Non-performing Loans due to Inefficient Capital Reallocation

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Question

What does the share of non-performing loans in total loans (sNPL) reveal about the state of the real economy?

Findings

- The sNPL is counter-cyclical
- Economies with a higher sNPL have lower real returns to capital. NPLs don't only affect credit supply (common "Balance sheet space hypothesis") and can be seen as the financial mirror image of capital misallocation.
- The model with frictions in reallocating underlying collateral can replicate sNPL business cycle dynamics.
- Inefficient used capital markets, which make it more difficult for banks to sell collateral and for capital to reenter production, seem to be a more likely driver of the sNPLs in economies with a high sNPL than bank forbearance incentives, as these can parsimoniously explain sNPLs and observed falling capital prices.

Motivation

Policymakers are concerned with sNPL levels, but there are few structural models to understand why NPLs are held by banks, their behaviour over the business cycle or their real economy effects, e.g. :

- "... 2016, the stock of gross NPLs in the EU banking sector was around € 1 trillion... the coverage of NPLs is, on average, 82% in the euro area ... the outstanding stock of NPLs is a consequence of cyclical and structural factors... structural weaknesses... include ... ineffective and costly debt recovery procedures in some Member States and misaligned incentives that prevent a quick resolution of NPLs." - Mario Draghi, at the time President of the ECB, second annual conference of the ESRB, Frankfurt am Main, 21 September 2017

- "To my knowledge, there is no clear theory suggesting that high volumes of NPLs impair the credit allocation mechanism." - Paolo Angelini, Deputy Governor of the Bank of Italy; VOX EU CEPR, 12 April 2018

Proposed Channels driving sNPL

- ▶ Forbearance incentives making foreclosure of NPLs costly for banks are summarised with parameter τ
- ▶ Difficulty in using foreclosed collateral capital → used capital market efficiency summarised with parameter μ_u

sNPL over the Business Cycle

Variable	sNPL (-2)	sNPL (-1)	sNPL	sNPL (+1)	sNPL (+2)
Real GDP	-0.64	-0.67	-0.64	-0.56	-0.43
Return on capital	-0.34	-0.49	-0.60	-0.68	-0.73
Investment	-0.67	-0.75	-0.77	-0.74	-0.66
Reallocation	-0.51	-0.47	-0.41	-0.32	-0.20
Delinquency rates	0.75	0.81	0.81	0.77	0.68
Property prices	-0.79	-0.75	-0.69	-0.60	-0.49

Table: Business cycle properties of sNPL. sNPL, Real GDP, Delinquency rates, and property prices are downloaded from FRED. Aggregate capital returns are calculated based on BEA data. Capital reallocation is calculated following Eisfeldt and Rampini (JME, 2006). All series are calculated as deviations from a quarterly Hodrick-Prescott trend. Property prices stand in as capital prices. Sources: FRED, BEA, WRDS
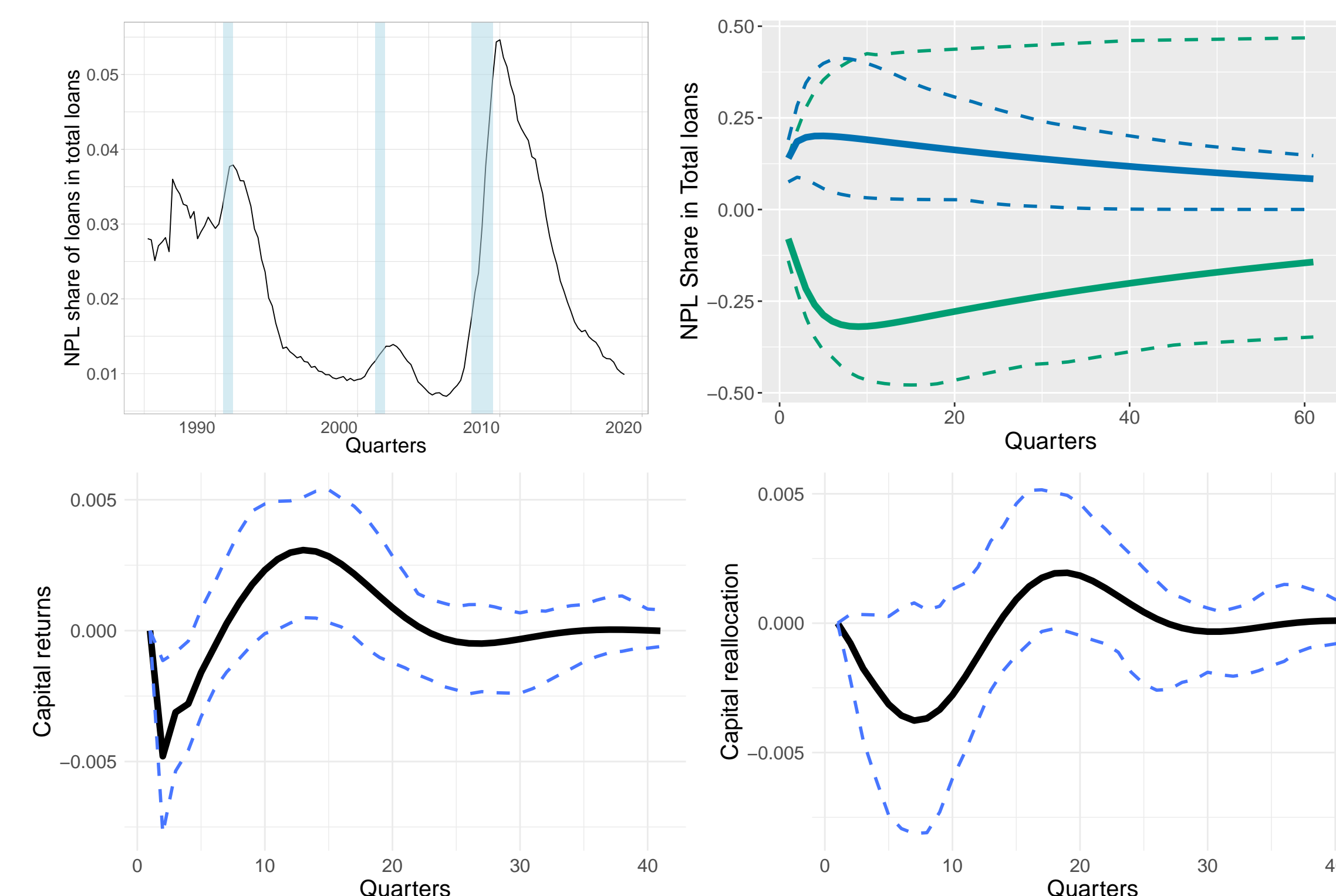

Figure: Top - left: NPL as a share of total loans and recessions (light blue) for the United States. Top - right: Blanchard-Quah (1988) long-run restrictions on sNPL and real GDP. Dark blue is the response of sNPL to sNPL shocks while green shows the response of sNPL to real GDP shocks. Lower - left: Short-run restrictions showing response of capital returns to sNPL shocks. Lower - right: Short-run restrictions showing response of capital reallocation (Eisfeldt and Rampini (JME, 2006)) to sNPL shocks. Sources: FRED, BEA, WRDS
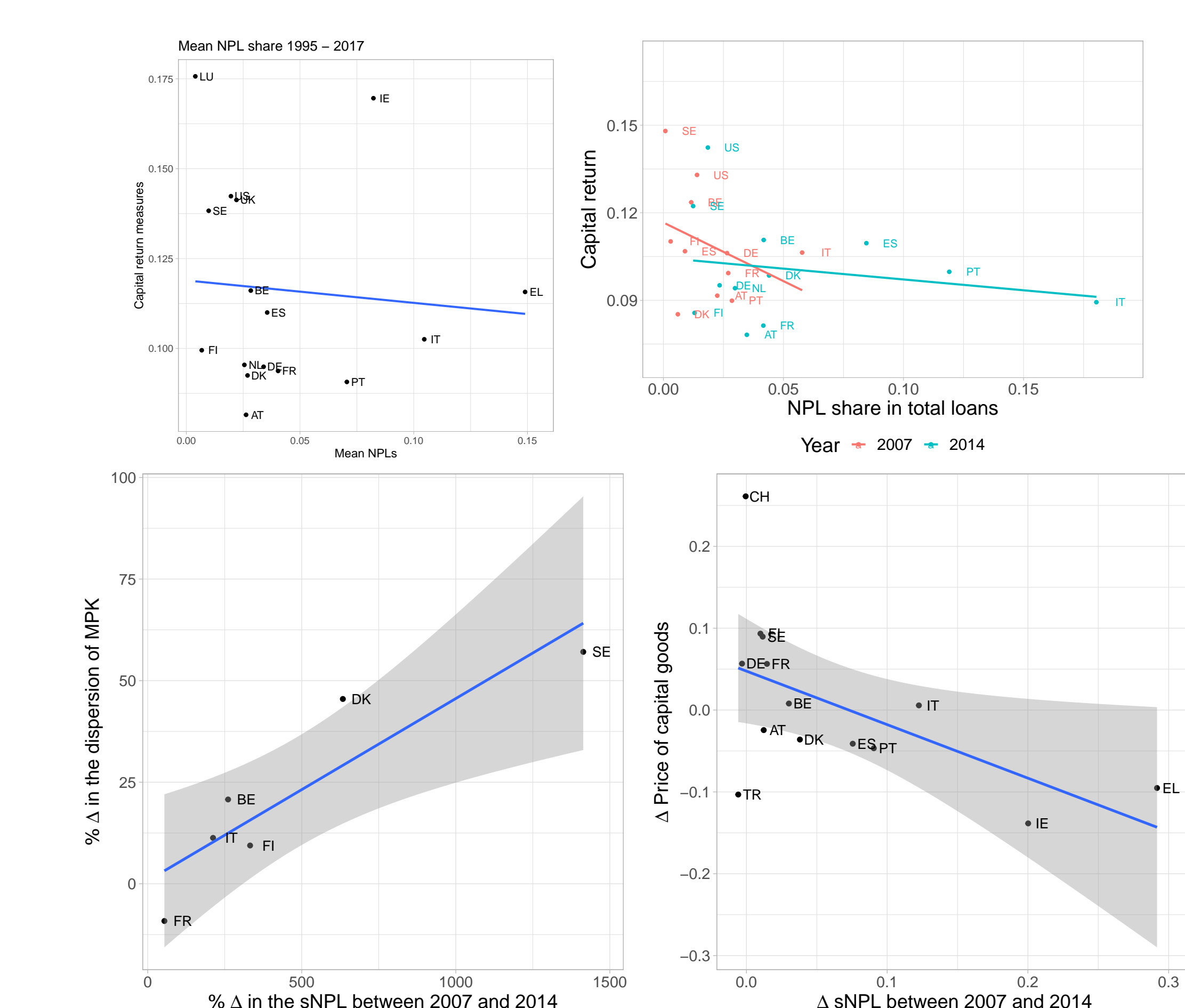
Country Cross-section

Figure: Top - left: Mean real capital returns and mean NPLs. Top - right: Real capital returns and sNPL relation unchanged in GFC. Lower - left: As sNPL changes estimated MPK dispersion from C-D estimation by sector increases proportionally. Lower - right: As sNPLs increase capital prices fall. Sources: IMF, World Bank, Eurostat, KLEMS, CompNet

Take-aways from the Empirics

- ▶ The sNPL is counter-cyclical and sNPL shocks cause lower investment, lower real capital returns, reduced real capital reallocation, and lower capital prices.
- ▶ Country cross sections show that as the sNPL rises real capital misallocation rises, and capital prices fall.

General Equilibrium Model

- Bank loans are given to entrepreneurs, which create with these loans real collateral capital
- Capital in safe, weak, and foreclosed loans contribute to decreasing marginal returns of capital
- Matching frictions in used capital markets summarise the frictional process to re-match specified capital for productive use, e.g. match the right foreclosed factory to a new productive proposal.
- Non-performing loans arise endogenously and are driven higher by factors that drive down the bank loan foreclosure margin:
  ❶ A lower outside value of foreclosed capital (V_u with $\frac{\delta V_u}{\delta \mu_u} > 0$) due to lower used capital market efficiency
  ❷ A higher cost for foreclosing a loan due to higher forbearance incentives τ
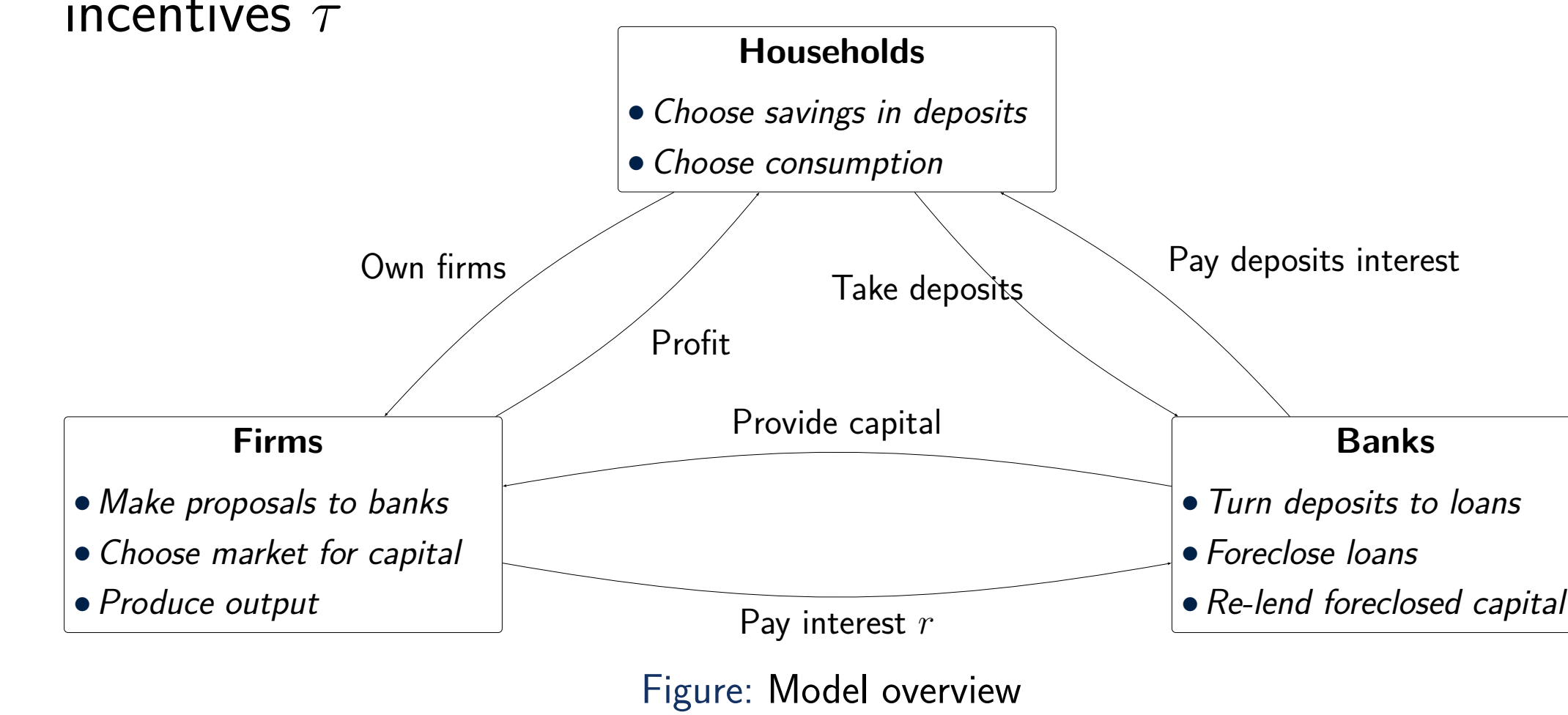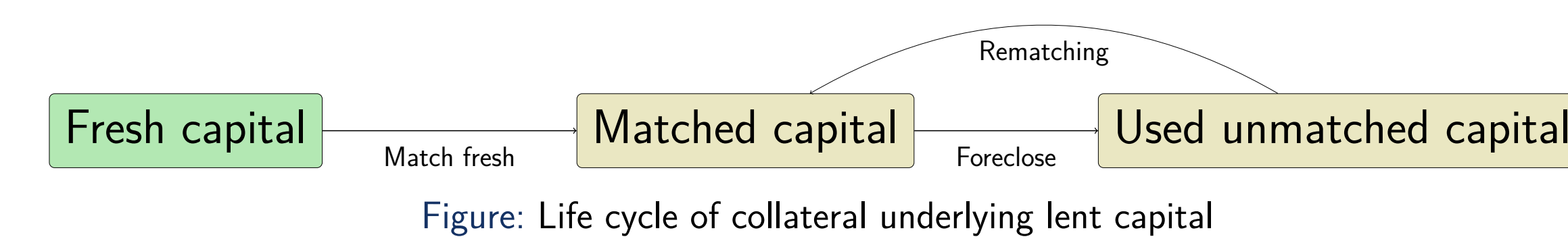

Figure: Model overview

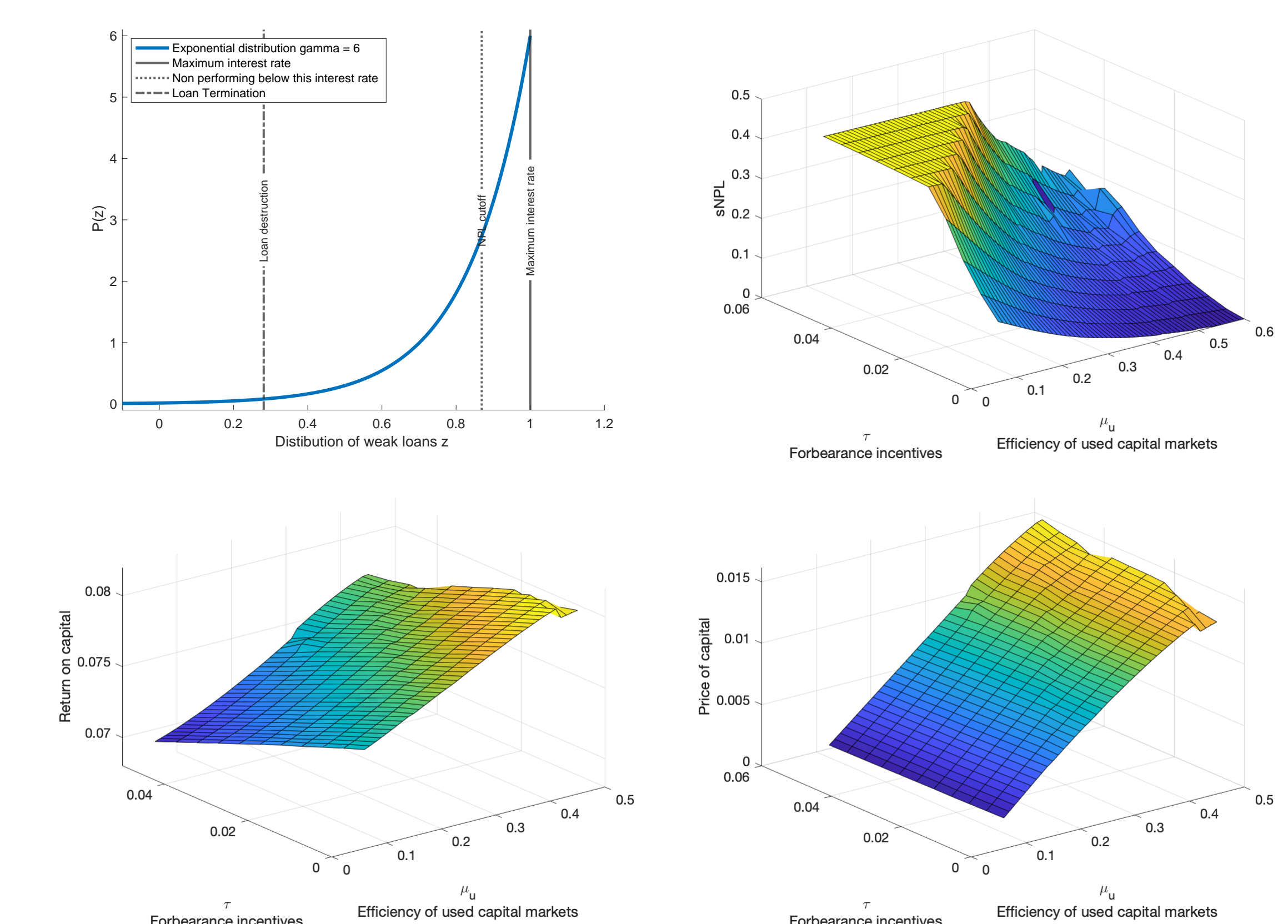Figure: Life cycle of collateral underlying lent capital

Figure: Comparative statics. Top left: a certain share of weak loans exhibits productivity below which it is non-performing, but not foreclosed. Top right, Bottom left, and Bottom right: Comparative effects of τ and μ_u on sNPL, return on capital and capital prices.

Take-aways from the Comparative Statics

- ▶ Both inefficient used capital markets (low μ_u) and forbearance incentives (high τ) can explain high sNPL paired with low real returns to capital, but only μ_u affects equilibrium capital prices.
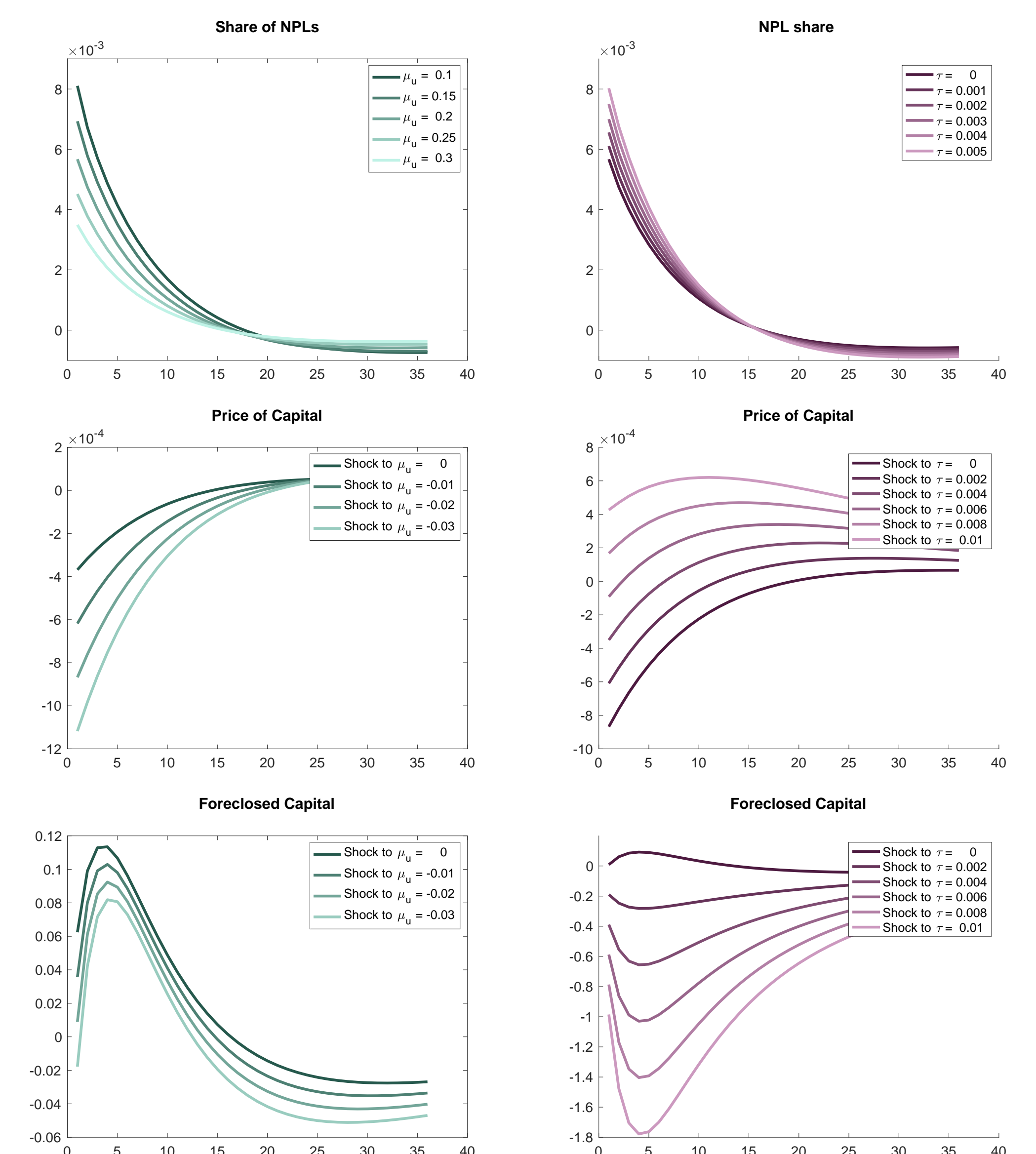
Model Dynamics

Figure: Dynamic responses to a negative 1% TFP shock (top row). In the second and third rows the negative 1% TFP shock is paired with a shock to used capital market efficiency μ_u or dynamic forbearance incentives $\hat{\tau}$ as stated in the legend.

Take-aways from the Dynamic Simulation

- ▶ A lower μ_u and higher τ will lead to stronger sNPL response when a TFP shock occurs.
- ▶ Only pairing the TFP shock with a fall in used capital market efficiency can explain the fall in the price of capital observed in the data. A rise in forbearance incentives in recessions would lead to fewer loan foreclosures, meaning less capital supply from used markets. This leads to tighter capital markets which would result in capital prices rising.

Conclusion

A random search model for re-matching capital markets can provide insights on NPL drivers, i.e. used capital market efficiency. It can combine recent advancements in the capital misallocation literature (e.g. Lanteri (2018, AER)) with empirical studies regarding the sNPL.