

On the Macroeconomic Effects of Shadow Banking Development

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Introduction

- ⊙ Shadow banking: credit intermediation outside the regular banking system (FSB)
 - market-based debts (IMF 2018), i.e., ABS, MBS, MMF, etc.
 - bank-like intermediation (Ehlers et al. 2018), i.e., wealth management products
- ⊙ Research question: what are the macroeconomic implications of shadow banking, particularly for productivity?
- ⊙ Motivation-data patterns
 - Shadow banking developed rapidly (80% of GDP in 2020, FSB)
 - Productivity slowdown (Kim and Loayza 2019)
- ⊙ Importance
 - shadow banking \Rightarrow unsustainable development?

Background and Overview

- ⊙ Innovation v.s. Physical capital
 - Innovation: riskier, lower collateral value, harder to evaluate (Bianchi et al. 2018)
 - Physical capital: higher collateral value, easier to monitor and verify (Levine 2005)
- ⊙ Traditional finance v.s. Shadow banking
 - Traditional finance: mitigate information asymmetry by traditional costly services, e.g. screening and monitoring (Christiano and Ikeda 2016)
 - important for innovation
 - Shadow banking: less effective in monitoring (Ferrante 2018); cheap funding source (Feve et al. 2019)
 - advantageous for physical capital accumulation

Literature and Contributions

⊙ Connections between business cycles and economic growth (Anzoategui et al. 2019; Bianchi et al. 2019; Ikeda and Kurozumi 2019; Moran and Queralto 2018)

- business cycle effects on the long-run economic trend

⊙ Shadow banking (Chang et al. 2019; Ferrante 2018; Feve et al. 2019; Moreira and Savov 2017; Ordonez 2018)

This paper: a crossroad between the literature

- productivity implications of shadow banking through an innovation channel
- interpret shadow banking booms for some major economies

⊙ Financial development (Arcand et al. 2015; Greenwood et al. 2010; Levine 2005; Morganti and Garofalo 2019; Zhu et al. 2020)

- why over-developed financial system can be harmful to the innovation-driven growth?

Empirical Analysis: Cross-country evidence

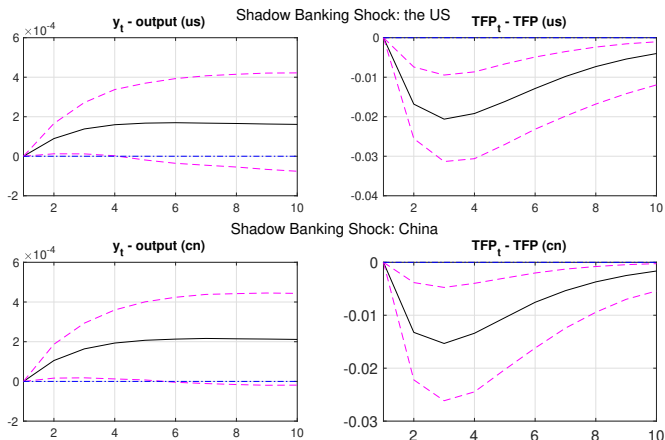
- sample: 28 countries, 2002-2017
- negative SB-innovation-productivity relationship

Variables	Patent	Journal
SB	-0.0203*** (0.0076)	-0.0184*** (0.0033)
Control	Yes	Yes
Constant	Yes	Yes
Country FE	Yes	Yes
Time FE	Yes	Yes
Observations	386	399
R^2	0.0823	0.1864

Variables	TFP growth
Inno	0.7217* (0.387)
SB	-1.8689** (0.728)
SB*Inno	-0.1485** (0.074)
Control	Yes
Constant	Yes
Country FE	Yes
Time FE	Yes
Observations	356
R^2	0.38

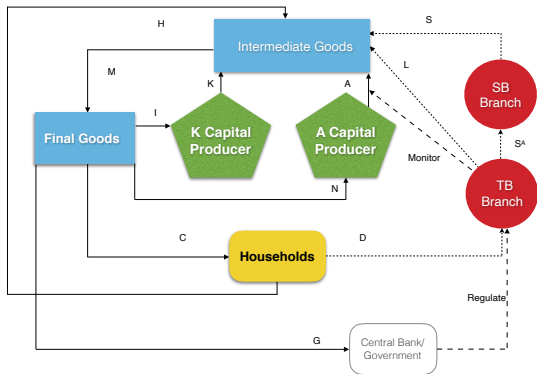
Empirical Analysis-Time series

Is the SB-productivity relationship robust to different shadow banking systems?



Theoretical Framework

- DSGE model with endogenous growth (e.g., Bianchi et al. 2018, JME) and shadow banking (Fève et al. 2019, JEDC)
- Bayesian estimation for the US, China and EA



Model-production

Knowledge capital (A_t) is risky in adoption (Anzoategui et al. 2019)

$$\text{project productivity} = \begin{cases} \theta^G & \text{w.p. } pr_t \\ \theta^B & \text{w.p. } 1 - pr_t \end{cases}$$

Efficiency of technology (project quality) ϕ_t

$$\phi_t = \theta^G pr_t + \theta^B(1 - pr_t) = \theta^B + (\theta^G - \theta^B)\xi_t$$

Outcome (ϕ_t) depends on bank's effort (ξ_t) (Christiano and Ikeda 2016)

Output and TFP

$$Y_t = \underbrace{\varepsilon_t^a (\phi_t A_t)^\zeta}_{\text{util. adj. TFP}} (u_t K_t)^\alpha (H_t)^{1-\alpha-\zeta}$$

Model-finance

Traditional banks conduct traditional business and hold off-balance-sheet assets (Fève et al. 2019)

$$\Pi_t^b = R_t^b(\xi_t)L_{t-1} + R_t^s S_{t-1}^a - \frac{\gamma_1}{2} \left(\frac{S_t^a}{L_t} - \theta \right) S_t^a - \frac{\gamma_2}{2} L_t^2 - \frac{\gamma_3}{2} \xi_t^2 - R_{t-1} D_{t-1}$$

$$R_t^{b'} L_{t-1} = \gamma_3 \xi_t$$

$$E_t \Lambda_{t,t+1} (R_{t+1}^s - R_t) = \gamma_1 \left(\frac{S_t^a}{L_t} - \theta \right) \left(\frac{S_t^a}{L_t} \right)$$

Shadow banks issue shadow banking products (S_t^a) to traditional banks, and lend shadow credits (S_t) to firms

$$S_t = (1 - \varepsilon_t^s) S_t^a$$

ε_t^s shadow banking shock may capture effects of regulatory changes and financial technology

Calibration

Parameters	Description	Value
α	physical capital share	0.35
ζ	knowledge share	0.1
β	discount factor	0.995
θ^G	high idiosyncratic realization	1.003
θ^B	low idiosyncratic realization	0.905
δ^k	capital depreciation	0.02
δ^a	knowledge depreciation	0.0375
λ^m	intermediate good mark-up	1.1
Steady-State		
$1+g^y$	ss per capita GDP growth	1.005
G/Y	ss exo. demand share	0.15
H	ss labour hour worked	1/3
θ	ss shadow credit share	0.25
ε^s	ss shadow credit cost	0.026

Estimation

- sample: 1992Q1 to 2019Q4 for the US
- variables: GDP, consumption, investment, R&D spending, hours worked, GDP deflator inflation, the policy interest rate and shadow banking credits

Parameters	Prior			Posterior
	Distribution	Mean	St.Dev.	Mean [5, 95]
b habit	Beta	0.7	0.1	0.80 [0.72, 0.87]
η Inverse labour elasticity	Gamma	2	0.75	1.61 [0.68, 2.50]
γ_1 bank portfolio adj. cost	Gamma	0.2	0.1	0.06 [0.02, 0.11]
s_k inv. adj. cost	Gamma	4	1	7.56 [5.72, 9.44]
s_a tech. adj. cost	Gamma	4	1	8.04 [6.21, 9.90]
δ_u capital util. elast.	Gamma	4	1	5.16 [3.57, 6.67]
ϵ_p calvo price	Beta	0.75	0.1	0.93 [0.92, 0.96]
ι_p price indexation	Beta	0.5	0.15	0.28 [0.06, 0.53]
ρ_r taylor smoothing	Beta	0.7	0.15	0.87 [0.85, 0.91]
ρ_π taylor parameter	Normal	1.5	0.25	1.91 [1.61, 2.22]
ρ_y taylor parameter	Normal	0.3	0.1	0.38 [0.25, 0.51]

Note: 90% HPD in bracket.

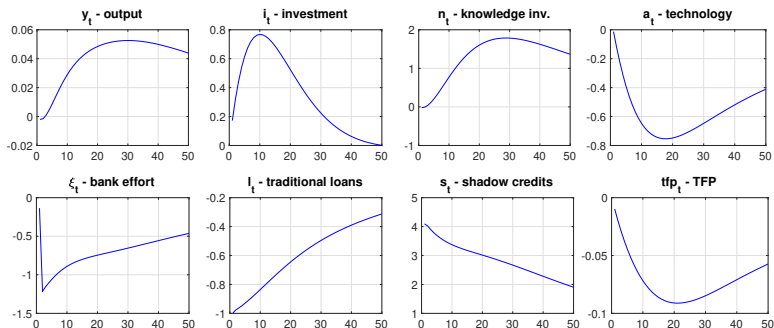
Estimation continued

Parameters	Prior			Posterior
	Distribution	Mean	St.Dev.	Mean [5, 95]
ρ_a per. of exo. TFP	Beta	0.5	0.2	0.95 [0.91, 0.98]
ρ_d per. of preference	Beta	0.5	0.2	0.79 [0.68, 0.88]
ρ_s per. of shadow credit	Beta	0.5	0.2	0.98 [0.97, 0.99]
ρ_i per. of inv. efficiency	Beta	0.5	0.2	0.89 [0.83, 0.94]
ρ_n per. of tech. efficiency	Beta	0.5	0.2	0.96 [0.93, 0.98]
ρ_p per. of price mark-up	Beta	0.5	0.2	0.48 [0.12, 0.76]
ρ_m per. of mon. policy	Beta	0.5	0.2	0.49 [0.40, 0.59]
ρ_g per. of exo. demand	Beta	0.5	0.2	0.94 [0.89, 0.98]
σ_a std. of exo. TFP	Inv_Gamma	0.1	2	0.46 [0.41, 0.51]
σ_d std. of preference	Inv_Gamma	0.1	2	0.72 [0.21, 1.18]
σ_s std. of shadow credit	Inv_Gamma	0.1	2	1.62 [0.99, 2.25]
σ_i std. of inv. efficiency	Inv_Gamma	0.1	2	0.19 [0.15, 0.23]
σ_n std. of tech. efficiency	Inv_Gamma	0.1	2	0.27 [0.23, 0.33]
σ_p std. of price mark-up	Inv_Gamma	0.1	2	0.09 [0.07, 0.12]
σ_m std. of mon. policy	Inv_Gamma	0.1	2	0.08 [0.07, 0.09]
σ_g std. of exo. demand	Inv_Gamma	0.1	2	0.39 [0.35, 0.44]

Note: 90% HPD in bracket.

Impulse Response-Shadow banking shock

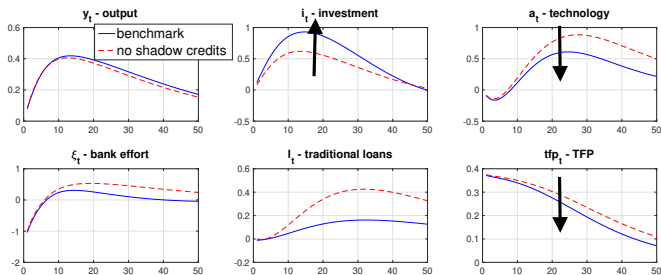
- stimulate investment
- crowd-out traditional finance
- reduce technology and TFP



Note: one standard deviation expansionary SB shock.

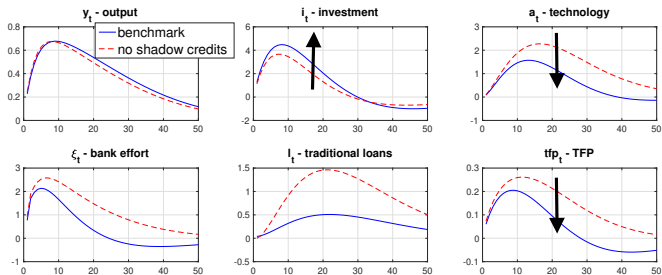
Impulse Response-TFP shock

- amplify investment
- dampen technology and TFP



Note: one standard deviation expansionary TFP shock.

Impulse Response-Inv. shock

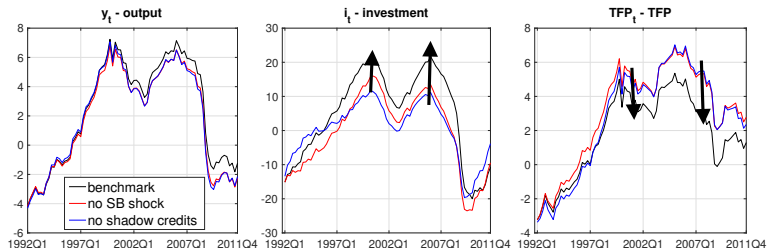


Note: one standard deviation expansionary Inv. shock.

Model application-the US

Impacts of the shadow banking boom

- stimulate investment before the financial crisis
- gradually dampen TFP with shadow banking development



Note: This figure shows percentage deviation of output, investment and TFP from their trends.

Model application-Comparing the US, China, and the EA

- US: largest damage on TFP
- China: largest stimulating effect on output
- EA: least affected

Table: Effects of shadow banking for each shadow banking boom period (percent)

	on output	on inv.	on TFP
US	0.76	11.59	-2.48
CN	1.02	6.69	-0.87
EA	0.45	6.04	-0.20

Conclusion

- ⊙ Shadow banking is a double-edged sword
 - “bright side”: cheap finance to stimulate investment
 - “dark side”: weaken productivity performance through the innovation channel
 - over-developed SB \Rightarrow unsustainable development
- ⊙ Policy Implications
 - regulation: limited development of shadow banking
 - relatively more benefits for developing country

Thank you for listening!