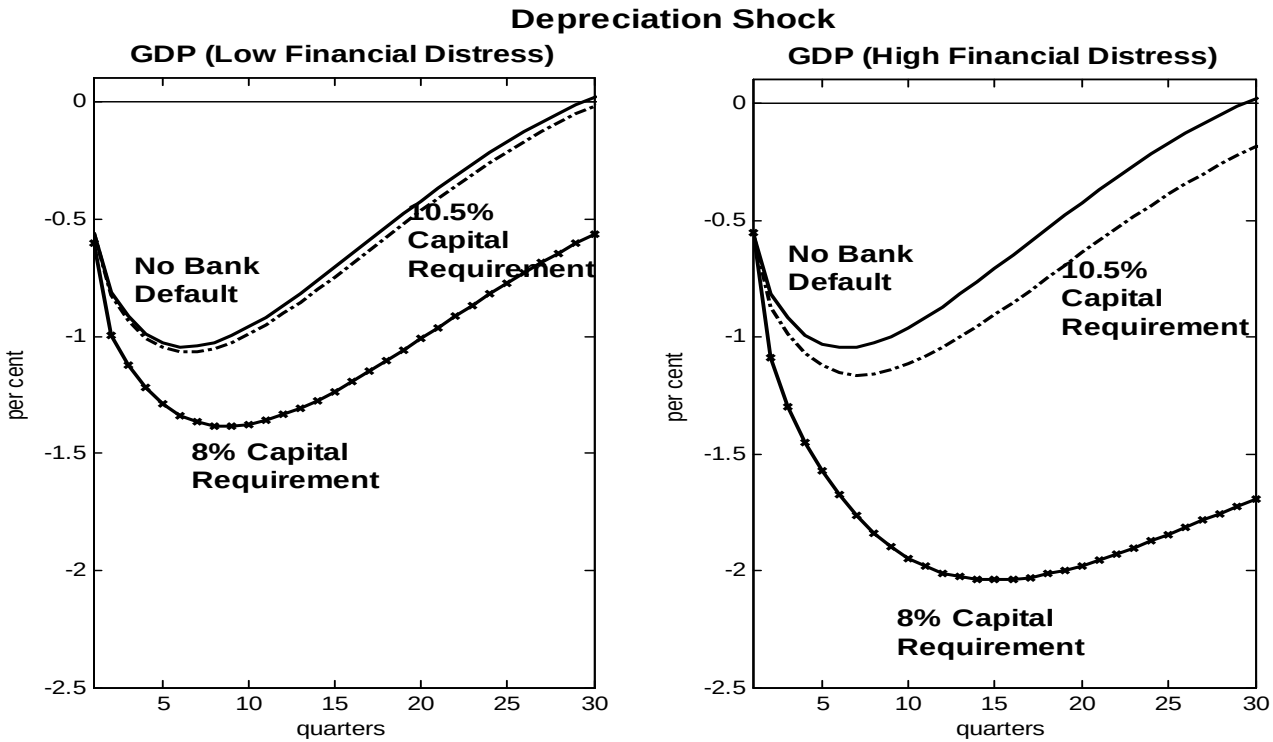
- $E_t R^k_{t+1} - R^F_t$:
  - BGG friction due to expected firm default costs
- $R^F_t - R^D_t$:
  - GK spread due to binding capital constraint
  - DI subsidy when prob. of bank default >0
- $R^D_t - R_t$
  - bank funding cost channel: default externality

Policy exercise: Shock amplification under different capital ratios

How are shocks transmitted under alternative capital ratios?

- Policy exercise: hit the economy with one large shock
- The shock: a persistent collapse in asset prices (housing and business equity)
- Question: how do capital ratios (high vs low) affect the transmission of shocks?

IRF to a 0.2% Depreciation shock (0.9 persistence)



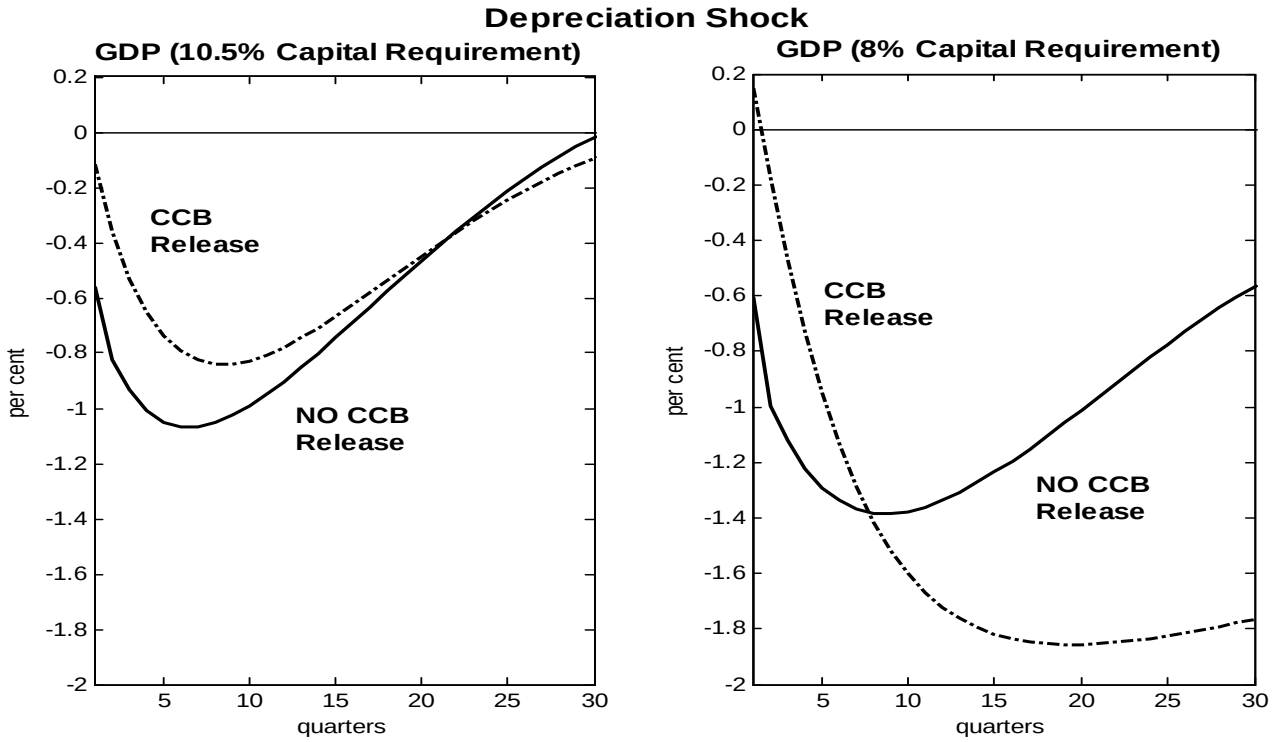
- Capital Requirements higher than benchmark ($\phi^F = 0.11; \phi^H = 0.07$)
- A: mitigates the effects of a financial shock (large decline in asset prices)
- B: mimics the dynamics of a no bank default economy ($\sigma_H = \sigma_F \approx 0$)
- High Financial Distress (abt 20% increase in $\sigma_H \& \sigma_F$) exacerbates the negative effect of the shock $\Longrightarrow$ Substantial amplification from Bank Default!

Policy exercise: the impact of the CCB release at different steady state capital ratios

Can a capital ratio reduction help in a crisis?

- Policy exercise: hit the economy with one (or more) large shocks
- The shock: a persistent collapse in asset prices (housing and business equity)
- Question: does a reduction in the capital ratio after a bad shock help to maintain economic activity?

Counter-cyclical Adjustment of CR



...High CR: Trade-Off: (+) mitigates $\downarrow$ Credit supply; (-) $\uparrow$ Bank default & Cost of funds

$\Rightarrow$ Overall: Margin for Policy Improvement!

...LOW CR: Shocks hit economy with Poorly Capitalized Banks: small (+) effect in short run BUT large (-) effect in the medium/long run effect!

Summary

- **We have developed a macroeconomic model in which banks and borrower default take center stage**
- **Steady state effects of capital requirements**
  - eliminate bank default and the limited liability subsidy
  - reduction in over-borrowing and over-investment
  - less dead-weight costs of default
- **Capital requirements and shock propagation**
  - shock propagation and amplification is very large when bank risk is high and/or bank capital is low
  - high capital requirements eliminate the extra shock propagation coming from bank defaults
- **Countercyclical response**
  - only beneficial when high capital requirements!

Conclusions

- **We have developed a macroeconomic model that:**
  - features costs and benefits of macroprudential policy
  - introduces financial instability in macro

- **$\Longrightarrow$ policy tool at the ECB**
  $\Longrightarrow$ available to NCBs

Backup Slides

Baseline Parameters Setting

Household Preference parameters

Description	Parameter	Value
Household Preferences		
Patient Household discount factor	β^s	0.995
Impatient Household discount factor	β^m	0.98
Patient Household utility weight on housing	v^s	0.25
Impatient Household utility weight on housing	v^m	0.25
Patient Household marginal disutility of labour	ϱ^s	1.0
Impatient Household marginal disutility of labour	ϱ^m	1.0
Habit persistence parameter	ψ	0.0
Variance of household idiosyncratic shocks	σ^2_m	0.08
Household bankruptcy cost	μ^m	0.3

Baseline Calibration

Entrepreneurial sector parameters

Description	Parameter	Value
Entrepreneurs		
Dividend payout ratio of entrepreneurs	χ^e	0.05
Variance of entrepreneurial idiosyncratic shocks	σ_e^2	0.12
Entrepreneur bankruptcy cost	μ^e	0.3

Baseline Calibration

Banking sector parameters

Description	Parameter	Value
Bankers		
Depositor cost of bank default	γ	0.1
Dividend payout ratio of bankers	χ^e	0.05
Variance of corporate bank idiosyncratic shocks	σ_F^2	0.0238
Variance of mortgage bank idiosyncratic shocks	σ_H^2	0.0119
Capital requirement for corporate loans	ϕ^F	0.08
Capital requirement for mortgages	ϕ^M	0.04
Corporate bank bankruptcy cost	μ^F	0.3
Mortgage bank bankruptcy cost	μ^H	0.3

Baseline Calibration

Production parameters

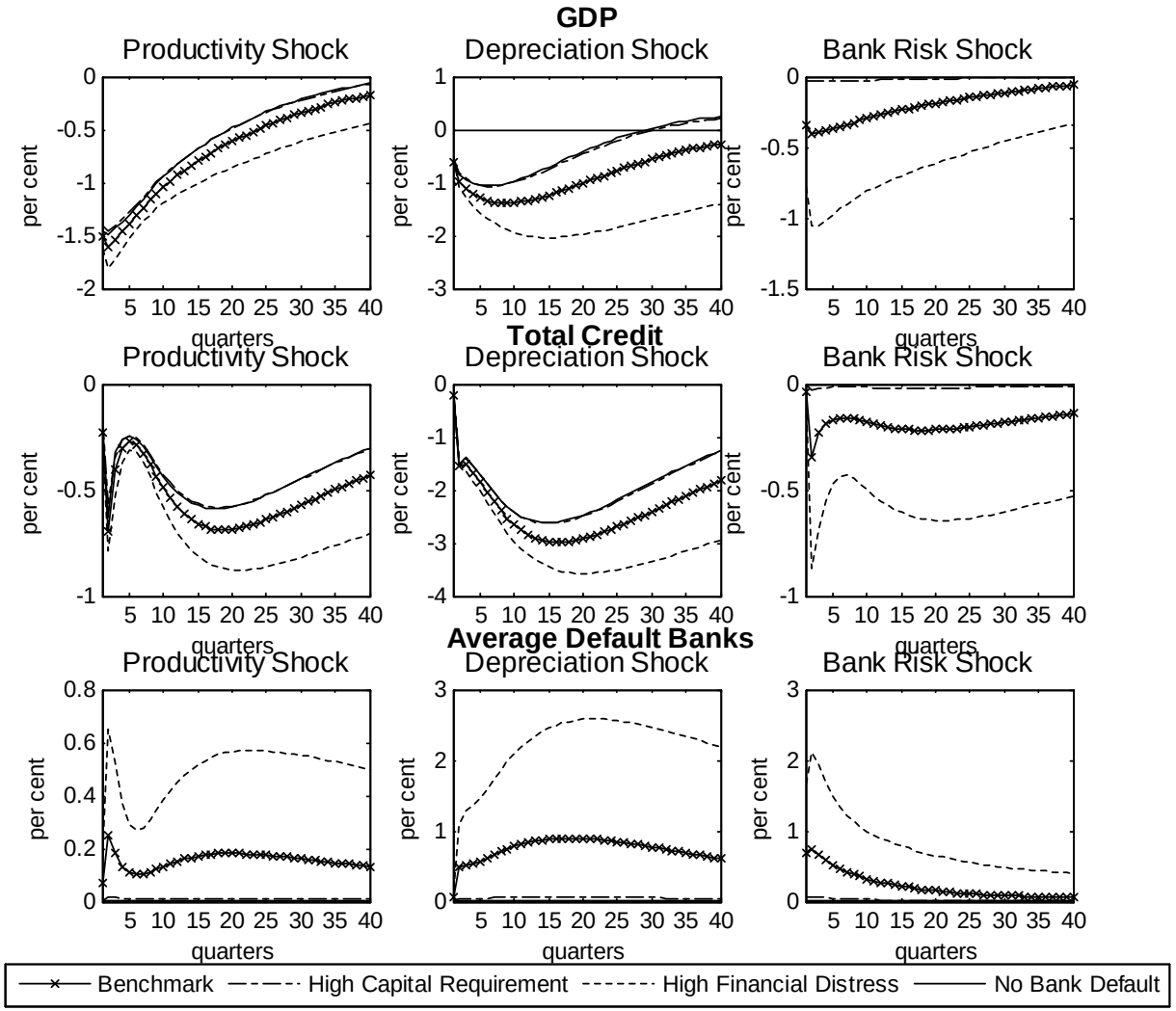
Description	Parameter	Value
Production parameters		
Capital share	α	0.30
Capital depreciation rate	δ^K	0.025
Capital adjustment cost parameter	ξ^K	2
Housing depreciation rate	δ^H	0.01
Housing adjustment cost parameter	ξ^H	2

Baseline Calibration

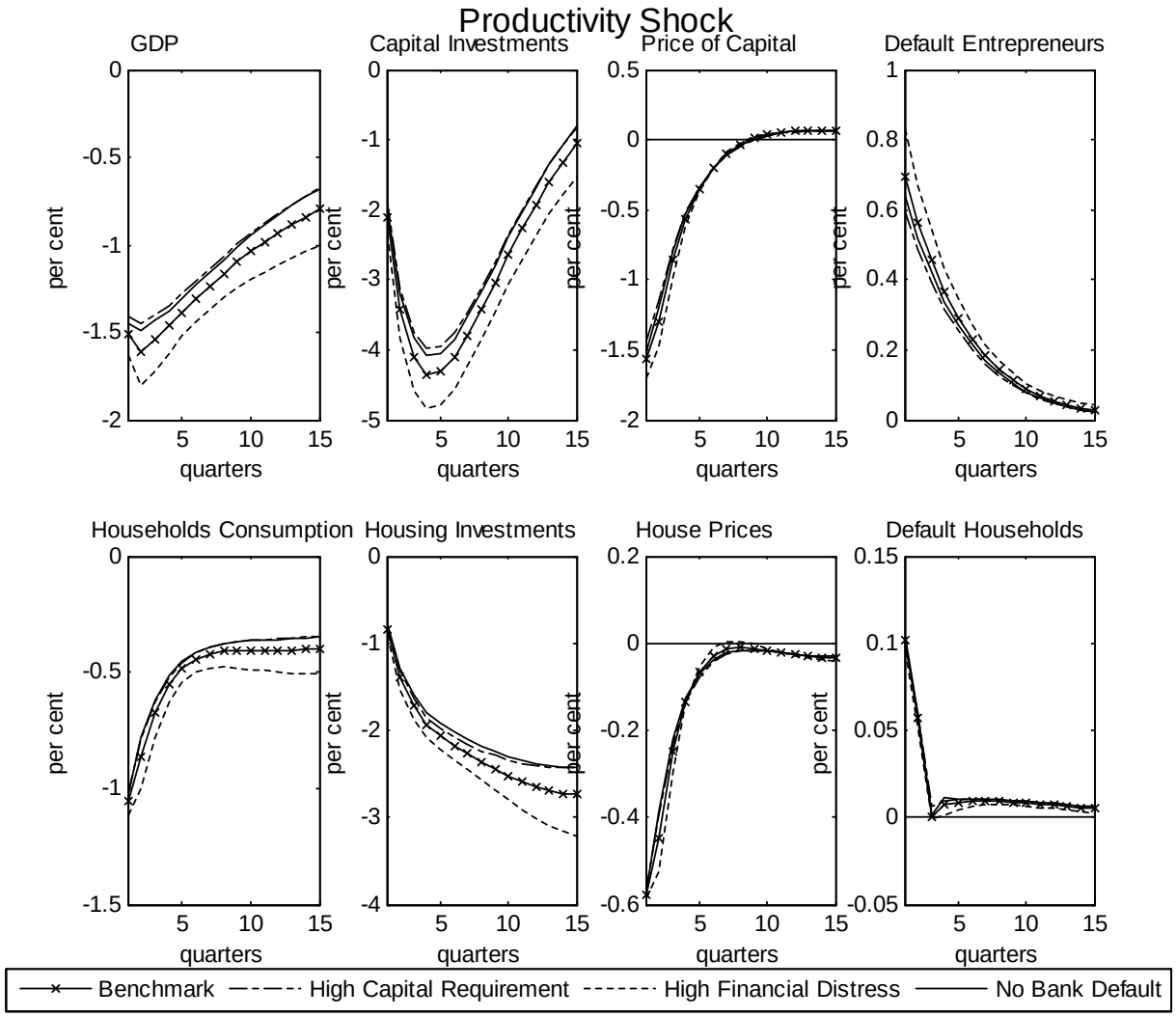
Shock processes

Description	Parameter	Value
Shock processes		
TFP shock persistence	ρ^A	0.9
Risk shock persistence	ρ^σ	0.9
Depreciation shock persistence	ρ^d	0.9
Housing demand persistence	ρ^D	0.9

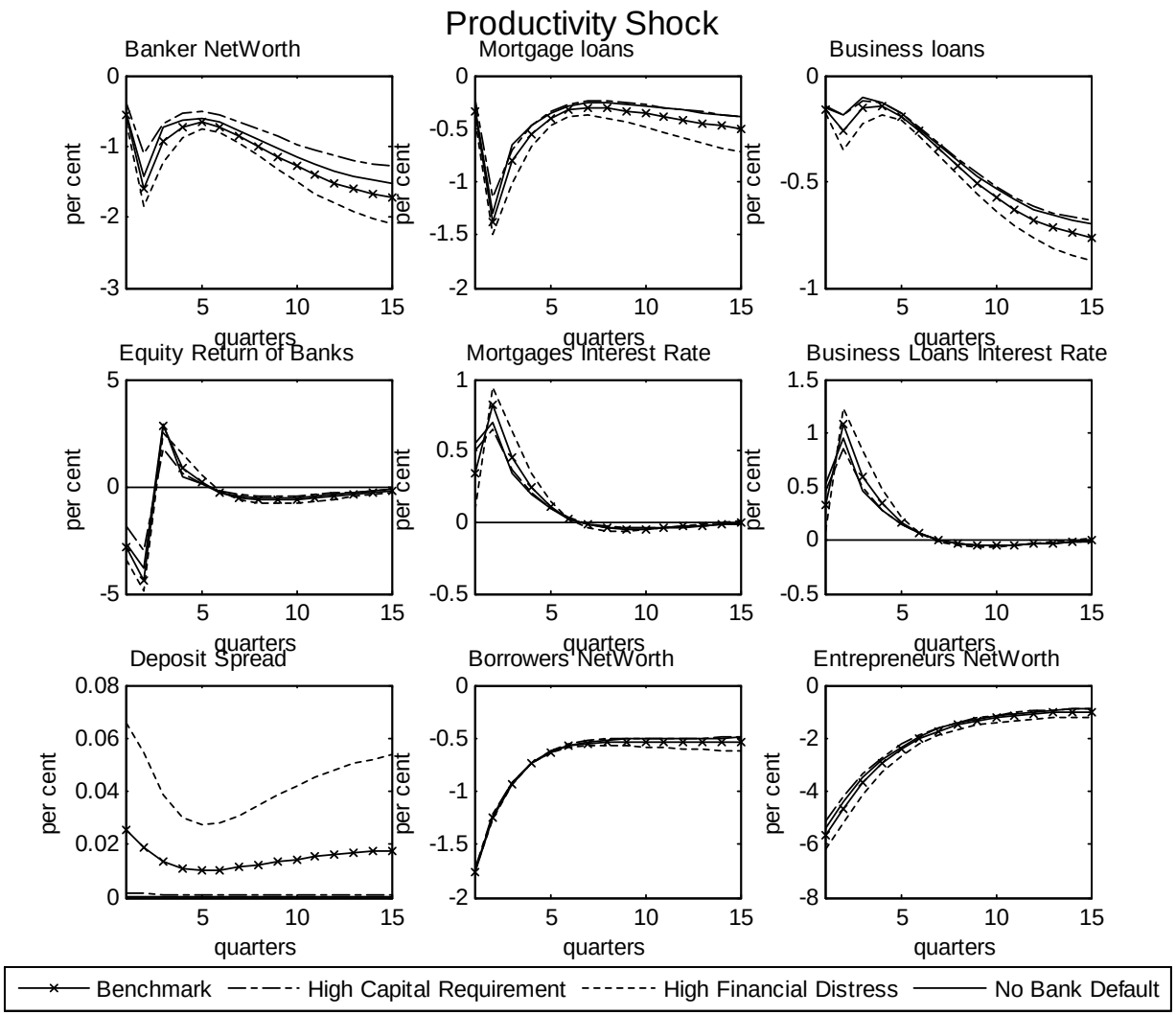
IRFs to Other shocks



IRFs: Productivity Shock



- Reduction in spending and production

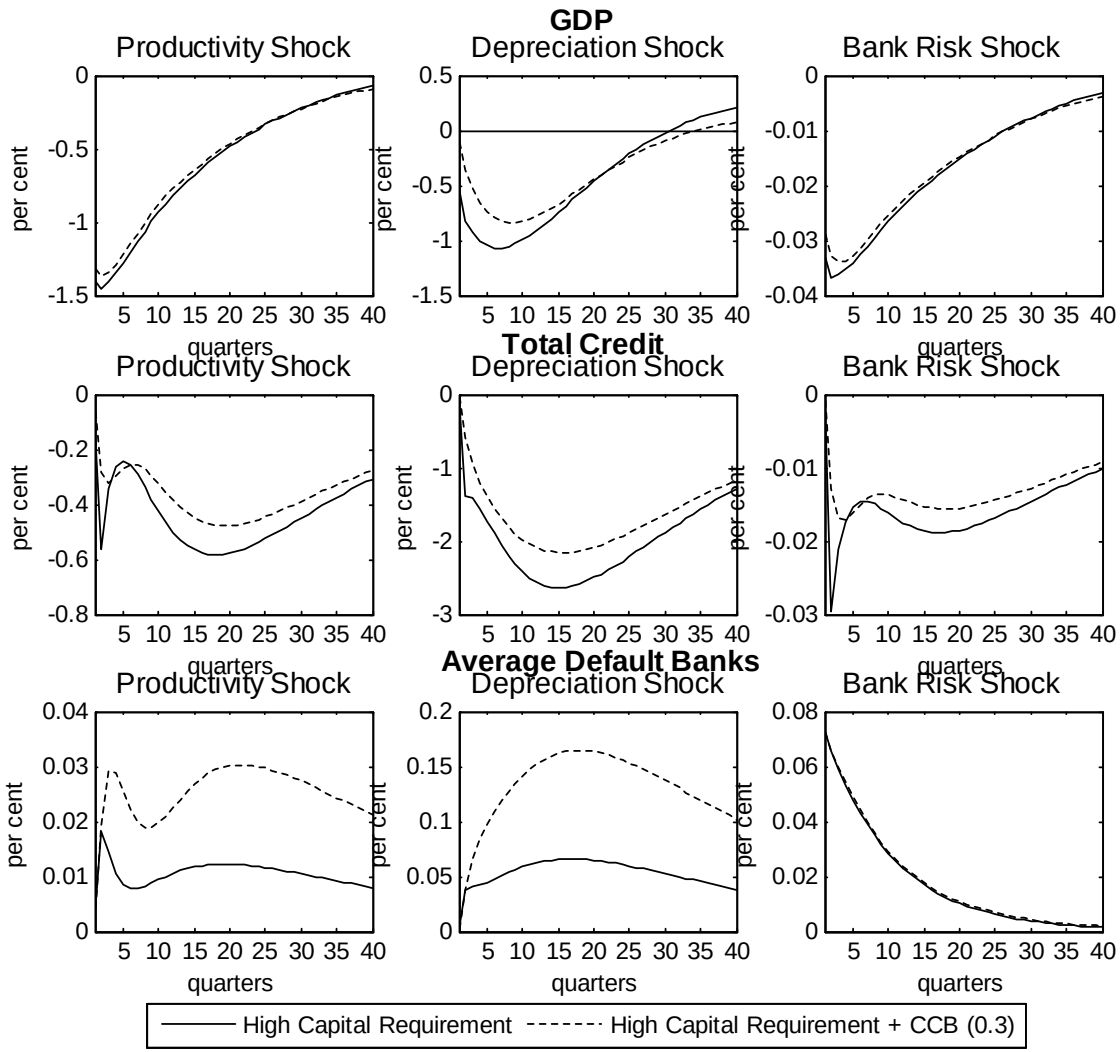


- $\uparrow$ Borrowers Default $\Longrightarrow$ $\downarrow$ Bank Capital $\Longrightarrow$

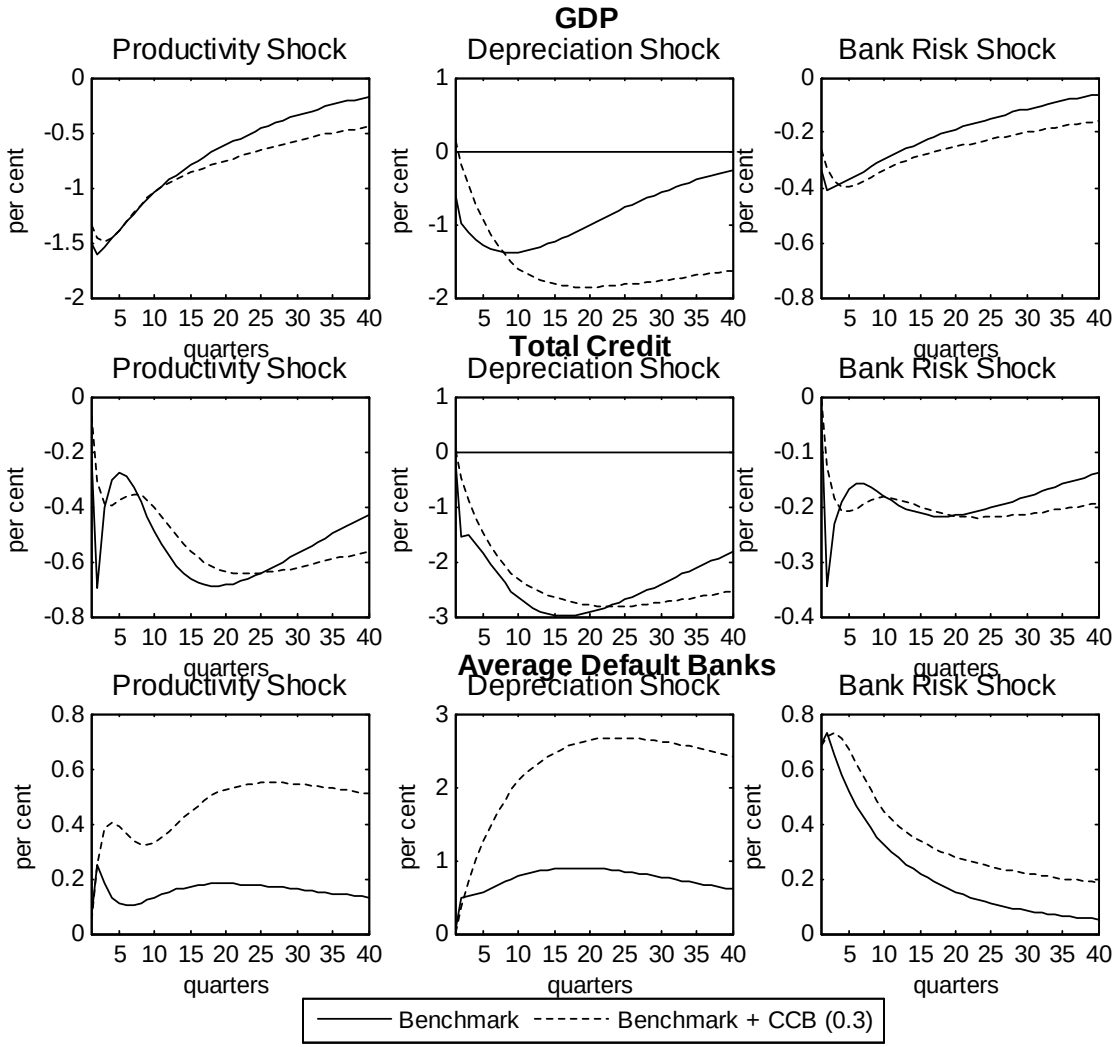
  A. Bank Capital Channel: $\downarrow$ Credit Supply

  B. Bank Funding Channel: $\uparrow$ Bank Default $\Longrightarrow$ $\uparrow$ Banks' funding cost $\Longrightarrow$ $\Uparrow$ loans rates

Counter-cyclical Adjustment of High Capital Requirements



Counter-cyclical Adjustment of Low Capital Requirements



Shocks hit economy with Poorly Capitalized Banks: small (+) effect in short run BUT

PAPER	OPTIMAL CAPITAL RATIO	GENERAL FRAMEWORK	BENEFITS OF CAPITAL	COSTS OF CAPITAL
Admati and Hellwig (2013)	20+%	Qualitative reasoning based on Modigliani-Miller type partial equilibrium models and corporate finance literature	General discussion of banks' ability to absorb losses, limiting their risk taking, preventing debt overhangs and the associated social benefits	General discussion rejecting reasons why bank capital is costly (banks can raise equity relatively freely)
Miles, Yang and Marcheggiano (2012)	16-20%	Range of partial equilibrium and ad hoc empirical estimates or models of social benefits and costs of bank equity	Reduced probability of banking crises and therefore their expected output costs	Increased average cost of bank funding and hence borrowing costs for firms and households
Martinez-Miera and Suarez (2012)	14%	Macroeconomic general equilibrium model with moral hazard for banks, for low capital ratios they invest in "correlated/bad" projects	Reduced implicit subsidies associated with deposit insurance, systemic risk taking and bank failures, leading to higher consumption	Reduced credit supply and output (banks cannot raise outside equity)
MaRs 3D	11%	Macroeconomic general equilibrium model with moral hazard for banks, for low capital ratios they generally lend at too low interest rates and therefore too much to firms and households	Reduced implicit subsidies associated with deposit insurance, over-lending and bank failures, leading to higher consumption	Reduced credit supply and output (banks cannot raise outside equity yet – extension of the model ongoing)