The Welfare Effects of Bank Liquidity and Capital Requirements

Skander Van den Heuvel*

Federal Reserve Board

FEDERAL RESERVE "DAY AHEAD" CONFERENCE ON FINANCIAL MARKETS AND INSTITUTIONS

Federal Reserve Bank of Atlanta, January 3, 2019

* *The views expressed here do not necessarily represent the views of the Federal Reserve Board or its staff.*

Introduction

Financial crisis spurred crucial regulatory reforms, including Basel III.

- Stronger capital requirements
- New liquidity requirements

Goal: Make banks and the financial system safer, limiting negative externalities from bank failures.

Is it enough? Too much? There is an ongoing debate. E.g.

- Some favor much higher capital requirements (e.g. Admati and Hellwig)
- Others have argued for versions of "narrow banking" (e.g. Cochrane, Friedman)
    - Similar to a 100% liquidity requirement

Introduction

Debate in large part reflects disagreement about the existence and magnitude of social costs of capital and liquidity requirements.

Possible cost – reduced (net) liquidity creation.

Key idea: High-quality liquid assets are in limited supply and have important alternative uses.

- E.g. Krishnamurthy and Vissing-Jorgenson (2012), Greenwood, Hanson and Stein (2015).

Introduction

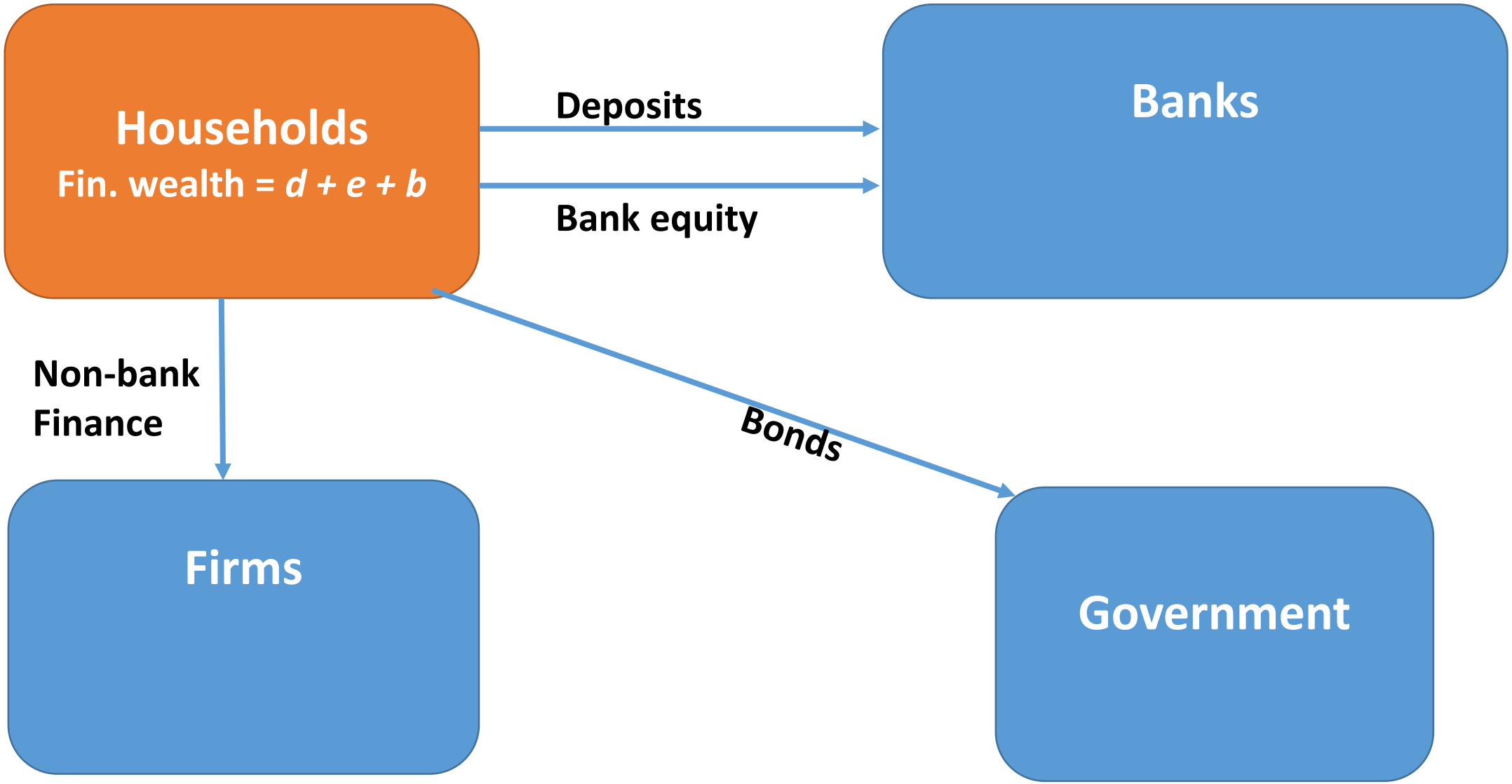
This paper –

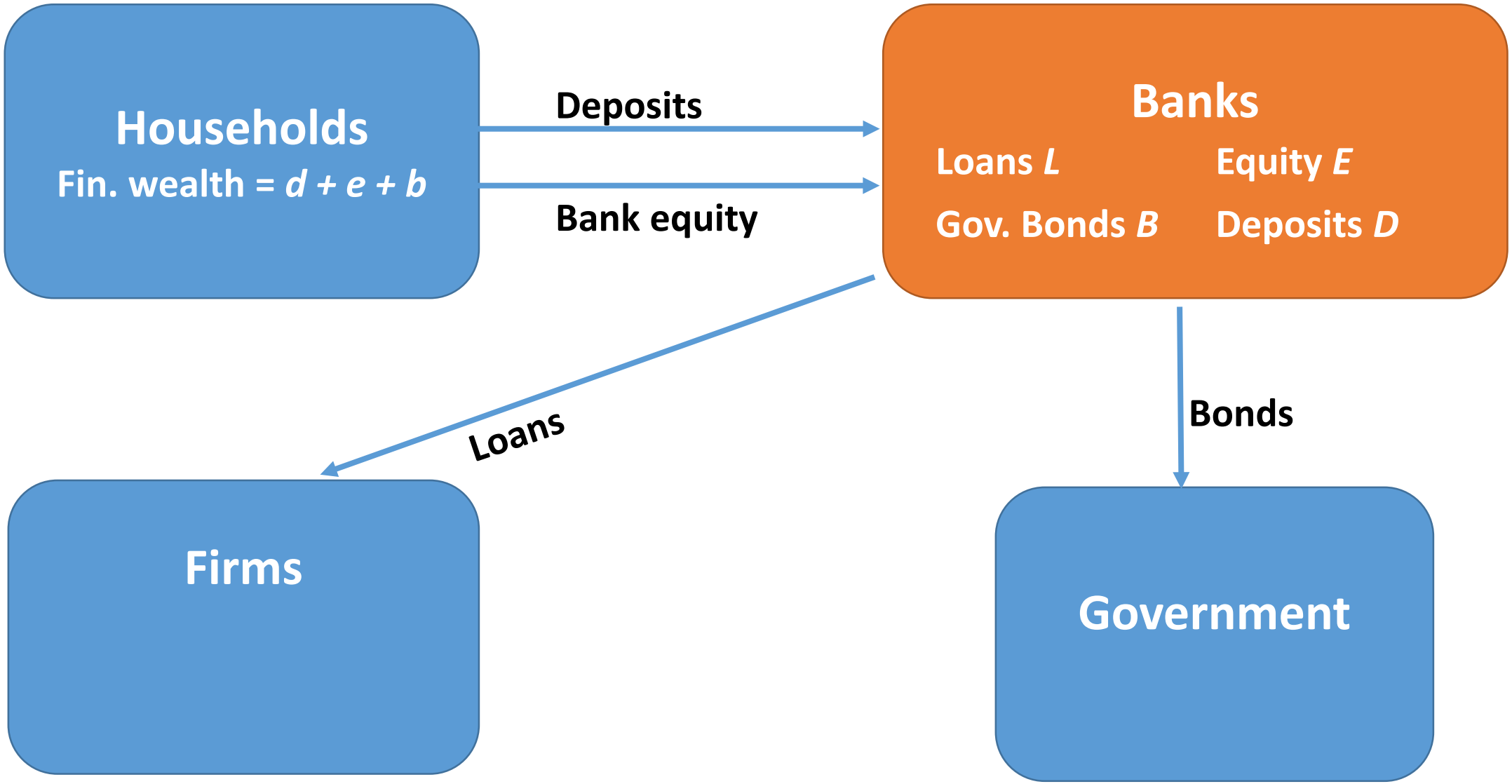
- Examines the welfare costs and benefits of:
  - bank liquidity requirements and
  - bank capital requirements
- Quantifies their welfare costs through a sufficient statistics approach.

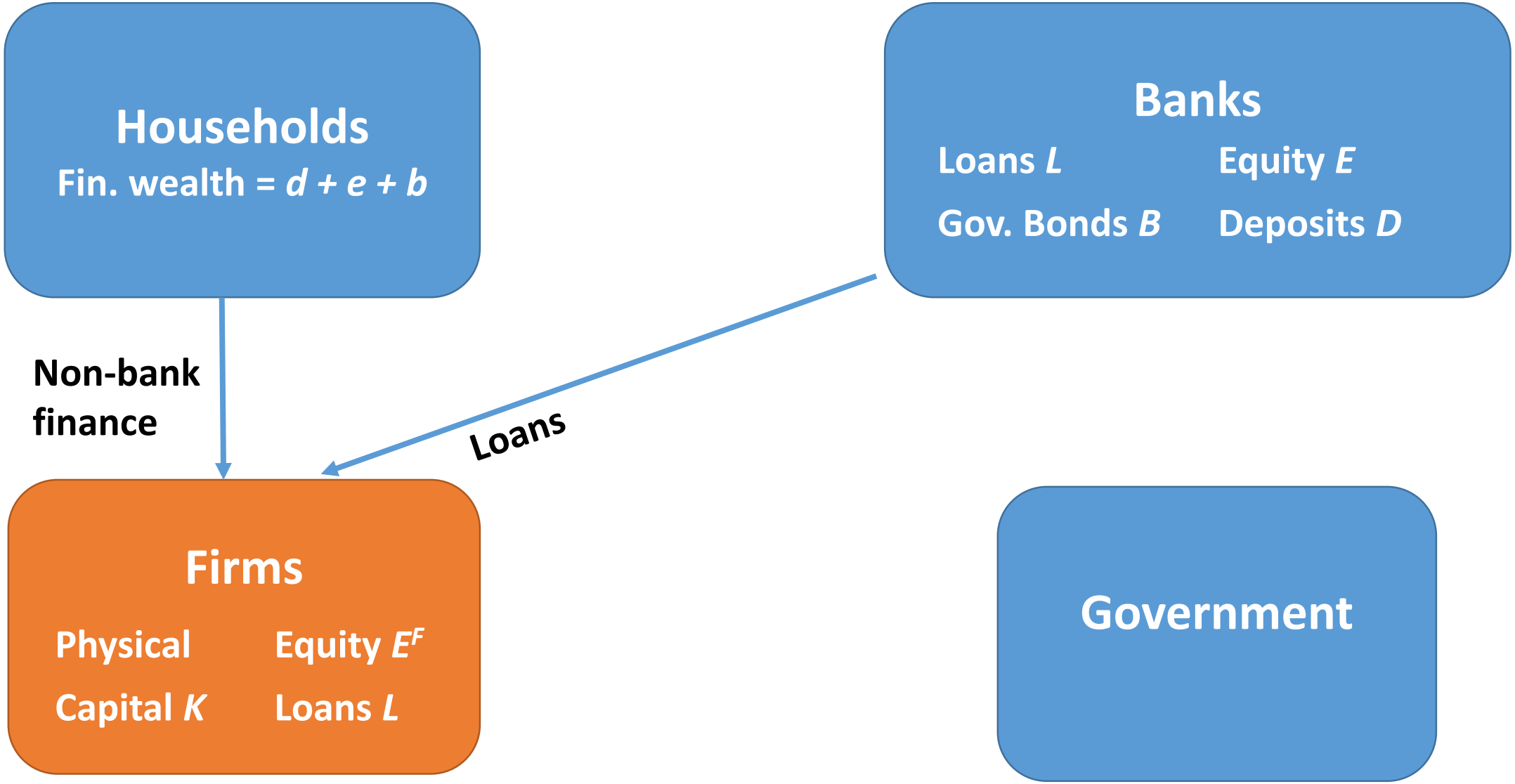
Quantitative general equilibrium analysis

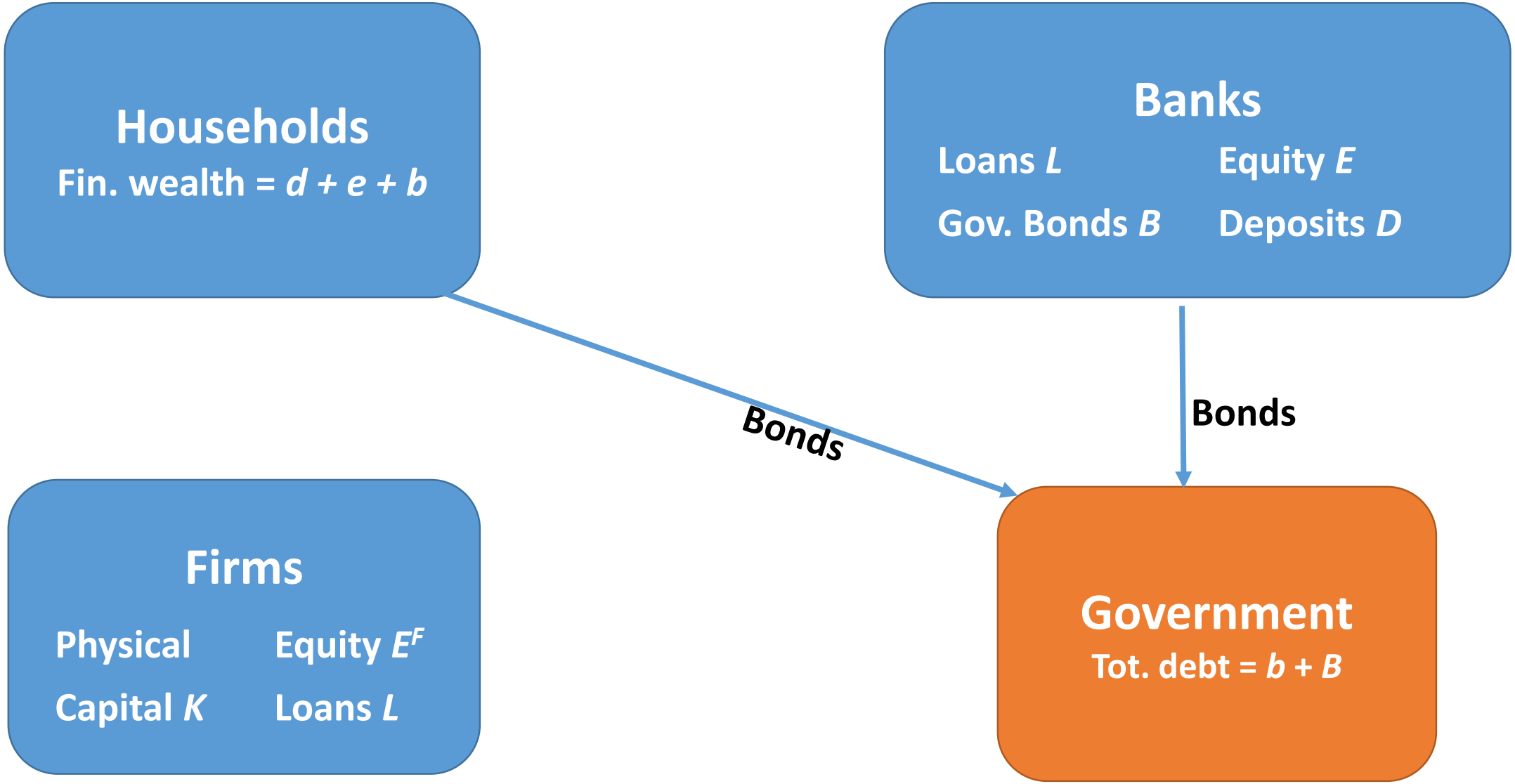
- Extends previous work on capital requirements
  (Van den Heuvel, 2008)

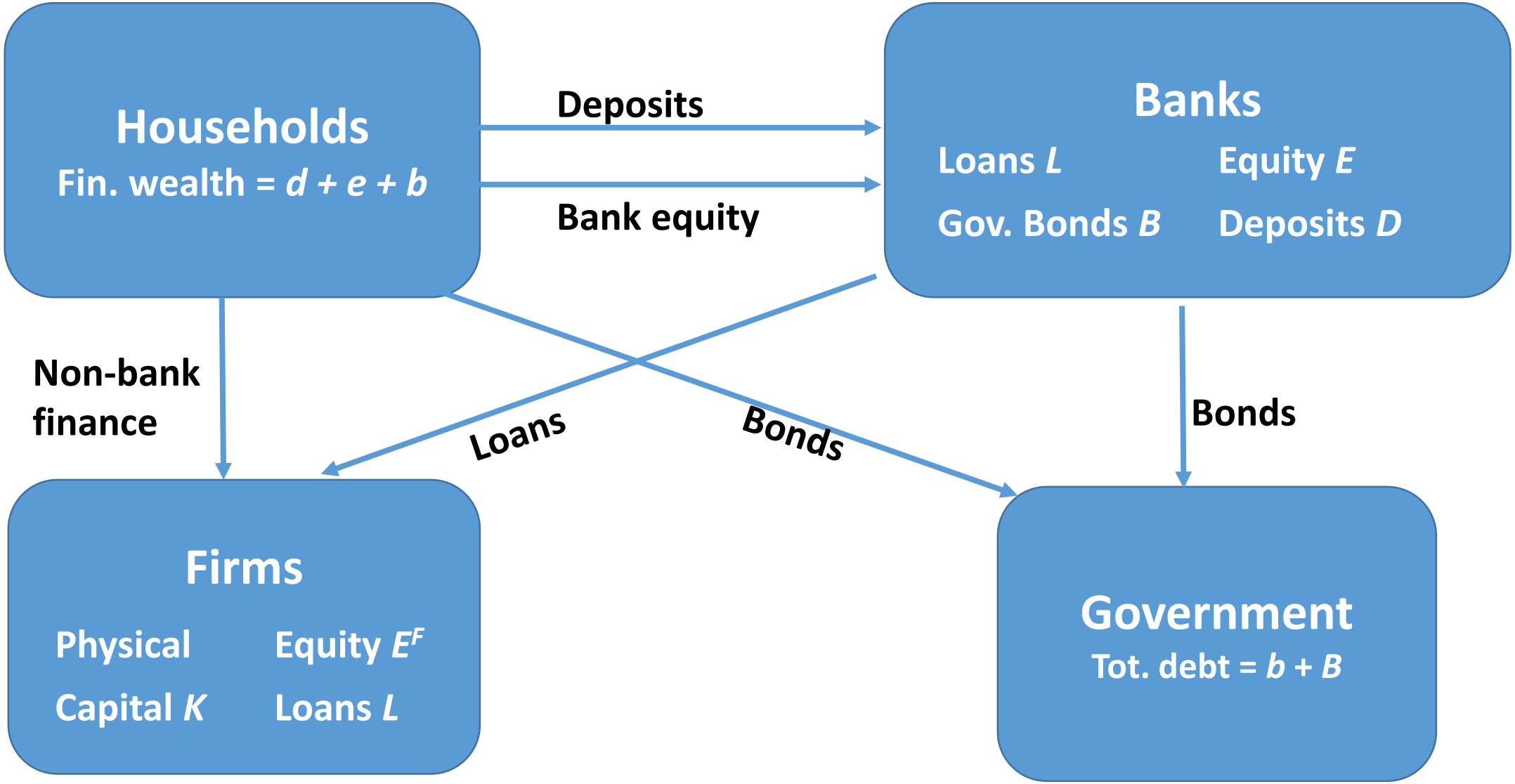
1. Basic Model


Households
Fin. wealth = d + e + b
Deposits
Bank equity
Banks
Non-bank
Finance
Bonds
Firms
Government


Households
Fin. wealth = d + e + b
Deposits
Bank equity
Banks
Loans L
Equity E
Gov. Bonds B
Deposits D
Loans
Bonds
Firms
Government


Households
Fin. wealth = d + e + b
Banks
Loans L
Equity E
Gov. Bonds B
Deposits D
Non-bank finance
Loans
Firms
Physical Capital K
Equity E^F
Loans L
Government


Households
Fin. wealth = d + e + b
Banks
Loans L
Equity E
Gov. Bonds B
Deposits D
Bonds
Bonds
Firms
Physical
Equity E^F
Capital K
Loans L
Government
Tot. debt = b + B


Households
Fin. wealth = d + e + b
Deposits
Bank equity
Banks
Loans L
Equity E
Gov. Bonds B
Deposits D
Non-bank finance
Loans
Bonds
Bonds
Firms
Physical Capital K
Equity E^F
Loans L
Government
Tot. debt = b + B

Households

Households value liquidity:

$$u(c,d,b)$$

- Derived utility function; Feenstra (1985).
- Increasing and concave
- Flexibility will let the data speak

Households

Infinite horizon, no aggregate uncertainty → Perfect foresight problem.

$$\max_{\{c_t,d_t,e_t,b_t\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \beta^t u(c_t,d_t,b_t)$$

$$\text{s.t.} \quad d_{t+1}+b_{t+1}+e_{t+1}+c_t = w_t 1+R_t^D d_t+R_t^B b_t+R_t^E e_t-T_t$$

(*c*) $$R_t^E = \left(\beta u_c(c_t,d_t,b_t)/u_c(c_{t-1},d_{t-1},b_{t-1})\right)^{-1}$$

(*d*) $$R_t^E - R_t^D = \frac{u_d(c_t,d_t,b_t)}{u_c(c_t,d_t,b_t)}$$: convenience yield on deposits

(*b*) $$R_t^E - R_t^B = \frac{u_b(c_t,d_t,b_t)}{u_c(c_t,d_t,b_t)}$$: convenience yield on Treasuries

Banks

L_t Loans	D_t Deposits
B_t Bonds	E_t Equity

Liquidity Requirement: $B_t \geq \lambda D_t$

Capital Requirement: $E_t \geq \gamma L_t$ *(risk-based)*

Bank maximizes shareholder value.

- Competitive banking: R^L, R^B, R^D, R^E given

Banks: Moral Hazard and Benefits of Regulation

Additional assumptions to generate benefits of regulation:

Deposit Insurance / government guarantees

→ Moral hazard of excessive risk taking. Two risk choices:

1. Credit risk: excessively risky lending practices

2. Liquidity risk: insufficient liquid assets

Banks: Moral Hazard and Benefits of Regulation

Deposit Insurance / government guarantees

→ Moral hazard of excessive risk taking. Two risk choices:

1. ***Credit risk***: excessively risky lending practices

   Capital requirement solves this, together with bank supervision, through "skin-in-the-game".

$$\gamma \geq \phi_{\varepsilon} \bar{\sigma} / R^{E} \qquad \text{(IC1)}$$

   - $\bar{\sigma}$: ability of banks to hide excessively risky loans from supervision
   - Liquidity regulation does not ameliorate this problem.
     - Bank size is not fixed so increase in B does not imply a decrease in L.

Banks: Moral Hazard and Benefits of Regulation

Deposit Insurance / government guarantees

→ Moral hazard of excessive risk taking. Two risk choices:

2. ***Liquidity risk***: insufficient liquid assets
   - Small probability $(1-p)$ of liquidity stress: Fraction *w* of depositors withdraws early.
   - Liquidity stress results in bank failure if $B < wD$.
     - Bank goes into resolution with social costs that may exceed the private loss

Banks: Moral Hazard and Benefits of Regulation

Bank will choose a prudent liquidity risk profile ($B \geq wD$) if

$$\gamma\left(\frac{1-p}{p}\right) \geq (1-\gamma)\left(\frac{w}{1-w} - \frac{\lambda}{1-\lambda}\right)(R^D - R^B) \qquad \text{(IC2)}$$

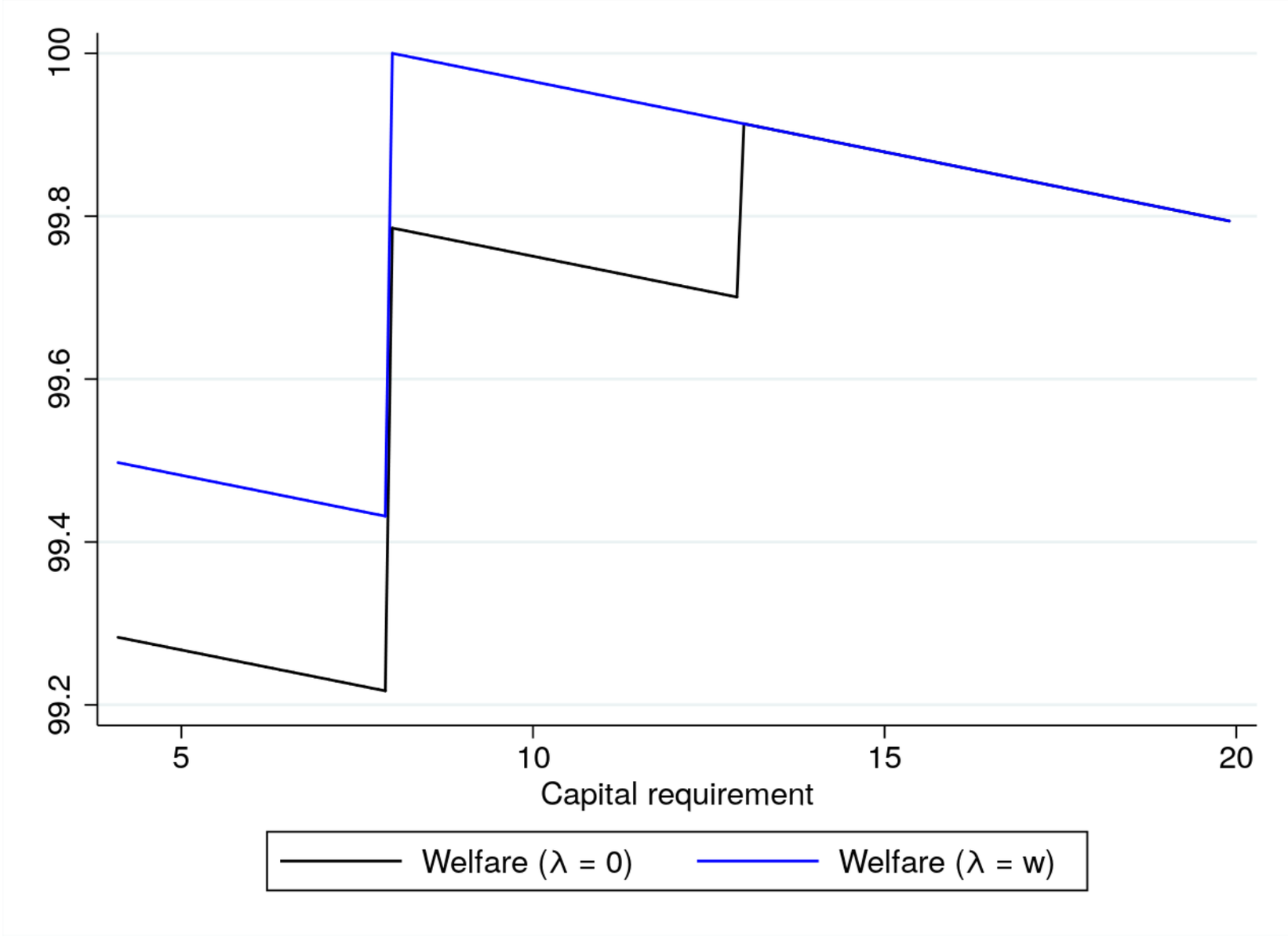
A sufficient condition is: $\lambda \geq w$.

Liquidity requirement and capital requirement can each mitigate the moral hazard of liquidity risk, but the liquidity requirement is more direct and efficient.

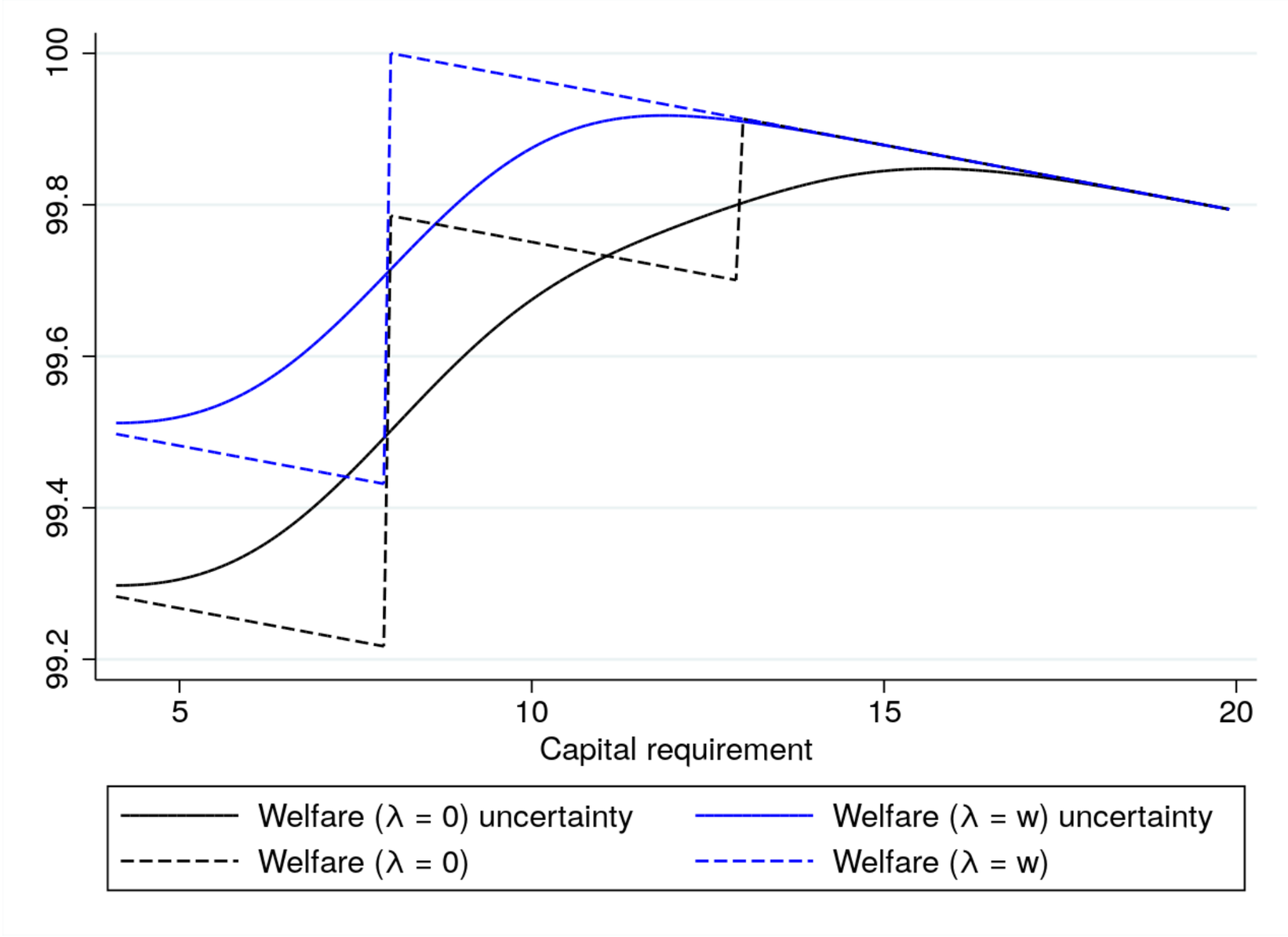
→ Division of Labor:

- Capital regulation for solvency risk
- Liquidity regulation for liquidity risk.

Banks: Illustration of welfare implications



Banks: Illustration of welfare implications



Summary of Bank's Problem (no excessive risk)

L_t	Loans	D_t	Deposits
$B_t \geq \lambda D_t$	Bonds	$E_t \geq \gamma L_t$	Equity

All-in cost of funding loans with deposits:

$$\tilde{R}^D(\lambda) \equiv R^D + \frac{\lambda}{1-\lambda}(R^D - R^B)$$

With (IC1) and (IC2), solution's zero-profit condition:

$$R^L = \gamma R^E + (1-\gamma)\tilde{R}^D(\lambda)$$

A finite solution requires: $R^B \leq R^D \leq R^L \leq R^E$.

1. Liquidity requirements binds if and only if $R^B < R^D$ *(will be relaxed)*

2. Capital requirement binds if and only if $R^E > \tilde{R}^D(\lambda)$

Equilibrium with capital and liquidity regulation

- **Capital** requirement typically binds due to convenience yield on deposits.

- **Liquidity** requirement may or may not bind, depending on relative convenience yields of bank deposits and government bonds.

Equilibrium with capital and liquidity regulation

- **Capital** requirement typically binds due to convenience yield on deposits.
- **Liquidity** requirement may or may not bind, depending on relative convenience yields of bank deposits and government bonds.
- **Investment** is affected by *both* the capital requirement and the liquidity requirement, if binding. ($R^L = \gamma R^E + (1-\gamma)\tilde{R}^D(\lambda)$).

Equilibrium with capital and liquidity regulation

- **Capital** requirement typically binds due to convenience yield on deposits.
- **Liquidity** requirement may or may not bind, depending on relative convenience yields of bank deposits and government bonds.
- **Investment** is affected by *both* the capital requirement and the liquidity requirement, if binding. ($R^L = \gamma R^E + (1-\gamma)\tilde{R}^D(\lambda)$).
- Introducing binding liquidity regulation leads **government bonds** to flow out of the nonbank sector, so their convenience yield $R^E - R^B$ rises.
- Adding a larger liquidity requirement → can lead to **disintermediation** **or** **non-bank intermediation**: *Shadow banking?*
    - More likely if the demand for safe, liquid assets is high relative to the supply.

2. Gross Welfare Cost of the Policy Tools

Welfare Cost of the *Liquidity* Requirement

If the economy is in steady state in the current period and IC1 and IC2 hold, then the marginal welfare cost of a permanent increase in λ is:

$$\nu_{LIQ} = \frac{d}{c}\left(R^D - R^B\right)(1-\lambda)^{-1}$$

- As a first-order approximation, the welfare loss from $\Delta\lambda$ is equivalent to a permanent relative loss in consumption of $\nu_{LIQ}\Delta\lambda$.
- Takes into account gains and losses associated with move to a new steady state.
- Revealed preference logic + competitive banking.

Welfare Cost of the *Capital* Requirement

Under the same assumptions, the marginal welfare cost of a permanent increase in γ is:

$$\nu_{CAP} = \frac{L}{c}\left(R^E - \tilde{R}^D(\lambda)\right)$$

Recall $\tilde{R}^D(\lambda) \equiv R^D + \frac{\lambda}{1-\lambda}(R^D - R^B)$

3. Costly Financial Intermediation

So far we have assumed that no resource costs are involved with financial intermediation.

- For 86-13, net noninterest costs are 1.3% of total assets.

Before measuring costs, extend model:

Bank pays noninterest cost: $g(D, L)$

g is increasing, convex, constant returns to scale.

Dividends = $\max(0, (R_t^L + \sigma_t \varepsilon) L_t + R_t^B B_t - R_t^D D_t - g(D_t, L_t))$

Gross Welfare Costs with Costly Intermediation

Marginal welfare costs of increasing λ and γ with costly financial intermediation:

$$\nu_{LIQ} = \frac{d}{c}\left(R^D + g_D(d,L) - R^B\right)(1-\lambda)^{-1}$$

$$\nu_{CAP} = \frac{L}{c}\left(R^E - \tilde{R}^D(\lambda) - (1-\lambda)^{-1} g_D(d,L)\right)$$

4. Measurement of the Welfare Cost

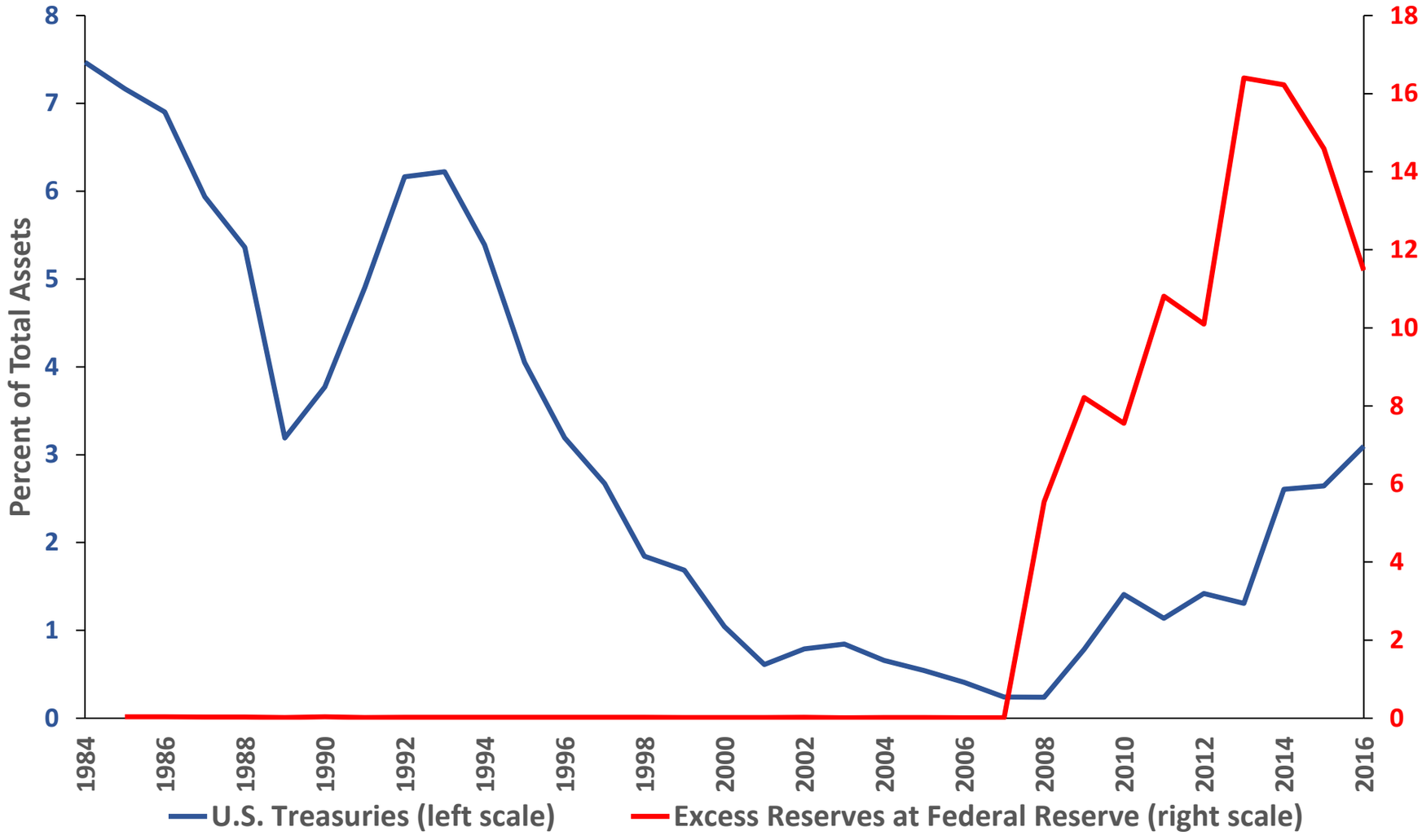
Historical Statistics on Banking - U.S. commercial banks (1986 – 2016).

- From 1986-2000, Treasuries/Assets exceed 1 percent → Use this period to estimate g_D through the condition: $R^B = R^D + g_D$ → $g_D = 1.22\%$

- Alternative estimate based Hanson, Schleifer, Stein, Vishny (2015): $g_D = 0.81\%$

- Use 2001-2007 to estimate average returns and ratios.
  - Treasuries < 1% of assets
  - Provides an estimate of the cost of a liquidity requirement for a period when it would likely have been binding.
  - Current environment: high level of reserves could reflect phase-in of LCR, or could mean that a modest liquidity requirement entails little *immediate* economic costs.

U.S. Treasuries and excess reserves held by U.S. depository institutions



Note: For years 1984-1988, U.S. Treasuries data is for commercial banks only. Starting in 1989, U.S. Treasuries series includes both commercial banks and savings institutions. Source: FDIC Historical Statistics on Banking and Federal Reserve H.3 Release.

Measurement of the Welfare Cost: Liquidity

d = Total Deposits $\quad d/c = 0.67$

c = Personal Consumption Expenditures

R^D = (Interest on Total Deposits) / (Total Deposits) $= 2.04\%$

Including marginal noninterest cost: $R^D + g_D$ $= 3.26\%$

R^B = 3-month Treasury yield $= 2.80\%$

λ = liquidity requirement $= 0$

$$\nu_{LIQ} = \frac{d}{c}\left(R^D + g_D - R^B\right)(1-\lambda)^{-1}$$
$$= 0.67 \times (0.0326 - 0.0280) \times 1 = \boxed{0.0031}$$

Measurement of the Welfare Cost: Liquidity

Interpretation of $\nu_{LIQ} = 0.003$.

- The gross welfare cost of imposing a 10 percent liquidity requirement is equivalent to a **permanent loss in consumption of** $\nu_{LIQ} \times 0.1 \times 100\% = \mathbf{0.031\%}$.

- About $3.5 billion per year.

- With HSSV-based estimate ($g_D = 0.81\%$): welfare cost = **0.003%.**

Measurement of the Welfare Cost: Capital

A risk-adjusted measure of the required return on equity is needed.

I use the required return on **subordinated bank debt**.

- Sub-debt counts towards regulatory capital, within certain limits.
- Defaults on bank sub-debt have been rare.

Limits:

- Part of tier 2 capital
- Until recently, limited to at most 50% of tier 1 capital.
- Same tax treatment as deposits

The required return on sub-debt may be less than the risk-adjusted pre-tax required return on regular bank equity.

→ conservative measure.

Measurement of the Welfare Cost: Capital

Sample: 1993-2010

L = Total Assets – (Treasuries + Ex. Reserves) $L/c = 0.96$

c = Personal Consumption Expenditures

R^E = (Interest on Subordinated debt) / (Sub-debt) $= 5.45\%$

R^D = (Interest on Total Deposits) / (Total Deposits) $= 2.43\%$

Including marginal noninterest cost: $R^D + g_D$ $= 3.65\%$

$$\nu_{CAP} = \frac{L}{c}\left(R^E - (R^D + g_D)\right)(1-\lambda)^{-1}$$

$$= 0.96 \times 0.0180 \times (1-0)^{-1} = \boxed{0.017}$$

Measurement of the Welfare Cost: Capital

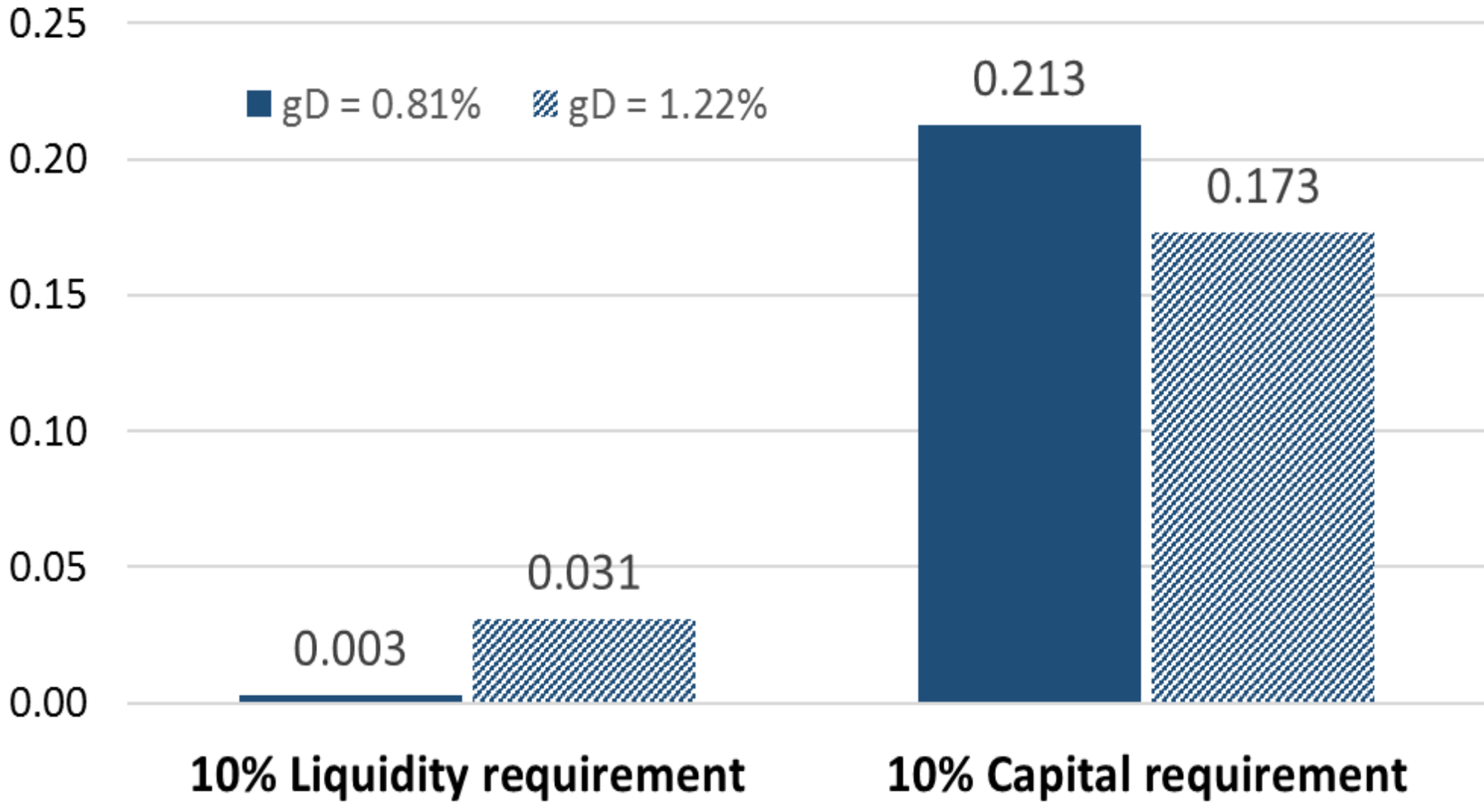
Interpretation of $\nu_{CAP} = 0.017$.

- The gross welfare cost of increasing capital requirements by 10 percentage points is equivalent to a **permanent loss in consumption of** $\nu \times 0.1 \times 100\% = \mathbf{0.17\%}$.

- About $20 billion per year.

- With HSSV-based estimate ($g_D = 0.81\%$): welfare cost = **$\mathbf{0.21\%}$.**

Measurement of the Welfare Cost: Summary



Conclusions

Liquidity and capital requirements reduce the ability of banks to create net liquidity in equilibrium and impact investment and economic activity.

- Cost of ***capital*** requirement scales with the ***convenience yield on bank deposits***
- Cost of ***liquidity*** requirement scales with the ***difference in the convenience yields on HQLA assets and on bank deposits*** (adjusted for noninterest costs)

Quantitative result: Welfare cost of liquidity requirement is modest and much lower than the welfare cost of similarly-sized capital requirements.

Financial stability benefits of liquidity requirements are narrower than capital, yet liquidity regulation is part of the optimal policy mix → division of labor:

- Capital regulation addresses credit risk;
- Liquidity regulation addresses liquidity risk.