



# Nonperforming Loans in Asia: Determinants & Macrofinancial Linkages

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# Background

- More than twenty years after the Asian financial crisis (AFC), Asia stands strong, with more resilient financial systems and a solid economic outlook.
- While NPLs have come down substantially since the AFC and remain moderate, especially in the crisis-afflicted countries, a recent rise of NPLs in some Asian economies calls for close monitoring.
- Meanwhile, financial markets have become more interconnected, which also entail some potential risks—such as increased risk of financial contagion and financial market volatilities.
- Amid a currently cloudy global economic outlook, the region's policy makers need to remain vigilant and take mitigating actions to safeguard financial stability. Effective workout and resolution of NPLs are central to avoid loss of confidence in the banking system and ensure banks continue to support growth.

# Why do NPLs matter?

- Increasing NPL levels reflect weak macroeconomic conditions and excess leverage; and they have harmful feedback effects on the overall economy
- Increasing NPL levels could:
  - negatively impact the flow of cross-border lending
  - damage market sentiment of the region as a whole
  - have negative wealth effects
  - lead to a deterioration in macroeconomic conditions
- Macrofinancial impact of NPLs may spill over to other economies, transmitted through various channels
  - Recent experience in Europe demonstrates how negative impact of buildup of distressed assets is not confined to high-NPL economies, but can extend to the region as a whole

# Development of NPLs (1997-2018)

## Bank Nonperforming Loans (% of gross loans)

| Economy               | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| <b>Central Asia</b>   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Afghanistan           |      |      |      |      |      |      |      |      |      |      |      |      |      | 49.9 | 4.7  | 5.0  | 4.9  | 7.8  | 12.1 | 11.4 | 12.2 | 8.9  |
| Armenia               |      | 6.0  | 8.0  | 17.5 | 24.4 | 9.9  | 5.4  | 2.1  | 2.0  | 2.4  | 2.4  | 4.3  | 4.9  | 3.0  | 3.4  | 3.7  | 4.5  | 7.0  | 8.0  | 6.7  | 5.5  | 4.8  |
| Azerbaijan            |      |      |      |      |      | 28.0 | 21.5 | 15.1 | 9.5  | 7.2  |      |      |      | 3.5  | 4.7  | 6.0  | 5.7  | 4.5  | 4.4  | 5.3  | 13.8 | 12.2 |
| Kazakhstan            |      |      |      |      |      | 11.9 | 8.4  | 4.3  | 3.3  | 2.4  | 2.7  | 7.1  | 18.9 | 20.9 | 20.7 | 19.4 | 19.5 | 12.4 | 8.0  | 6.7  | 9.3  | 7.4  |
| Kyrgyz Republic       |      | 10.1 | 30.9 | 30.9 | 13.4 | 13.3 | 11.2 | 8.0  |      | 6.2  | 3.6  | 5.3  | 8.2  | 14.8 | 9.4  | 6.6  | 5.1  | 4.2  | 6.7  | 8.5  | 7.4  | 7.3  |
| Tajikistan            |      |      |      |      |      |      |      |      |      | 11.3 | 4.8  | 5.4  | 9.6  | 7.4  | 7.2  | 9.5  | 13.2 | 20.4 | 19.1 |      |      |      |
| <b>East Asia</b>      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Korea, Rep. of        | 5.8  | 7.4  | 8.3  | 8.9  | 3.4  | 2.4  | 2.6  | 1.9  | 1.2  | 0.8  | 0.7  |      |      |      |      |      |      |      | 0.5  | 0.5  | 0.4  |      |
| Mongolia              | 19.7 | 31.0 | 50.5 | 21.9 | 6.7  | 5.1  | 4.8  | 6.4  | 5.8  | 4.9  | 3.3  | 7.2  | 17.4 | 11.5 | 5.8  | 4.2  | 5.3  | 5.0  | 7.4  | 8.5  | 8.5  | 10.4 |
| PRC                   |      |      | 28.5 | 22.4 | 29.8 | 26.0 | 20.4 | 13.2 | 8.6  | 7.1  | 6.2  | 2.4  | 1.6  | 1.1  | 1.0  | 1.0  | 1.0  | 1.3  | 1.7  | 1.7  | 1.7  | 1.8  |
| <b>South Asia</b>     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Bangladesh            |      | 40.7 | 41.1 | 34.9 | 31.5 | 28.1 | 22.1 | 17.5 | 13.2 | 12.8 | 14.5 |      |      |      | 5.8  | 9.7  | 8.6  | 9.4  | 8.4  | 8.9  | 8.9  | 9.9  |
| India                 | 14.4 | 14.7 | 12.8 | 11.5 | 10.4 | 9.1  | 7.2  | 4.9  | 3.3  | 2.5  | 2.3  | 2.3  | 2.4  | 2.3  | 2.8  | 3.2  | 3.8  | 4.3  | 7.5  | 9.3  | 11.2 | 9.1  |
| Maldives              |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 20.9 | 17.6 | 17.5 | 14.1 | 10.6 | 10.5 | 8.9  |
| Pakistan              | 24.0 | 23.0 | 26.0 | 24.0 | 23.0 | 22.0 | 17.0 | 12.0 | 8.3  | 6.9  | 7.6  | 10.5 | 12.6 | 14.7 | 15.7 | 14.6 | 13.3 | 12.3 | 11.4 | 10.1 | 8.4  | 8.0  |
| <b>Southeast Asia</b> |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Cambodia              | 7.2  | 16.2 | 14.5 | 12.4 | 8.4  | 14.8 | 13.9 | 10.3 | 7.8  | 9.9  | 3.4  | 3.7  | 4.8  | 3.1  | 2.4  | 2.5  | 2.7  | 2.2  | 2.0  | 2.4  | 2.4  |      |
| Indonesia             |      | 48.6 | 32.9 | 34.4 | 31.9 | 24.0 | 6.8  | 4.5  | 7.3  | 5.9  | 4.0  | 3.2  | 3.3  | 2.5  | 2.1  | 1.8  | 1.7  | 2.1  | 2.4  | 2.9  | 2.6  | 2.3  |
| Malaysia              | 4.1  | 18.6 | 16.6 | 15.4 | 17.8 | 15.9 | 13.9 | 11.7 | 9.4  | 8.5  | 6.5  | 4.8  | 3.6  | 3.4  | 2.7  | 2.0  | 1.8  | 1.6  | 1.6  | 1.6  | 1.5  | 1.5  |
| Philippines           | 4.7  | 12.4 | 14.6 | 24.0 | 27.7 | 14.6 | 16.1 | 14.4 | 10.0 | 7.5  | 5.8  | 4.6  | 3.5  | 3.4  | 2.6  | 2.2  | 2.4  | 2.0  | 1.9  | 1.7  | 1.6  | 1.7  |
| Thailand              |      | 42.9 | 38.6 | 17.7 | 11.5 | 16.5 | 13.5 | 11.9 | 9.1  | 7.8  | 7.6  | 5.6  | 5.2  | 3.9  | 2.9  | 2.4  | 2.3  | 2.3  | 2.7  | 3.0  | 3.1  | 3.1  |

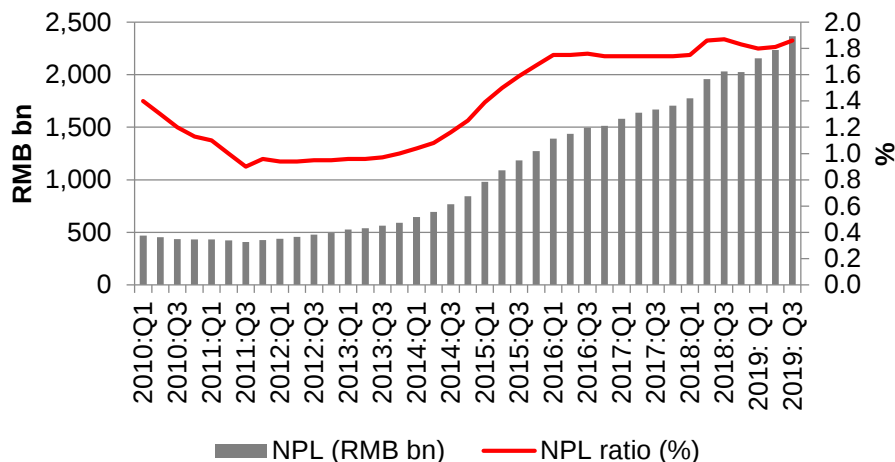
PRC = People's Republic of China

Note: White cells denote nonperforming ratio less than 5%, yellow between 5% and 10%, and orange higher than 10%. Blank cells mean data is not available.

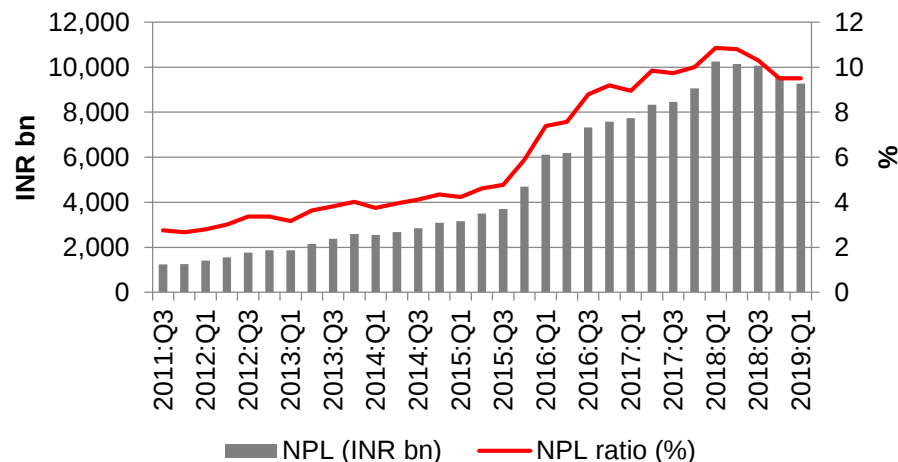
Source: ADB calculations using data from Bank of Mongolia; and World Bank. World Development Indicators. <http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators> (accessed January 2020)

# Development of NPLs for selected Asian economies

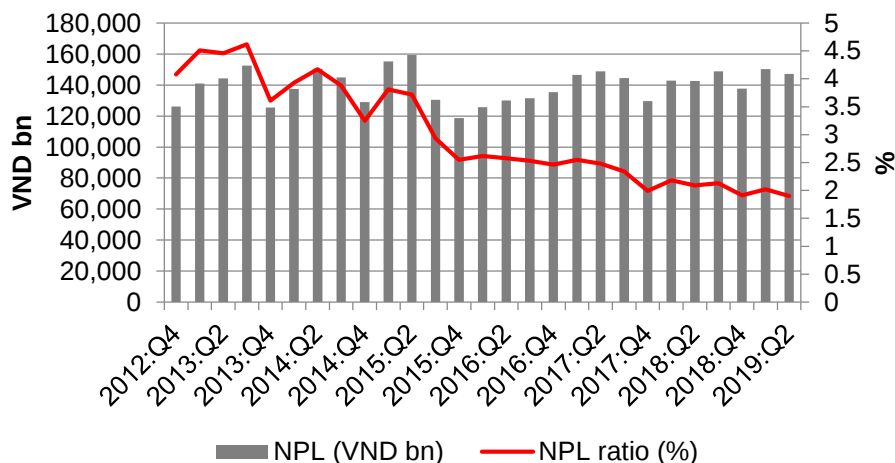
## People's Republic of China



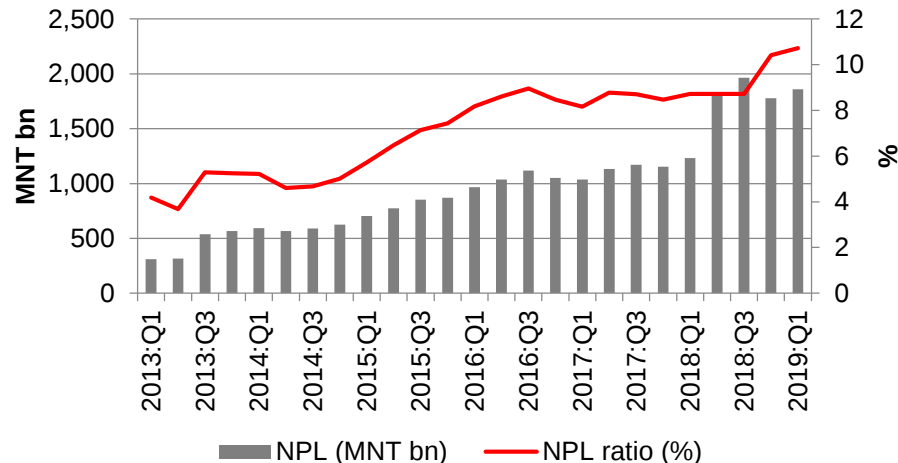
## India



## Viet Nam



## Mongolia

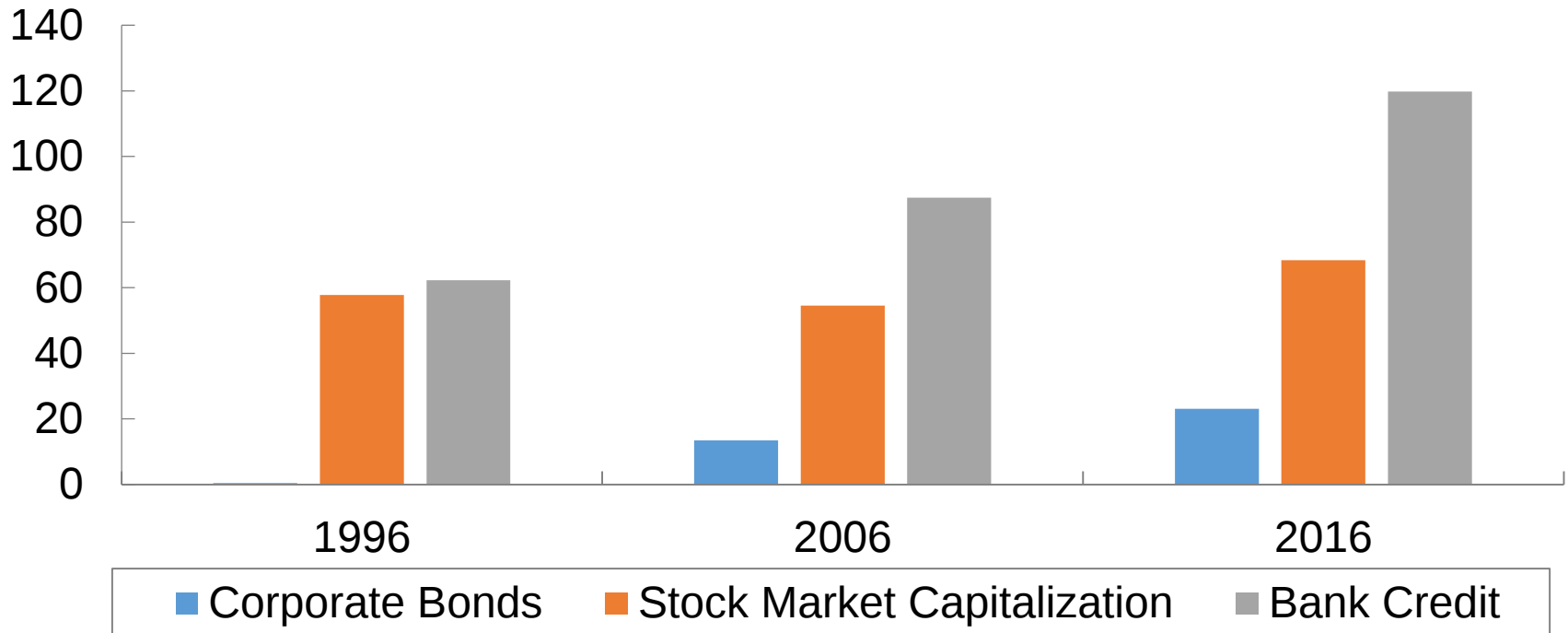


Source: ADB calculations using data from CEIC and Haver Analytics (2020).

# Asia's financial system remains bank-based

- **Limited capital market-based financing solutions** such as long-term local currency bond markets

## Corporate Financing as % of GDP—EMEAP (excluding high-income Asian economies)



EMEAP (excluding high-income Asian economies) includes the People's Republic of China; Indonesia; the Republic of Korea; Malaysia; the Philippines; and Thailand.

Source: *AsianBondsOnline*; IMF International Financial Statistics and World Economic Outlook October 2016, and national sources.

# Nexus between troubled banking system and distressed debt

1. **Shocks to the banking system** that hamper the sector's functions result in the freezing of the credit channel and slowing down of economic activities. In extreme cases, such episodes **may lead to a surge in unemployment rate and poverty incidence**
2. The Asian financial crisis in 1997/98, global financial crisis in 2008/09, and more recent European sovereign debt crisis are vivid reminders of how **financial distress** can result in real economic downturns
3. **Banking and financial distress** are characterized by an unusual **surge in nonperforming assets or NPLs**
4. **Systemic dimension of NPLs**—as observed in Europe—calls for efforts at regional level to develop strategies addressing problems of distressed assets/NPLs

# Related literature

- Macroeconomic determinants:
  - Roy (2014) investigates the drivers of NPL ratio in **India** using panel data for 5 bank groups from 1995-2012
  - Ha, Trien, and Diep (2014) analyze the macroeconomic determinants of the NPL ratio in **Vietnam** using panel data for 8 commercial banks from 2008Q4-2013Q2
- Bank-specific determinants:
  - Hassan, Ilyas, and Rehman (2015) test the importance of bank-specific variables along with social factors (e.g. political interference, management competence) in driving NPLs in **Pakistan's** banking sector
  - Karim, Chan, and Hassan (2010) test the bad management hypothesis proposed by Berger and DeYoung (1997) using data from **Malaysian and Singaporean** banks
- Macrofinancial feedback effects of NPLs:
  - Klein (2013) focuses on **Central, Eastern and Southeastern Europe**; Nkusu (2011) covers **advanced economies**; and Espinoza and Prasad (2010) look at countries in the **Cooperation Council for the Arab States of the Gulf**

# Empirical Analyses

- **Determinants of NPLs in Asia: Dynamic Panel Analysis**
- **Macrofinancial Feedback effects of NPLs in Asia: Panel VAR Analysis**

# Determinants of NPLs in Asia: Dynamic Panel Analysis

# Data

- This paper uses panel data of **individual banks' balance sheets** from *Bankscope* and macroeconomic indicators from CEIC
- The sample covers **annual data for 1995-2014**. Bank-level data consists of **165 commercial banks in 17 economies** in Emerging Asia
- The dataset covers more than 60% of the banking sector's assets in most of the economies in the sample

## Number of Banks in Sample and Their Share in Commercial Bank Total Assets

| Country            | Banks (number) | % of Total Assets |
|--------------------|----------------|-------------------|
| Bangladesh         | 20             | 78.32             |
| Georgia            | 8              | 91.13             |
| Hong Kong, China   | 3              | 58.28             |
| India              | 14             | 71.96             |
| Indonesia          | 12             | 71.10             |
| Japan              | 13             | 56.30             |
| Kazakhstan         | 8              | 71.39             |
| Korea, Republic of | 12             | 72.43             |
| Kyrgyz Republic    | 2              | 43.15             |
| Malaysia           | 14             | 89.66             |
| Pakistan           | 9              | 79.16             |
| Philippines        | 5              | 67.62             |
| PRC                | 9              | 52.42             |
| Singapore          | 2              | 53.83             |
| Sri Lanka          | 9              | 86.97             |
| Thailand           | 15             | 85.70             |
| Viet Nam           | 10             | 63.73             |

PRC = People's Republic of China.

Source: Authors' calculations using data from Bankscope database (accessed February 2016).

# Data

## Bank-level variables

- **NPL ratio** (ratio of impaired loans to gross loans)
- **equity-to-assets ratio**
- **return on equity** (ratio of net income to average equity)
- **loans-to-deposits ratio** (ratio of gross loans to deposits)
- **loans growth rate** (year-on-year growth rate of loans)

## Macroeconomic variables

- **real gross domestic product growth rate**
- **unemployment rate**
- **exchange rate** (value of local currency per US dollar; increase indicates depreciation of the local currency)
- **inflation rate**
- **VIX index**, capturing financial volatility

# Dynamic Panel Data (DPD) Model

- We estimate the following DPD model:

$$\begin{aligned}y_{i,t} &= \rho y_{i,t-1} + \alpha B_{i,t-1} + \beta C_{i,t} + \gamma G_t + \varepsilon_{i,t}, \\ \varepsilon_{i,t} &= u_i + e_{i,t},\end{aligned}$$

where the dependent variable  $y_{i,t}$  denotes the **logit transformation of the NPL ratio** for bank  $i$  at year  $t$

- The regressors:  $B_{i,t-1}$  denotes the vector of **lagged bank-level variables** ( $earatio, roe, ldratio, \Delta loans$ );  $C_t$  denotes the vector of **country-specific macroeconomic indicators** ( $\Delta unemprate, inf, exrate, \Delta gdp$ ); and  $G_t$  represents the vector of **global variables** ( $vix, dummy\_afc$ ) where  $dummy\_afc$  is an event dummy variable to control for the **Asian financial crisis in 1998**
- The term  $\varepsilon_{i,t}$  denotes the composite error term consisting of bank fixed effects,  $u_i$ , and the idiosyncratic term,  $e_{i,t}$

# Estimation Results (1995-2014)

|                                 | Fixed Effects |           |           | Difference GMM |           |           | System GMM |           |           |
|---------------------------------|---------------|-----------|-----------|----------------|-----------|-----------|------------|-----------|-----------|
| <i>npl</i> <sub>-1</sub>        | 0.671***      | 0.689***  | 0.697***  | 0.685***       | 0.708***  | 0.708***  | 0.851***   | 0.804***  | 0.812***  |
| <b>Macroeconomic variables</b>  |               |           |           |                |           |           |            |           |           |
| $\Delta unemprate$              | 0.131***      | 0.129***  | 0.129***  | 0.125***       | 0.140***  | 0.135***  | 0.104***   | 0.126***  | 0.122***  |
| <i>inf</i> <sub>-1</sub>        | 0.006         | 0.010**   | 0.010**   | 0.006          | 0.009***  | 0.008***  | 0.017***   | 0.019***  | 0.018***  |
| <i>exrate</i>                   | 0.00005*      | 0.000     | 0.000     | 0.00002        | 0.00003** | 0.00003** | 0.000      | 0.000     | 0.000     |
| $\Delta gdp$ <sub>-1</sub>      | -0.015**      | -0.017*** | -0.017*** | -0.014***      | -0.015*** | -0.015*** | -0.008**   | -0.011*** | -0.011*** |
| <i>vix</i>                      | 0.008***      | 0.007***  | 0.006***  | 0.006***       | 0.005***  | 0.004***  | 0.006***   | 0.005***  | 0.005***  |
| <i>dummy_afc</i>                |               |           | 0.383***  |                |           | 0.266***  |            |           | 0.306***  |
| <b>Bank-level variables</b>     |               |           |           |                |           |           |            |           |           |
| <i>earatio</i> <sub>-1</sub>    |               | -0.004*   | -0.005    |                | 0.005     | 0.005     | -0.011***  | -0.011*** |           |
| <i>roe</i> <sub>-1</sub>        |               | -0.001*   | -0.002*   |                | 0.002     | 0.002     | -0.001***  | -0.0007** |           |
| <i>ldratio</i> <sub>-1</sub>    |               | 0.001***  | 0.001***  |                | 0.001*    | 0.001*    | 0.001***   | 0.001***  |           |
| $\Delta loans$ <sub>-2</sub>    |               | 0.0005*** | 0.0004*** |                | 0.001***  | 0.001***  | 0.0006***  | 0.0006*** |           |
| No. of observations             | 1,996         | 1,770     | 1,774     | 1,831          | 1,686     | 1,686     | 1,996      | 1,764     | 1,764     |
| <i>R</i> <sup>2</sup> (within)  | 0.534         | 0.540     | 0.546     |                |           |           |            |           |           |
| <i>R</i> <sup>2</sup> (between) | 0.801         | 0.967     | 0.963     |                |           |           |            |           |           |
| No. of banks                    | 165           | 165       | 165       | 165            | 165       | 165       | 165        | 165       | 165       |
| No. of instruments              |               |           |           | 22             | 81        | 81        | 24         | 96        | 96        |
| Hansen test                     |               |           |           | 0.136          | 0.467     | 0.467     | 0.899      | 0.496     | 0.496     |
| A-B AR(1) test                  |               |           |           | 0.000          | 0.000     | 0.000     | 0.000      | 0.000     | 0.000     |
| A-B AR(2) test                  |               |           |           | 0.398          | 0.278     | 0.278     | 0.401      | 0.306     | 0.306     |

GMM = generalized method of moments.

Notes: \*\*\* = significant at 1%, \*\* = significant at 5%, \* = significant at 10%. Empirical results have been derived using Stata 13 software.

Source: Author's calculations using data from Bankscope database (accessed February 2016), CEIC database (accessed October 2017), and Bloomberg (accessed May 2016).

# Macrofinancial Feedback effects of NPLs in Asia: Panel VAR Analysis

# Data

- Panel data of annual macroeconomic and financial indicators covering 32 EAES from 1994-2014
- Variables:
  - **Policy rate**
  - **Loan growth rate:** year-on-year growth rate of loans of overall banking system
  - **Unemployment rate**
  - **GDP growth**
  - **NPL ratio:** the ratio of NPLs to total loans of the economy's overall banking system

# Estimating macrofinancial implications of NPLs: Methodology and model

- Model:
  - Panel vector autoregression (PVAR) model
  - Impulse response analysis to estimate feedback effects of rising NPLs
- PVAR model estimated as follows:

$$Y_{i,t} = \Pi_0 + \sum_{j=1}^n \Pi_j Y_{i,t-j} + \varepsilon_{i,t},$$
$$\varepsilon_{i,t} = u_i + e_{i,t}$$

- Identification: Choleski Decomposition of  $\Sigma_e \rightarrow$  recursive ordering

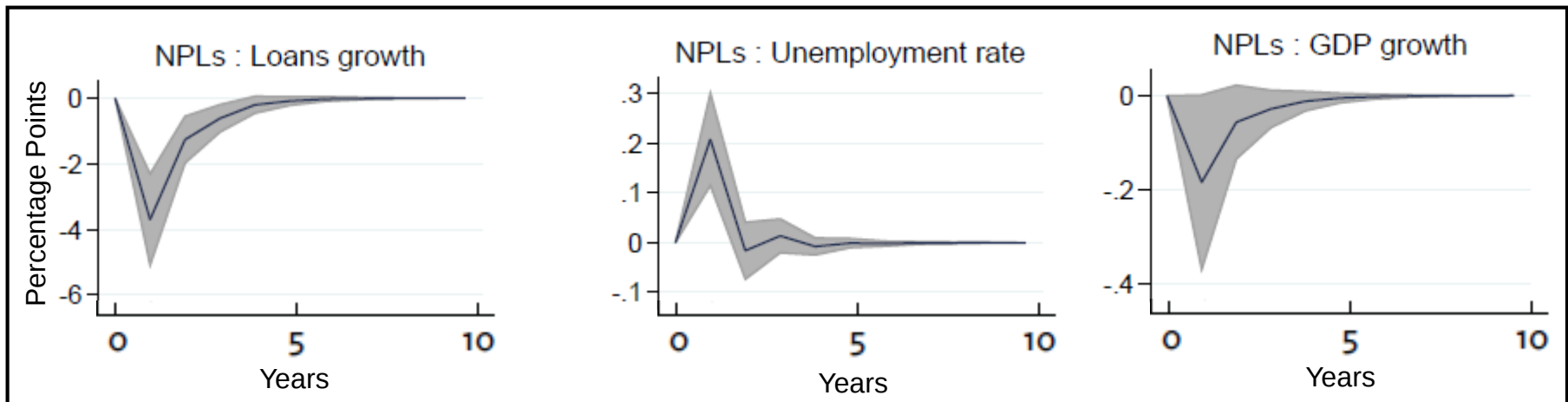
$Y_{i,t}$ : vector of endogenous variables

$\varepsilon_{i,t}$ : composite error term consisting of economy fixed effects ( $u_i$ ) and idiosyncratic errors ( $e_{i,t}$ ) In baseline specification,  $Y_{i,t}$  consists of four endogenous variables— $nplr_{i,t}$ ,  $\Delta loans_{i,t}$ ,  $unemp_{i,t}$ , and  $policyrate_{i,t}$

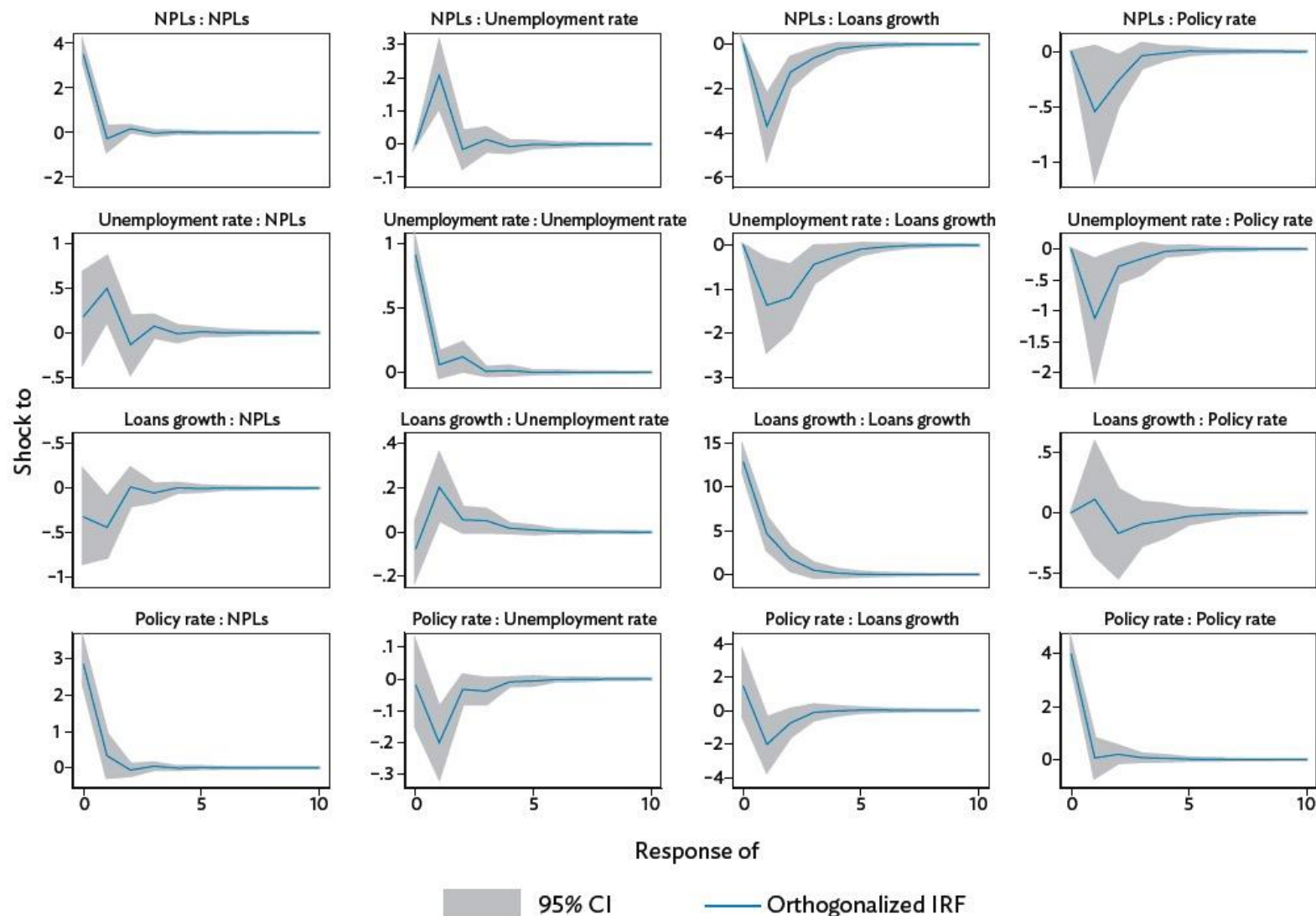
# Buildup of NPLs can affect real sector and spill over through macrofinancial linkages

- **Macrofinancial feedback effects:** Empirical findings show that an increase in NPLs leads to a reduction in credit supply, a rise in unemployment, and slowdown in overall economic activity

## Estimated Impulse Response Functions to a Shock in the NPL Ratio



# Orthogonalized Impulse Response Functions, Baseline Model

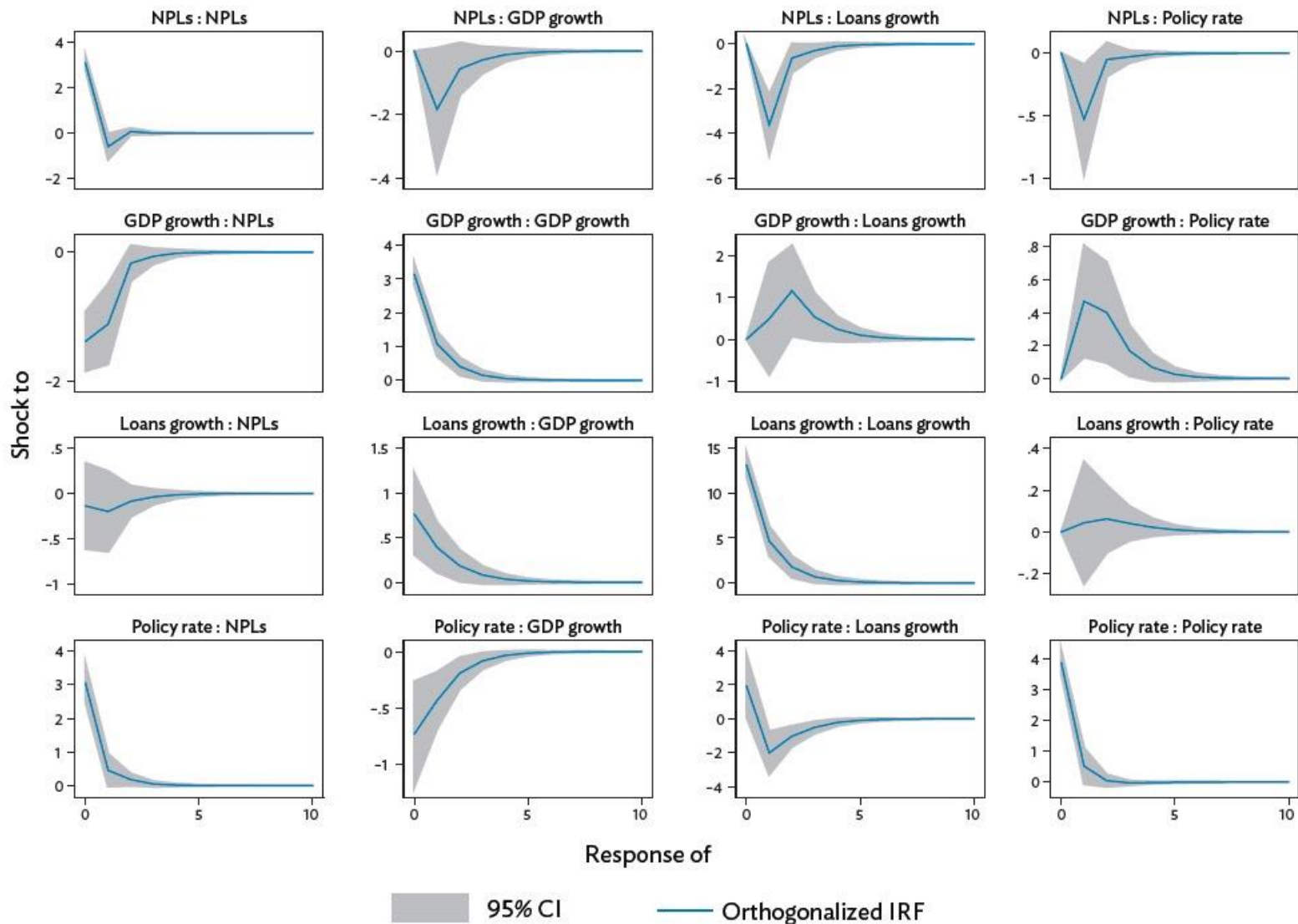


CI = confidence interval, GDP = gross domestic product, IRF = impulse response function, NPL = nonperforming loan.

Notes: 95% confidence intervals are generated by 5,000 Monte Carlo draws. Empirical results have been derived using Stata 13 software.

Source: Author's calculations using data from Bankscope database (accessed February 2016) and CEIC database (accessed October 2017).

# Orthogonalized Impulse Response Functions, Specification 2



CI = confidence interval, GDP = gross domestic product, IRF = impulse response function, NPL = nonperforming loan.

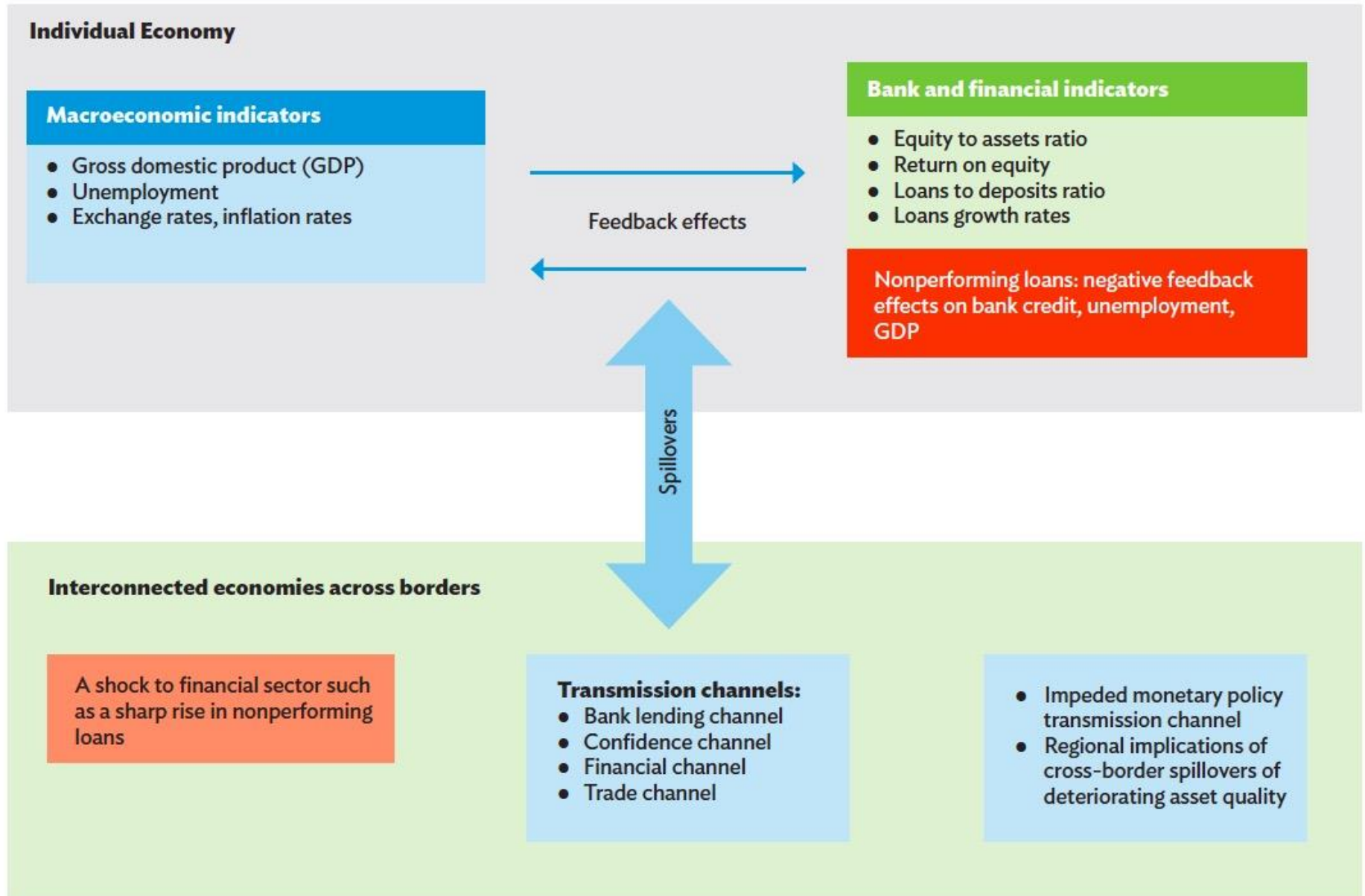
Notes: 95% confidence intervals are generated by 5,000 Monte Carlo draws. Empirical results have been derived using Stata 13 software.

Source: Author's calculations using data from Bankscope database (accessed February 2016) and CEIC database (accessed October 2017).

# Results and discussion

- Results reveal that **both macroeconomic indicators as well as bank-level variables play a key role in explaining the evolution of banks' NPL ratio**. This finding appears to be consistent across all model specifications.
- **Increasing NPL levels reflect weak macroeconomic conditions and excess; and they have harmful feedback effects on the overall economy.**
  - A shock to the NPL ratio decreases GDP growth, credit supply, and policy rate, and it increases unemployment.
- A buildup in nonperforming loans can yield macrofinancial feedback effects, with **possible spillover effects in increasingly interconnected financial markets**

# Macrofinancial impacts of nonperforming loans



Source: ADB (2017). Asian Economic Integration Report 2017. *The Era of Financial Interconnectedness: How Can Asia Strengthen Financial Resilience?*

# Policy Considerations for Asia

- ✓ Recent rise in NPLs in some Asian economies calls for close monitoring due to potential macrofinancial feedback effects and implications for region's financial stability
- ✓ Policy makers need to swiftly and effectively manage and respond to a buildup of distressed assets
- ✓ National legal, regulatory, and supervisory frameworks and institutional capacities need to be strengthened while efforts to build and develop a market for effectively addressing NPLs and distressed assets in the financial sector should be made complementarily
- ✓ Regional cooperation needed to identify and mitigate possible spillovers and contagion from cross-border bank lending and rapid deterioration of bank asset qualities where financial shocks can be spread through financial linkages across borders in the region

# Thank you very much!

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