



# THREE STABILITY CONCEPTS

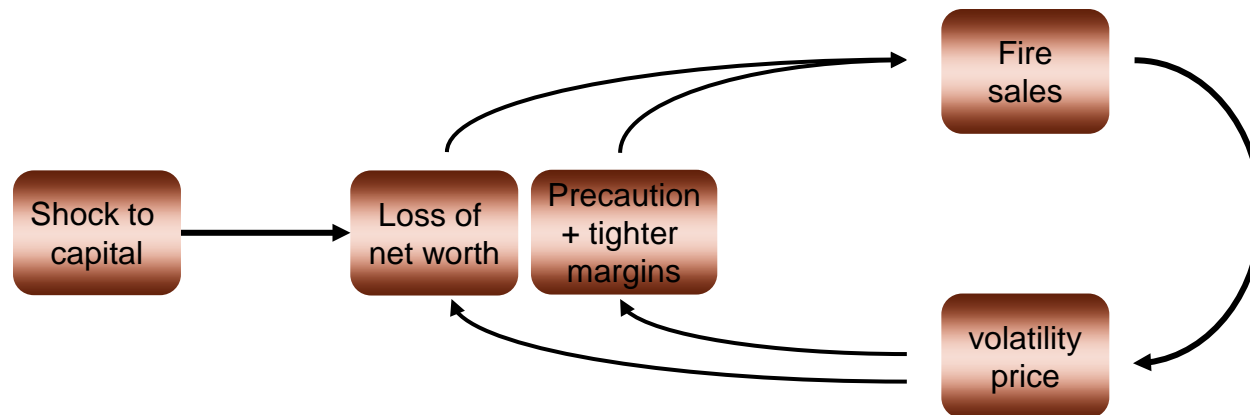
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Updates: [http://scholar.princeton.edu/markus/files/i\\_theory\\_slides.pdf](http://scholar.princeton.edu/markus/files/i_theory_slides.pdf)

# || The 2 Components of Systemic Risk

- Systemic **risk build-up** during (credit) bubble
  - “Volatility Paradox” → contemp. measures inappropriate
  - Financial innovation/liberalization → more systematic risk
- Spillovers/contagion – **externalities**
  - Direct contractual: domino effect (interconnectedness)
  - Indirect: price effect (fire-sale externalities)  
credit crunch, liquidity spirals



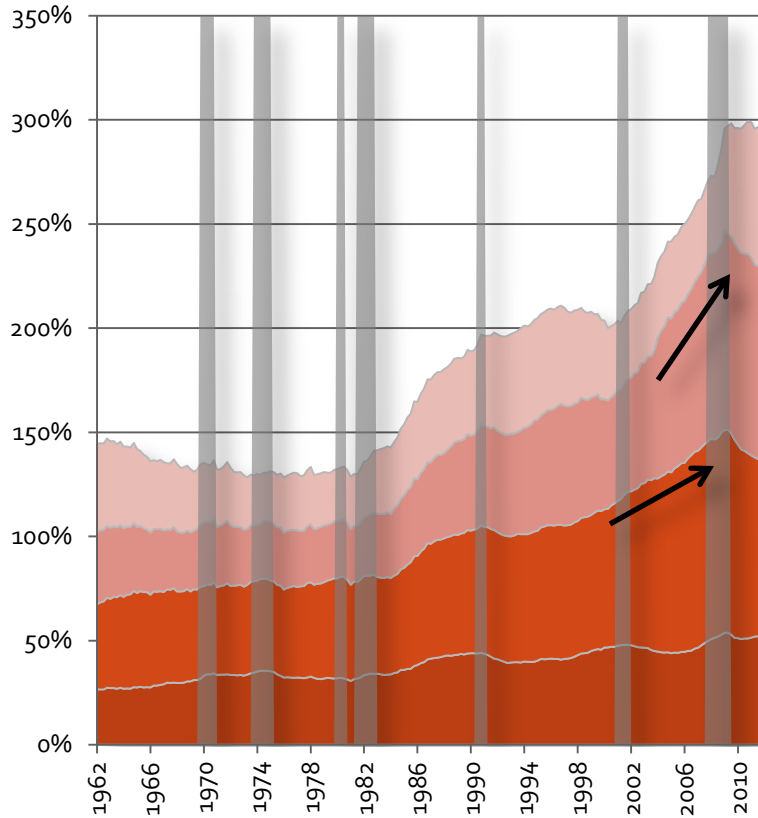
- *Adverse GE response* → systemic risk is endogenous

preventive

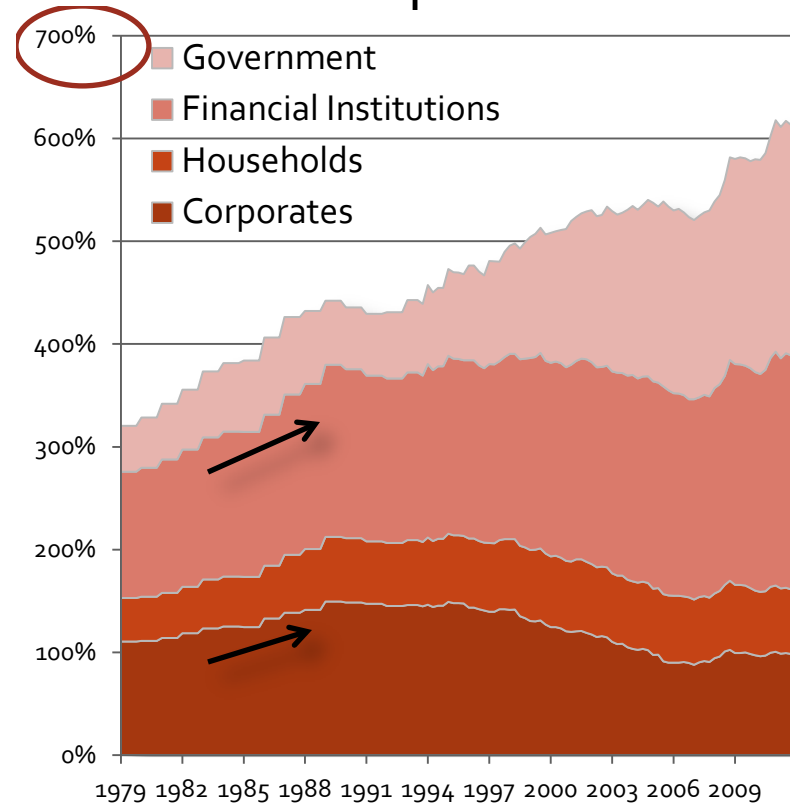
crisis management

# Run-ups of Debt – Different Sectors

## United States



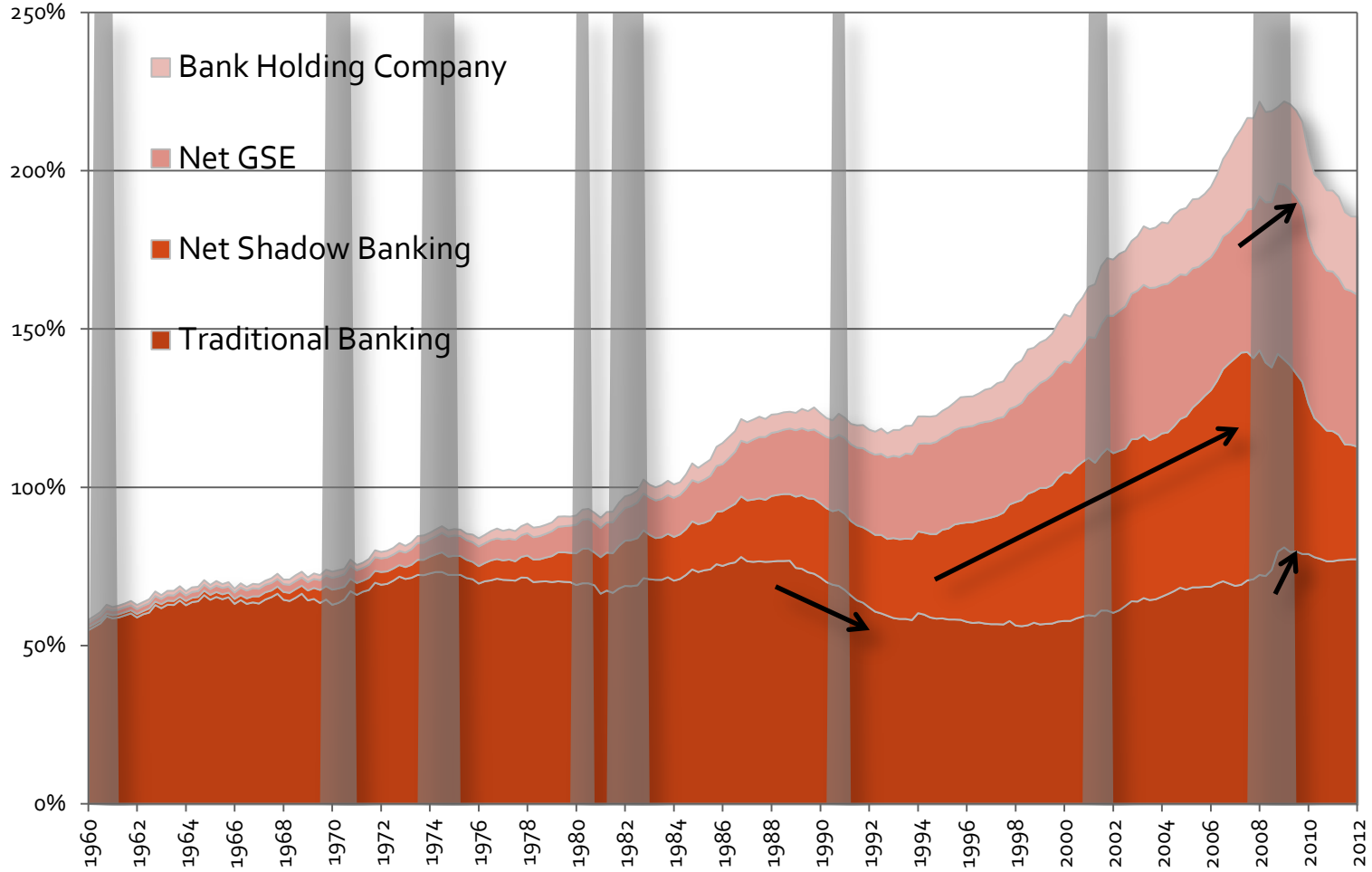
## Japan

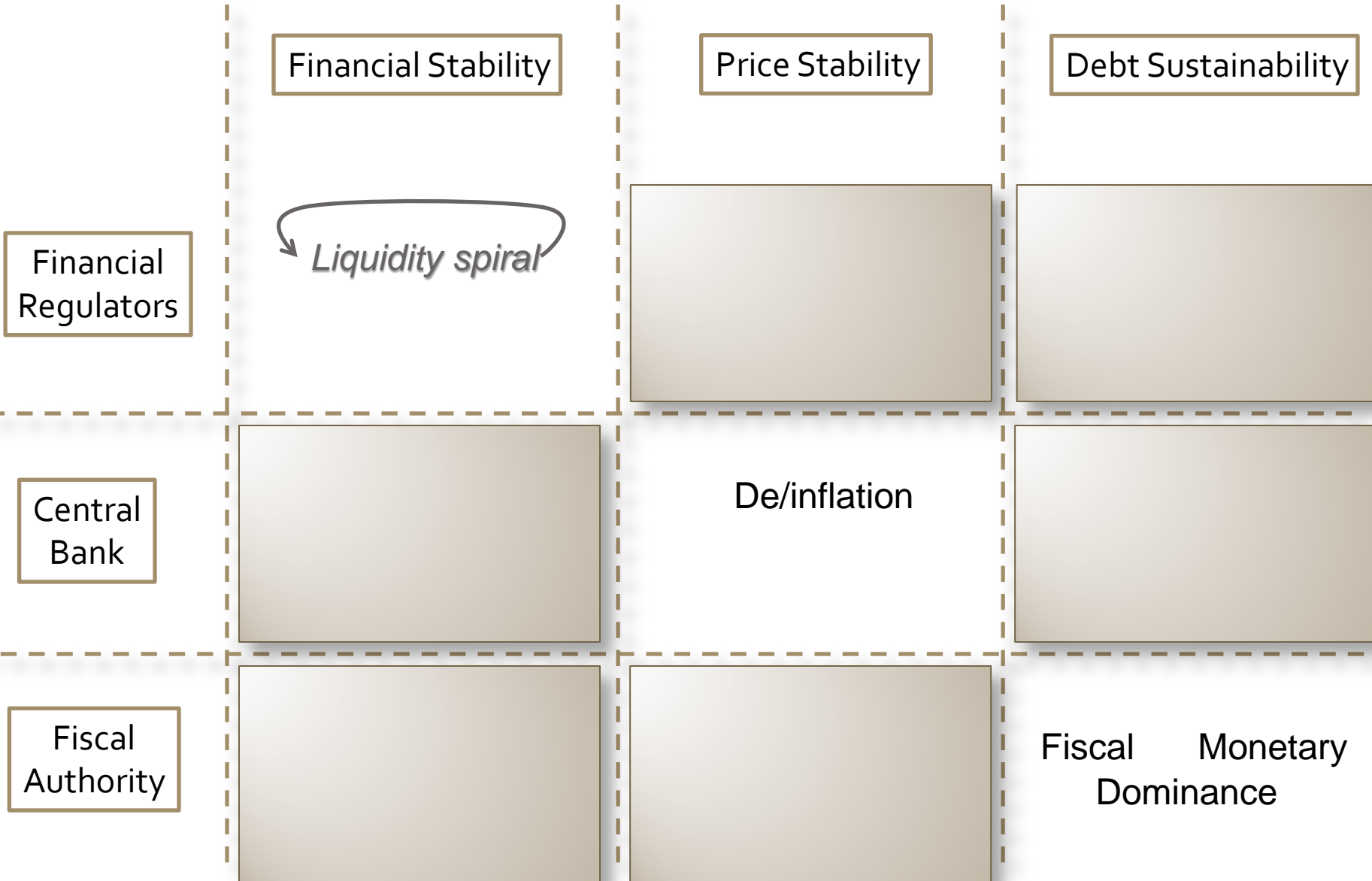


## ■ Different sectors

- Japan 1980s: non-fin. business sector + financial
- United States 2000s: household sector + financial

# U.S. Financial Sector Debt





# Liquidity Concepts

- Financial instability arises from the fragility of liquidity

A

L

## Technological liquidity

- Reversibility of investment

## Market liquidity

- Specificity of capital  
Price impact of capital sale

## Funding liquidity

- Maturity structure of debt
  - Can't roll over short term debt
- Sensitivity of margins
  - Margin-funding is recalled

Maturity mismatch

# Liquidity Mismatch

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~~Liquidity~~  
Maturity mismatch

- Liquidity mismatch index* = response indicator



# Risk Topography: Data collection

joint with Gary Gorton & Arvind Krishnamurthy

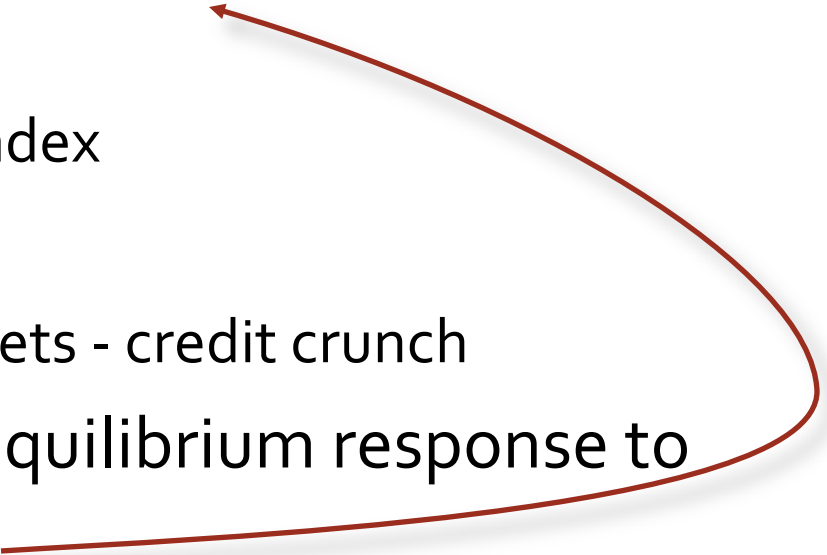
- **Direct** responses to 5%, 10%, 15%,... drop in factor to
  - $\Delta$ Value
  - $\Delta$ Liquidity Mismatch Index
- Predict response
  - hold out  $\longrightarrow$   $\Delta$ Value
  - "fire" sell assets  $\longrightarrow$   $\Delta$ LMI
  - credit crunch (no new loans)

~~Liquidity~~  
Maturity mismatch

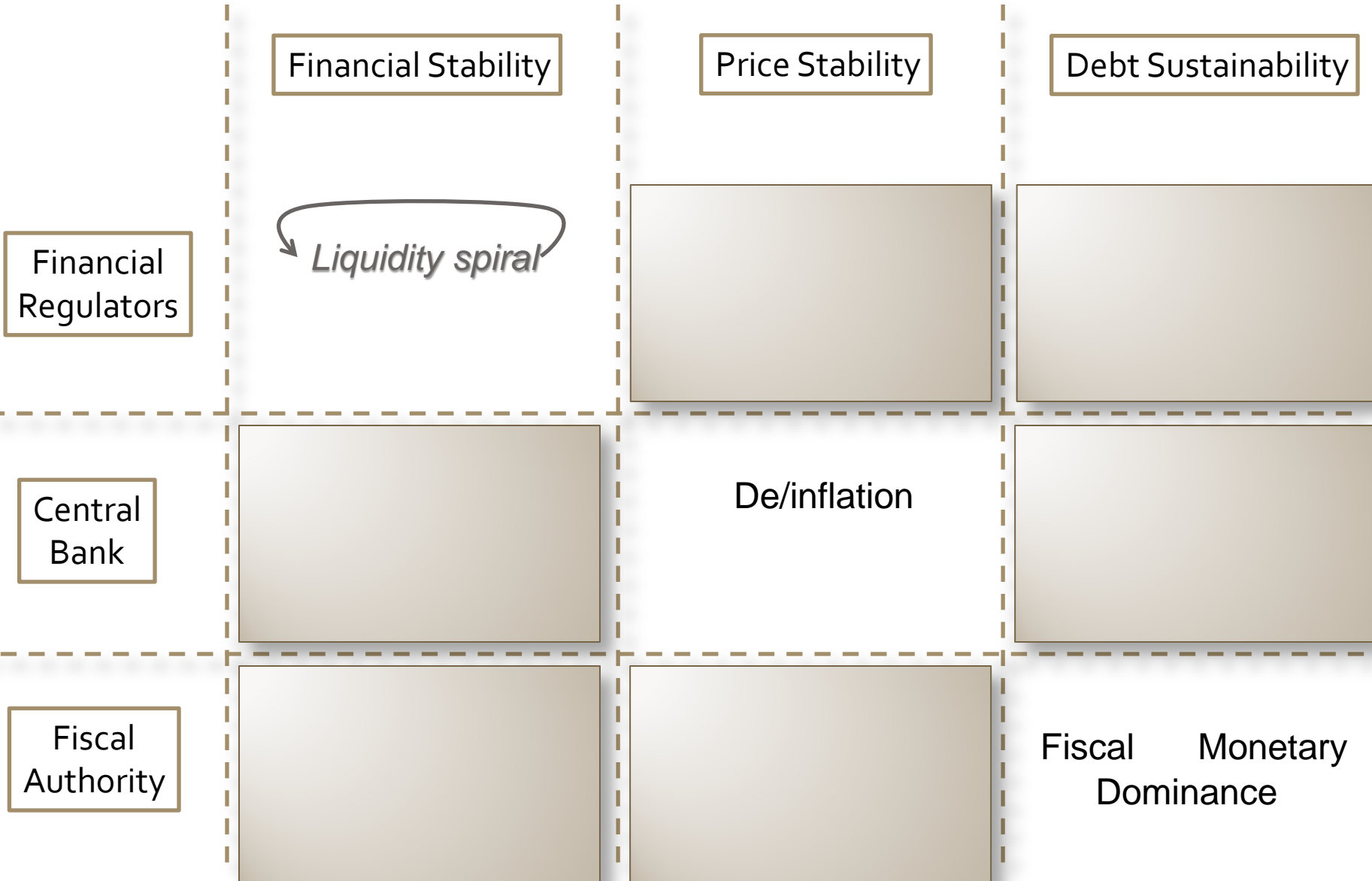


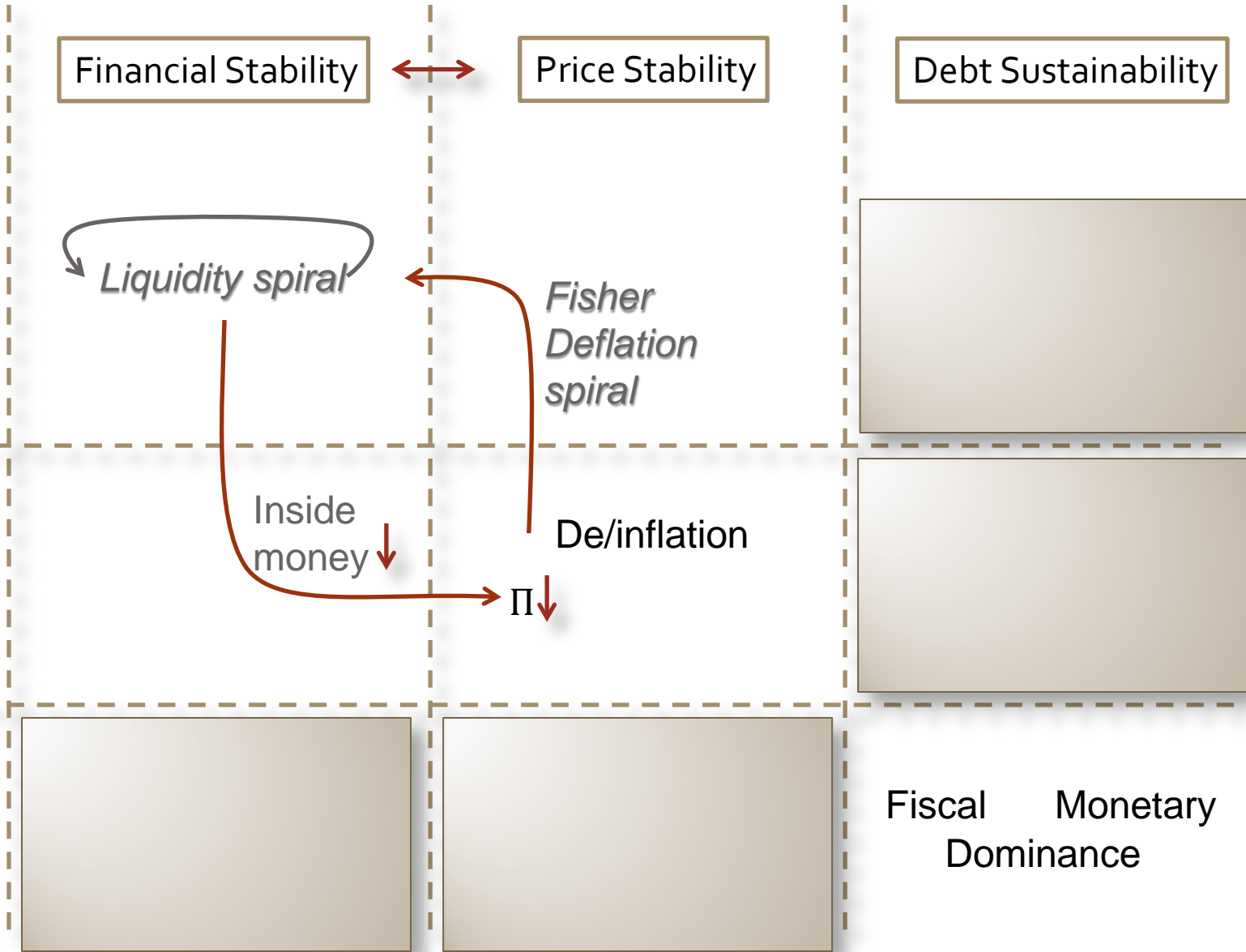
# || Risk Topography: General equilibrium

joint with Gary Gorton & Arvind Krishnamurthy

- **Direct** responses to 5%, 10%, 15%,... drop in factor to
    - $\Delta$ Value
    - $\Delta$ Liquidity Mismatch Index
  - Predict response
    - hold out - "fire" sell assets - credit crunch
  - Derive likely **indirect** equilibrium response to
    - this stress factor
    - other factors
- 

*Find out whether plans were mutually consistent!*  
(if not → tail risk)





Fiscal    Monetary  
Dominance

# || Main results

- Passive monetary policy

A	L
□ Liquidity Spirals	□ Disinflationary spiral

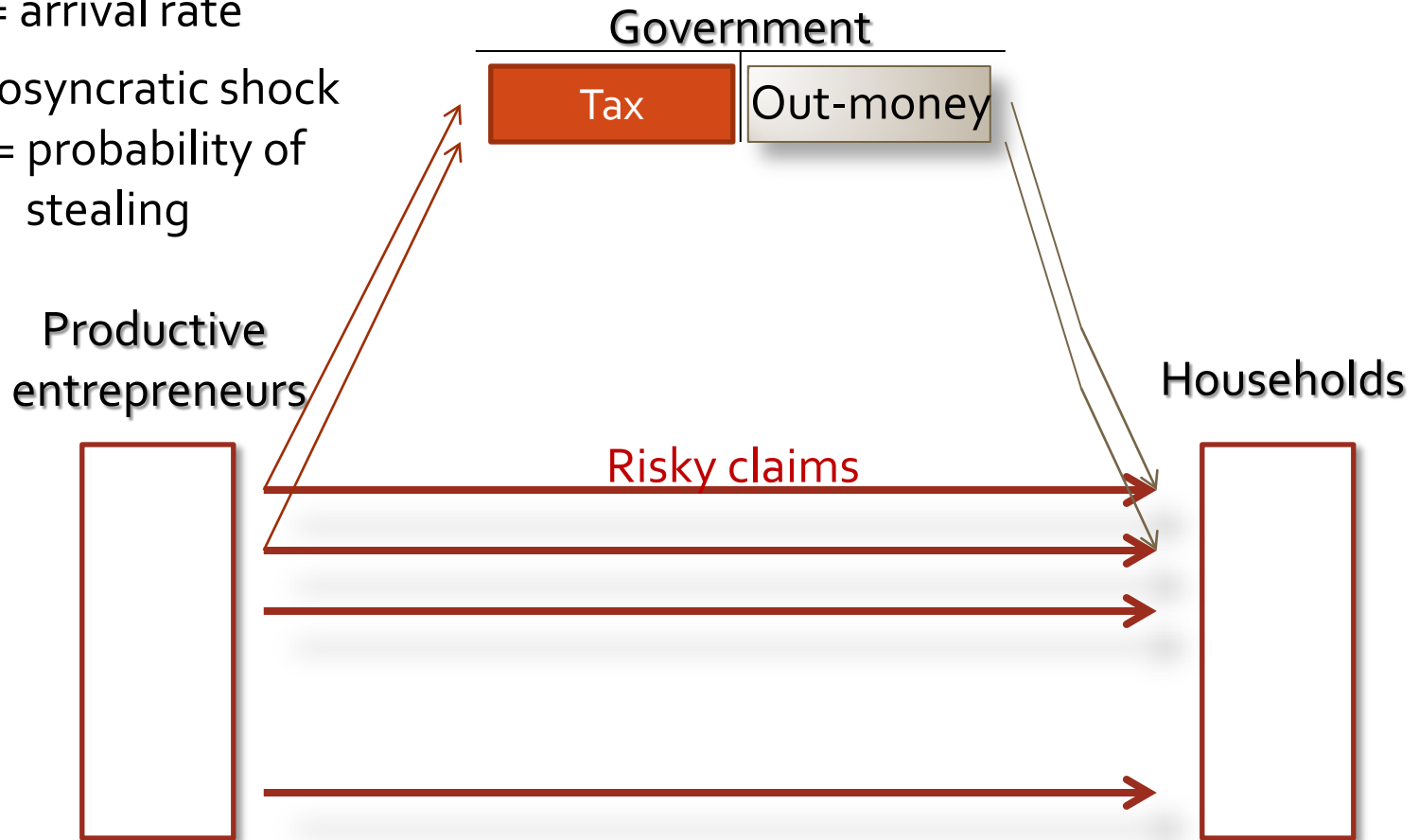
- Endogenous risk
- Redistributive effects

- Active monetary policy

- Interest rate
  - Current rate
  - Forward guidance
- Asset purchase programs – open market operation
- “Stealth” recapitalization

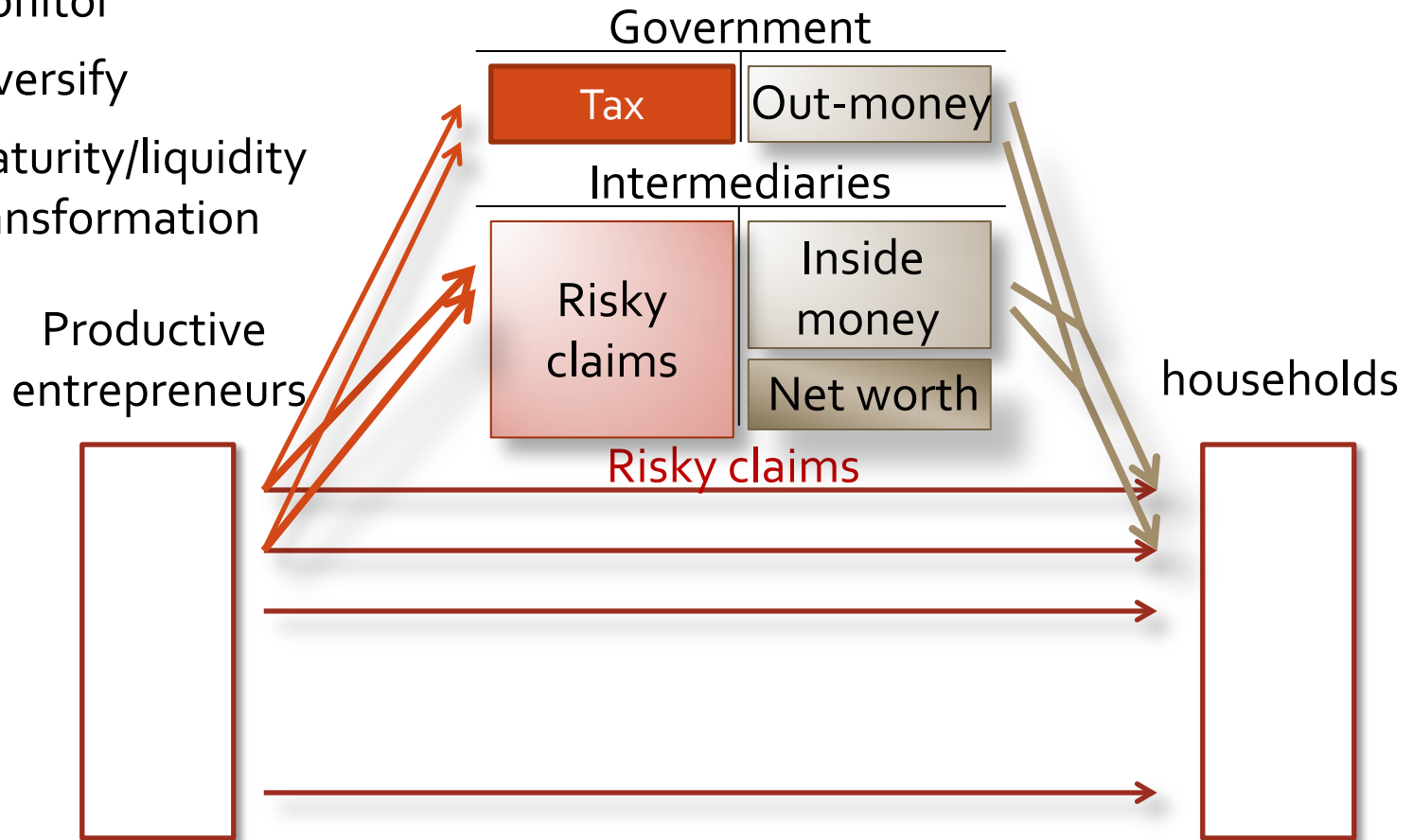
# Baseline model without intermediaries

- Macro shock  
 $\lambda$  = arrival rate
- Idiosyncratic shock  
 $\phi$  = probability of stealing



# Introducing intermediaries

- Monitor
- Diversify
- Maturity/liquidity transformation



# Two Polar Regimes without intermediaries

Regime	Frictions	Value of fiat money	Price of capital
“Money”	severe	high	low
“Bliss”	small	low	high

# Two Polar Regimes with Intermediaries

Regime	Frictions	Value of fiat money	Price of capital		Intermediaries' capitalization
"Money"	severe	high	low		poor
"Bliss"	small	low	high		well

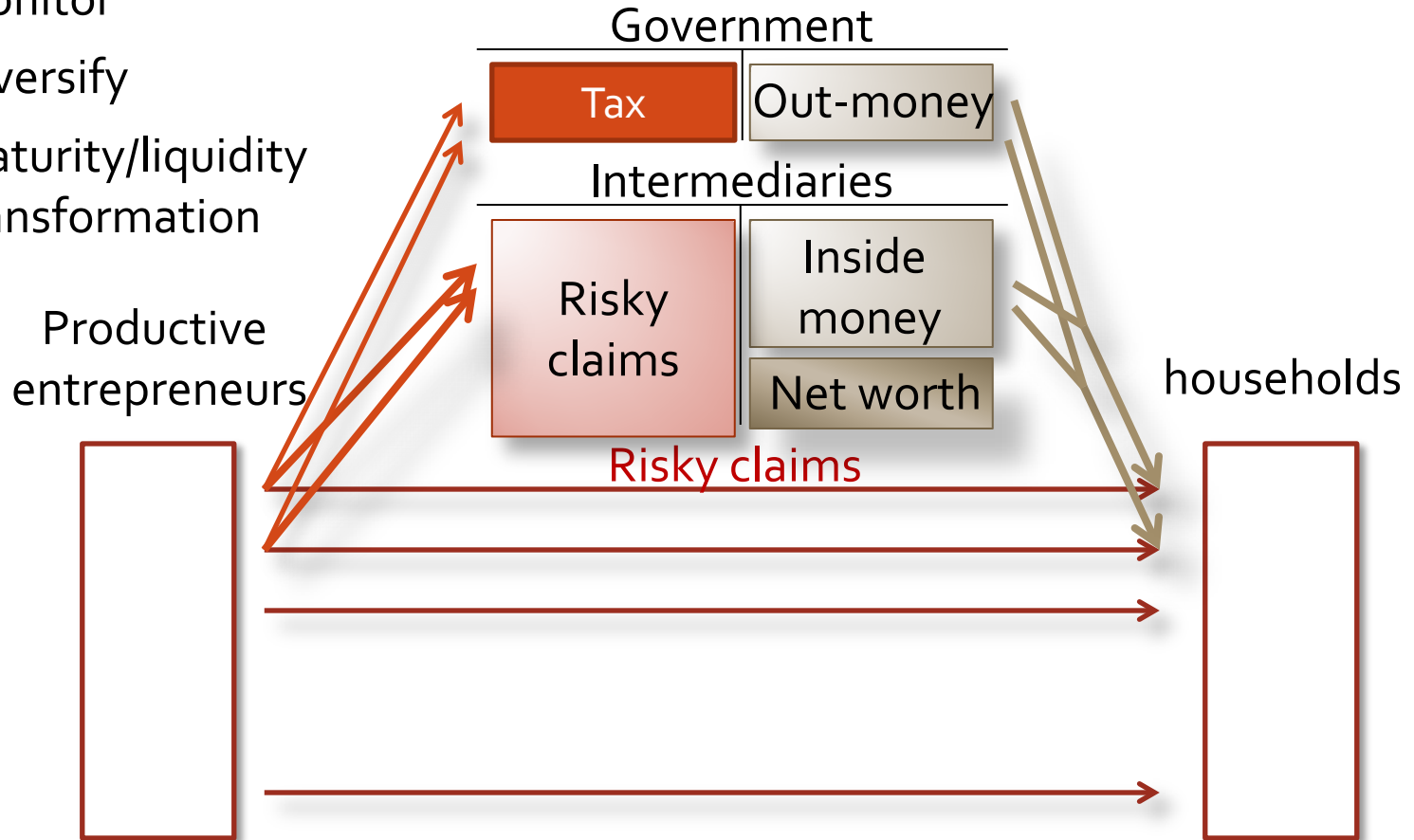
## ■ Role of intermediaries

- Monitoring and thereby reduce friction from  $\underline{\phi}$  to  $\phi$ 
  - Have to take on productive agent's equity risk to have incentive to monitor
  - Depends on their ability to absorb risk
- Diversify
- Maturity/liquidity transformation



# Introducing intermediaries

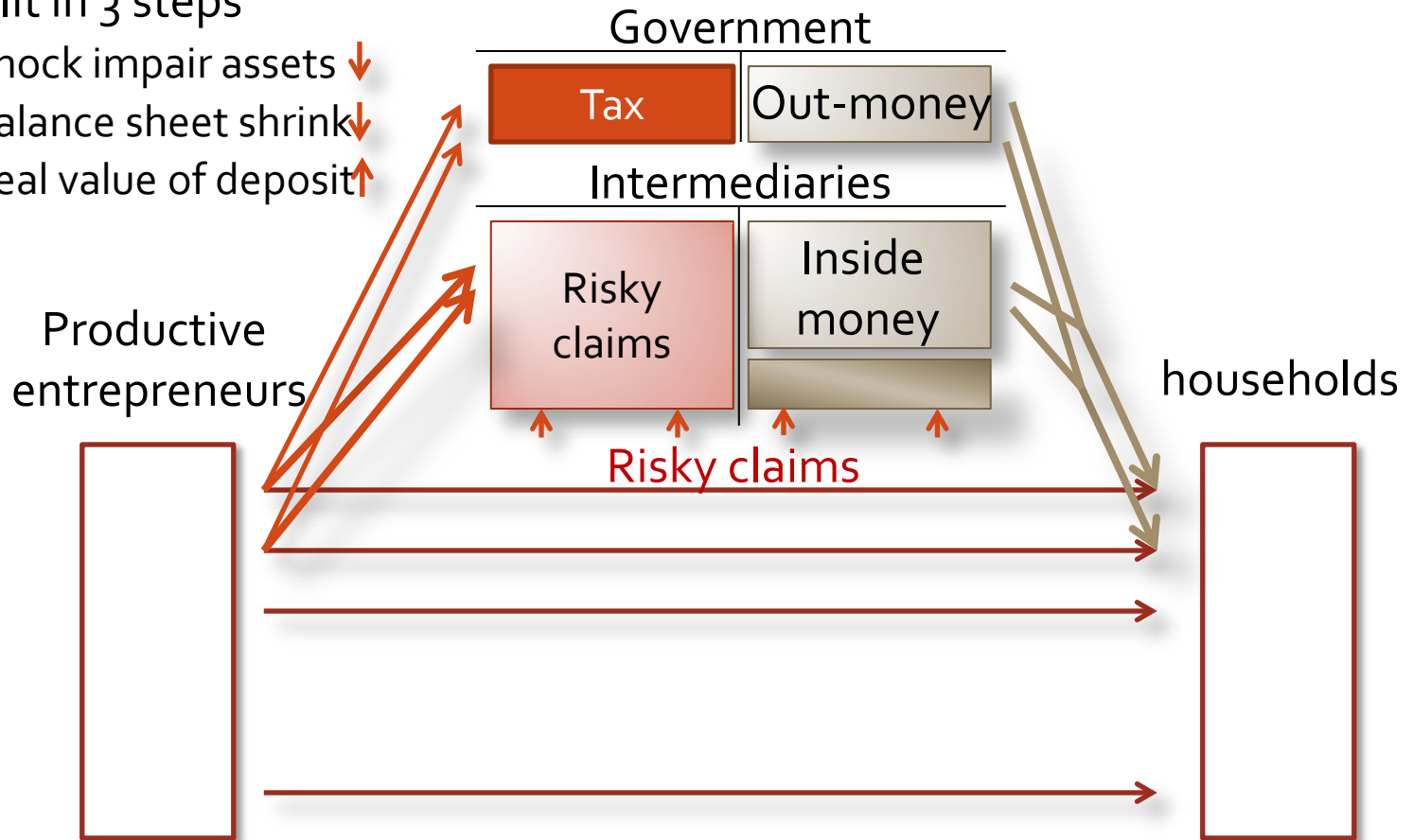
- Monitor
- Diversify
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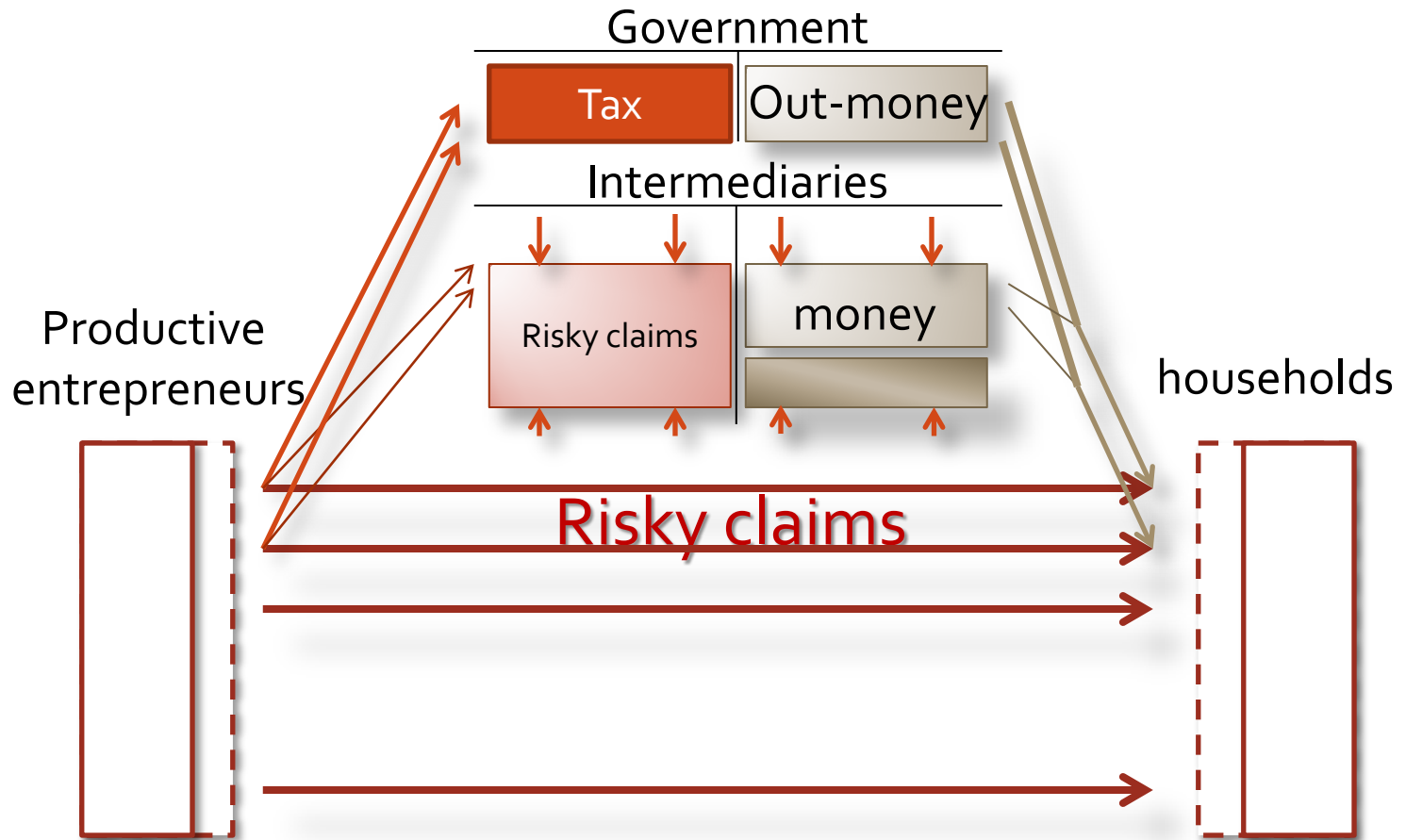
# Adverse shock

- Split in 3 steps

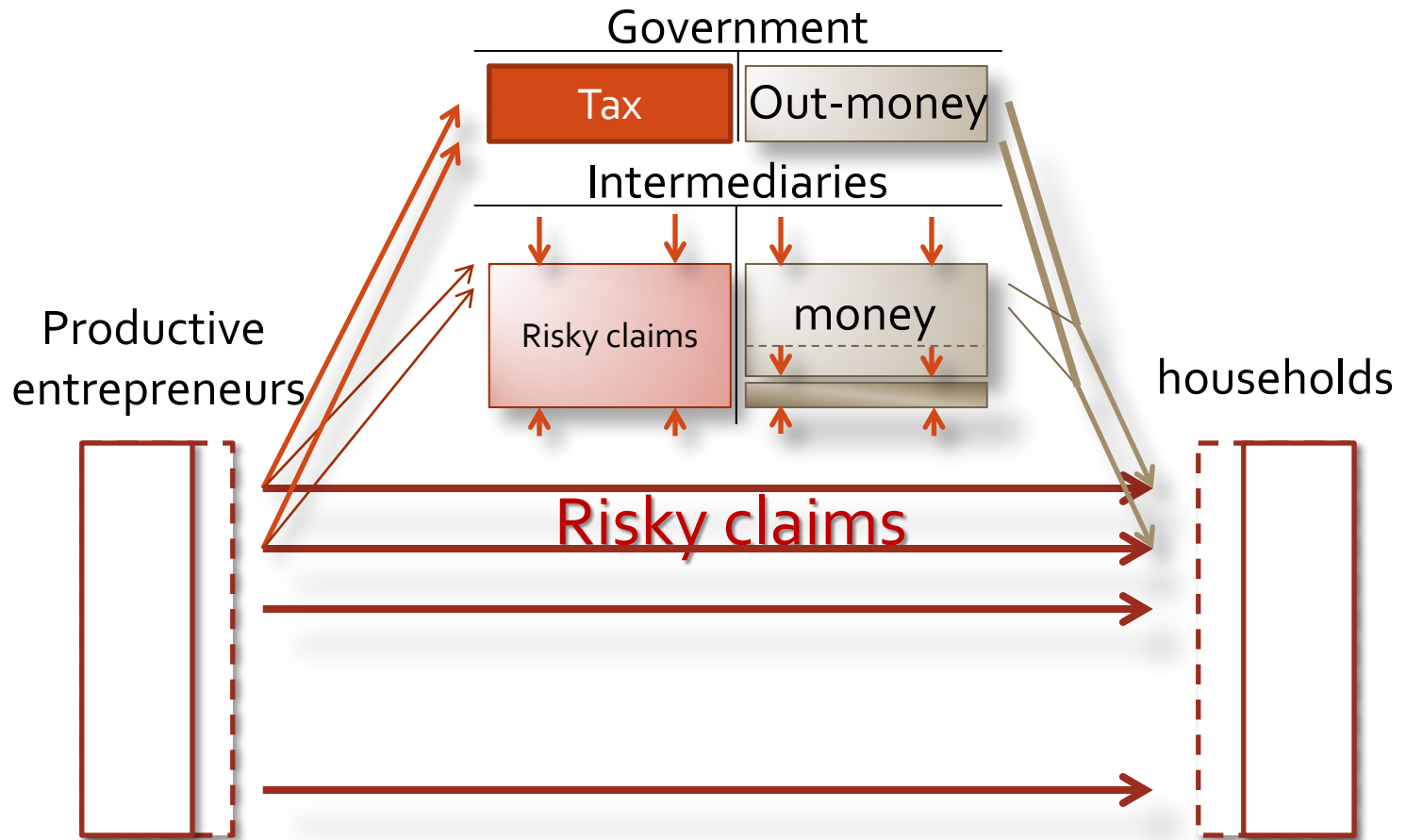
1. Shock impair assets ↓
2. Balance sheet shrink ↓
3. Real value of deposit ↑



# Shrink balance sheet – sell off of assets



# Disinflation effect – value of liabilities expand



# After adverse shock

- Intermediary net worth ↓
  - **Capital:**
    - fire sales, price  $q$  ↓
    - Allocation efficiency ↓
  - **Money:**
    - Lending + deposits ↓
    - value of money  $p$  ⇕
    - Multiplier ↓
- } Liquidity spiral
- } Disinflation spiral

- **Banking**
  - Hit on both sides of balance sheet
  - Externality among banks
  - Competition ↓

- Amplification/persistence → endogenous risk
- wealth redistribution<sub>32</sub>

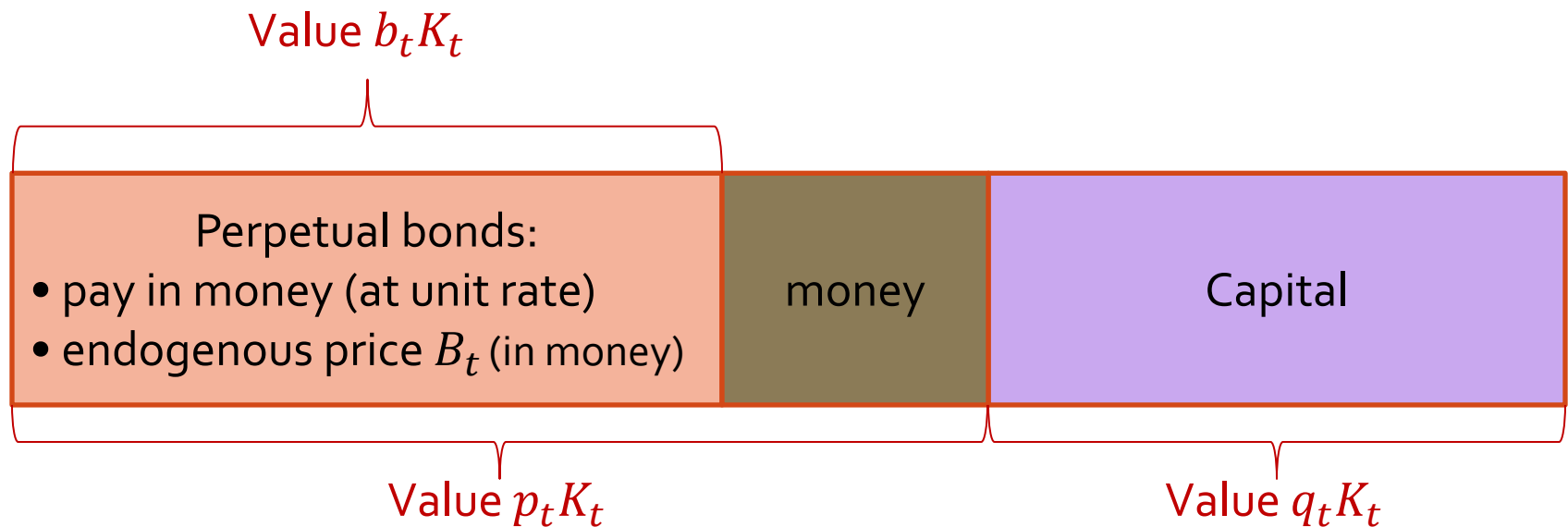
# Monetary Policy

- So far, “Gold Standard”
  - outside money supply is fixed
  - pays no interest
  - no central bank
- Government issues long-term (perpetual) bonds
  - pays fixed interest (in money)
- Monetary policy
  - Central bank pays interest  $r_t \geq 0$  on money (by printing)
  - Sets total outstanding value  $b_t K_t$  of perpetual bond
    - By changing interest  $r_t$
    - Additional Quantitative Easing/Open market operations

# Money (incl. bonds) + physical capital

- Total wealth in the economy:

$$p_t K_t + q_t K_t$$



- Implies a complete yield curve

# Observations




- As interest rate are cut in downturns, bonds held by intermediaries appreciate, this
  - protects intermediaries against shocks
  - increases the supply of asset that can be used as storage (weakens deflation)
- Because downturns are softened, for all  $\eta$ 
  - drop in financial sectors' capitalization conditional on a shock ↓
  - price of capital ↑
  - money multiplier ↑
  - price of money ↓
  - intermediary allocation to capital ↑
  - household allocation to capital ↓
  - risk premia (and thus the rate of recovery, conditional on no shocks) ↓



# Ex-post Objective of Monetary Policy

- Mitigate redistributive effects from endogenous risk/amplification
- Targeted redistribution
  - US 2000s: Household sector
  - Japan 1980s: non-financial business sector

# Interest rate cut $\neq$ Forward guidance/LSAP

- Interest rate cut
  - Increase long-term fixed assets
  - Widen term-spread  benefits banks' net income
- Forward guidance / LSAP
  - Lowers 10-1 yrs term spread  hurts banks' net income
  - Widens 25-10 yrs term spread  hurts insurance/pension funds
- LSAP on MBS
  - mortgage credit spread
    - Reduces debt service burden (if can refinance)
    - Increases house prices (fall less)

 **Redistributional effects are very different**

# || (Tail) Risk Redistribution

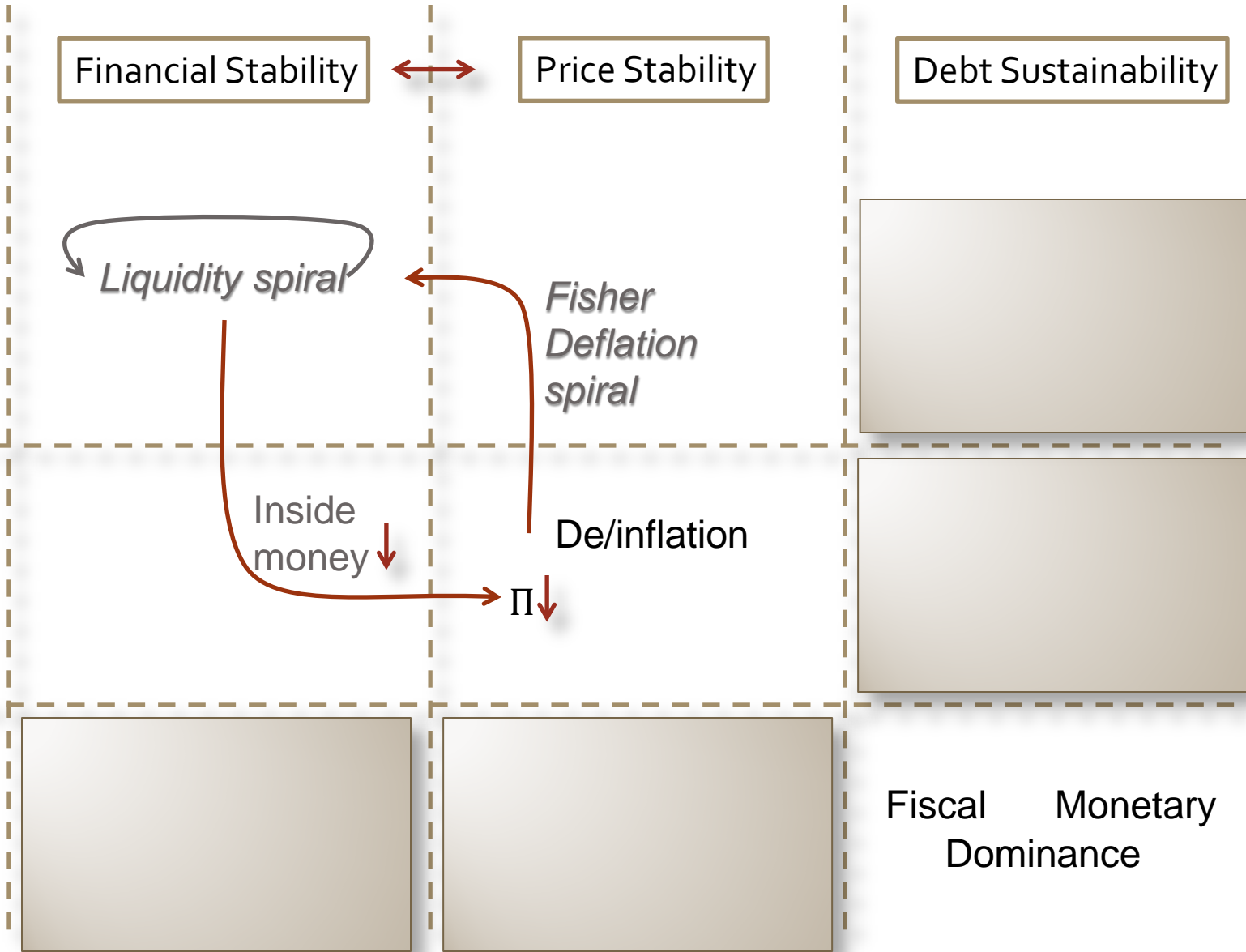
- Central bank “assumes” tail risk
- Risk redistribution = future contingent wealth redistr.
- Purchase programs – upside and downside
  - Interest rate risk
  - Credit risk
- Lending programs – only downside
  - Joint event: insufficient collateral & failed counterparty
  - Collateral policy changes tail event

# Overall Welfare of ex-post Redistribution

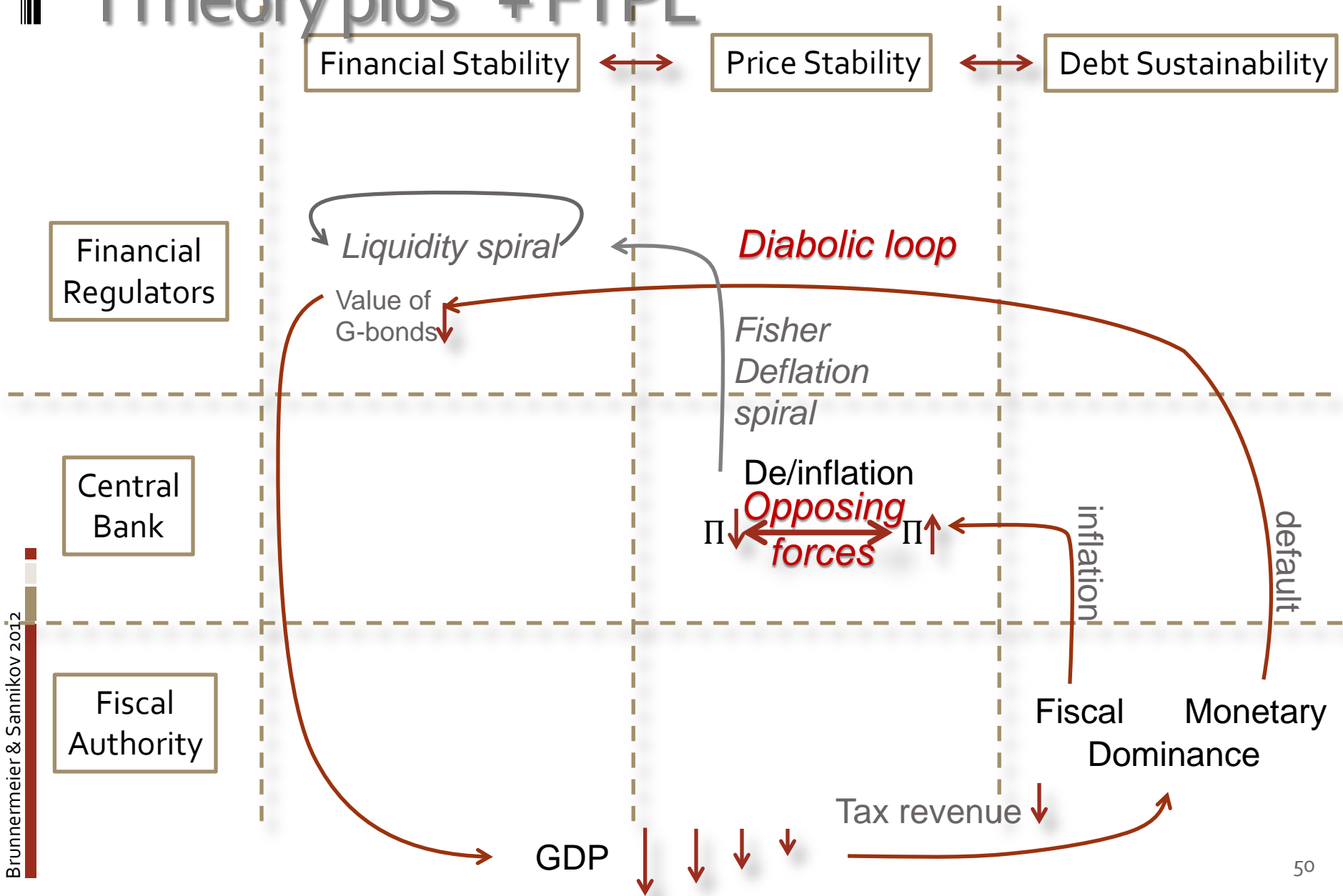
- Redistribution is not a zero sum game!
- When is ex-post redistribution most desirable?
  - Endogenous risk is large
    - Technological and market liquidity (redeployability) is low
    - gap between first and second best use is large
  - Exogenous risk is small!

# Ex-ante Monetary Policy

- Implementation problem
- “Insurance agreement” across sectors
  - completes markets
- Moral Hazard – limits “implementable” rules
  - Punish the weak and strengthen the cautious within sector
  - Interest rate rule is not sufficient
  - Target excessive spreads
  - Combine with macro-prudential (quantitative) rules (LTV, haircuts,...)



# “I Theory plus” + FTPL



# ||| Opposing De- and Inflationary Forces

- Difficult to balance
- System is very unforgiving towards small mistakes



# ||| Opposing De- and Inflationary Forces

- Difficult to balance
- System is very unforgiving towards small mistakes



- Divergence in inflation expectations

# Preventive Monetary Policy

- Early warning signals
  - Credit growth and imbalances
- Volatility Paradox + Financial Innovation
- Quantity controls
  - Through macro-prudential tools
  - LTV, ...

	New Keynesian	I-Theory
Key friction	Price stickiness & ZLB	Financial friction
Role of money	Unit of account	Store of value
Driver	Demand driven as firms are obliged to meet demand at sticky price	Misallocation of funds
Monetary policy <ul style="list-style-type: none"> <li>• implementation</li> <li>• First order effects</li> </ul>	Optimal price setting over time  Affect HH's intertemporal trade-off Nominal interest rate impact real interest rate due to price stickiness	Ex-ante insurance "complete markets"  Ex-post: redistributinal effects  Ex-ante: insurance
Time consistency	Wage stickiness Price stickiness + monopolistic competition	Moral hazard in risk taking (bubbles) - Greenspan put -
Yield curve	Expectation hypothesis only	Term/inflation risk premia

# Conclusion

- New perspective – focus on
  - Financial frictions, less on price stickiness
  - Store of value of money, not only unit of account
  - Wealth/income effects, not only substitution effects
- Redistributive in (i) wealth & (ii) risk
- MP reduces endogenous (self-generated) risk
- Interest rate cut  $\neq$  Forward guidance/LSAP (not only ZLB)
- Stability concepts are highly interlinked
- Opposing de- & inflationary forces
  - Difficult to balance
  - Calls for preventative monetary and macro-prudential tools<sup>57</sup>