



PUEY UNGPHAKORN INSTITUTE  
FOR ECONOMIC RESEARCH

# Consequences of Bank Loan Growth: Evidence from Asia

by

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February 2016

Discussion Paper

No. 19

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# **The Consequences of Bank Loan Growth: Evidence from Asia**

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10 February 2016

# The Consequences of Bank Loan Growth: Evidence from Asia

## ABSTRACT

When an increase in bank loans does not immediately lead to a hike in non-performing loans, bank loan officers (and/or bank managers) whose compensation is based on the value/amount of loans granted have incentives to grant more loans to (potentially lower credit quality) borrowers, which should increase the banks' profits (and their personal compensation) in the short run. Using a sample of publicly listed banks in 18 countries in Asia during the period 1990-2014, I show that banks' loan growth rate has a negative short-run effect on their non-performing loans and a positive short-run effect on their profitability. While the loan growth rate does not increase non-performing loans in the short run, there is some evidence to suggest that it increases non-performing loans in the long run. The results further indicate that banks' profitability is not affected by the level of loans but by the loan growth rate.

JEL Classification: F4; F5; G1; G2; G3

Keywords: Asia; financial crisis; loan growth; non-performing loans; profitability

## 1 Introduction

Since the global financial crisis of 2007-2009, there is a strong view that banks engage in higher risk-taking, which causes them not only to be more exposed to economic and financial shocks but also to increase systemic risk in the banking/financial systems that might result in banking and/or financial crises. For example, Farhi and Tirole (2012) note that the global financial crisis of 2007-2009 shows that commercial banks became more sensitive to market

conditions and that there is a large maturity mismatch in the financial systems. This view has been debated among policy makers and researchers (see e.g., Acemoglu et al., 2015; Allen et al., 2012; Freixas et al., 2000; Gauthier et al., 2012), leading to various changes in banking/financial regulations around the world. These debates also raise several empirical questions.

The starting point of this paper is that banks may ex ante attempt to maximize their profits by increasing revenues (through raising the supply of loans to borrowers). As suggested in the literature (see e.g., Mayordomo et al., 2014), in doing so, the level of non-performing loans tends to subsequently increase, which will naturally reduce profits of banks in subsequently periods. Two fundamental questions to be addressed in this paper are: (1) whether expanding bank loans leads to larger non-performing loans in the short run and (2) whether increasing bank loans results in higher profitability in the short run.

If expanding bank loans does not necessarily lead to larger non-performing loans in the short run but results in higher short-term profitability, a bank's lending officers who are compensated on the basis of the volume (and/or value) of loans made<sup>1</sup> are ex ante incentivized to grant more loans to increase their personal compensation at the costs of the bank's higher loan losses in the future. This issue is a standard moral hazard problem of banks.<sup>2</sup>

To empirically test the main prediction that the loan growth rate positively affects non-performing loans, I primarily use two estimation techniques: (1) ordinary least squares (OLS) regressions and (2) two-stage least squares regressions. Based on the final sample of 3,059

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<sup>1</sup> See, e.g., Bannier et al. (2013) for a discussion of implications of remuneration systems for risk-taking of banks.

<sup>2</sup> See, e.g., Morrison and White (2005) and Feess and Hege (2012) for a discussion of how banking regulators use capital requirements to mitigate moral hazard problems of banks.

bank-year observations, involving with 271 banks in 18 countries in Asia and Oceania (consisting of 15 developing countries and 3 developed countries) during the period 1990-2014, I obtain three major sets of key findings.

My first set of results shows that banks with higher loan growth rates tend to have lower ratios of non-performing loans to total loans in a following year, after controlling for bank-specific characteristics and country-level factors. This result is robust to several robustness checks and is in sharp contrast to the finding of prior studies. For example, Foos et al. (2010) find that loan growth is positively associated with loan loss provisions in a sample of 16 advanced economies during the period 1997-2007. In addition to illustrating that the loan growth rate has a negative effect on non-performing loans, I show that this effect is stronger for banks in developing countries than for banks in developed countries. My results provide support to a conjecture of Peek and Rosengren (2005), Caballero et al. (2008) and Bruche and Llobet (2014), who suggest that banks might be engaging in providing credit supply to insolvent borrowers in order to delay or avoid the realization of loan losses. A competing explanation is that by providing new loans to borrowers, banks practically increase the size of loan portfolio. In general, the new loans do not quickly become bad loans; therefore, when holding the amount of non-performing constant, an increase in total loans immediately leads to a fall in the ratio of non-performing loans to total loans. Another plausible explanation is that banks have improved their risk management and increased lending standards over time, leading to a larger share of high quality loans and a reduction in non-performing loans. This explanation is supported by recent studies such as Ağca et al. (2013) and Lee and Hsieh (2014), showing that financial reforms in the aftermath of financial crises improve banks' lending standards.

My second set of results shows that the loan growth rate has a positive long-run effect on non-performing loans; however, this result is not robust. Generally speaking, this finding is

consistent with the traditional view in the literature that as banks increase the size of their loan portfolio, they provide new loans to lower quality borrowers. The low quality loans become non-performing loans in subsequent years. Given that (1) the loan growth rate does not increase non-performing loans in the short run and (2) the loan growth rate has the positive long-run effect on non-performing loans, this study provides strong evidence to a current debate on new regulations on compensation (see e.g., Chaigneau, 2013; Hakenes and Schnabel, 2014; John et al., 2010; Murphy, 2013). For example, it has been argued that compensation schemes (e.g., deferred compensation) should incorporate long-term performance so as to mitigate the moral hazard problem in risk-taking and lending decisions (see e.g., Cole et al., 2015).

My third set of results indicates that banks with higher loan growth rate tend to have higher profitability, measured as the return on asset (ROA), after accounting for bank-specific characteristics and country-level factors. In addition, the effect of the loan growth rate on profitability is non-linear; that is, it has an inverted U-shaped relationship. My findings are in line with prior studies (see e.g., Onali, 2014) that document a positive association between bank risk-taking and dividends. When banks expect the government or the central bank to bail them out when a banking or financial crisis occurs (due to e.g., a too-many-too-fail effect and/or a too-big-too-fail effect), banks might be more willing to have an (excessive) appetite for risk-taking. For instance, Farhi and Tirole (2012) argue that leverage choices (e.g., of banks) are dependent on central banks' expected policy response to the overall maturity mismatch in the financial systems (e.g., financial institutions). Dam and Koetter (2012) find that in the context of Germany, an increase in bailout expectations of banks increases the probability of distress, suggesting that levels of risk taking by banks are dependent on safety nets in the banking system. In addition, Brown and Dinç (2011) find evidence for a too-many-too-fail effect (e.g., when the banking system is weak) in a sample

of 21 emerging market countries in the 1990s. Based on a sample of Euro-area and the U.S. bank lending standards, Maddaloni and Peydró (2011) show that when short-term interest rates are low, lending standards for both household and corporate loans are also softened.

This paper is organized as follows. I briefly discuss closely related studies in Section 2. In Section 3, I describe my data and summary statistics. In Section 4, I present empirical results for the short-run effect of the loan growth rate on non-performing loans. In Section 5, I present empirical results for the long-run effect of the loan growth rate on non-performing loans. Section 6 presents empirical results for the impact of the loan growth rate on profitability. I conclude the paper in Section 7.

## **2 Related studies**

While the effect of loan growth on non-performing loans should be positive, scholars such as Ellul and Yerramilli (2013) argue that other factors such as bank-specific risk management activities might alter this relationship. If banks increase their profitability in the short run by increasing the loan growth rate without having to suffer larger non-performing loans in the short run, it is natural to observe that banks expand the supply of loans, especially when banks' loan officers are compensated on the basis of the size of loans being granted. A non-positive relationship between the loan growth and non-performing loans will encourage banks' loan officers to approve more loan applications.

In closely related studies, Louzis et al. (2012) examine the macroeconomic and bank-level determinants of non-performing loans while Chen and Kao (2011) study the determinants of bank performing (including non-performing loans). A key difference between their study and mine is that their study focuses on the examination of banks in one country (e.g., the sample of Louzis et al. (2012) includes only nine largest banks in Greece;

the sample of Chen and Kao (2011) consists of banks in Taiwan) but this study includes banks in 18 countries in Asia.<sup>3</sup>

This paper is also closely related to Pesola (2011) who examines the impact of financial fragility and macroeconomic shocks on loan losses of banks at the aggregate level and shows that the indicator for indebtedness (the ratio of total outstanding lending of banks to GDP) has a positive effect on loan losses (the ratio of loan losses to lending) in Europe. While my results at the individual bank level are broadly consistent with that of Pesola (2011), I further show that the loan growth rate plays an important role in determining non-performing loans in the short run.

The findings of this paper contribute to a growing body of banking literature on the determinants of non-performing loans (see e.g., Chang et al., 2008; Lepetit et al., 2012; Louzis et al., 2012) and of profitability/efficiency (see e.g., Berger et al., 1993; Bolt et al., 2012; Bolt and Humphrey, 2010; Chan et al., 2014; Luo, 2003). Variation in non-performing loans can be explained by both bank-level and macro-level factors. Scholars such as Acharya and Naqvi (2012) and Bruche and Llobet (2014) argue that key internal factors that affect non-performing loans are lending standards and risk management processes of banks. Loans that are ex ante provided to high-risk borrowers (as a result of higher-risk taking of banks) are more likely to become problem loans and eventually non-performing loans<sup>4</sup>. Economic conditions (e.g., economic shocks) exacerbate the rate (as well as the speed) at which high-risk loans become non-performing loans. Furthermore, the recognition of non-performing loans also depends on the existence of loan evergreening or so-called zombie lending (see

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<sup>3</sup> The sample of this study is limited to only publicly listed banks due to the availability of data provided by Datastream.

<sup>4</sup> Please see, e.g., Maddaloni and Peydró (2011), Farhi and Tirole (2012), Acharya and Naqvi (2012), and Cole et al. (2015) for a discussion of banks' risk-taking behaviors.



e.g., Bruche and Llobet, 2014; Caballero et al., 2008). This paper is one of few studies that examine the impact of loan growth on non-performing loans of banks in Asia and thus complements prior studies such as Foos et al. (2010).

The findings of this paper also contribute to the literature on the influence of banking regulations on banks' behaviors (e.g., Banker et al., 2010; Lee and Hsieh, 2014). In this regard, I show that the effect of the loan growth rate on non-performing loans is time-varying, which is consistent with the notion that banks alter their behaviors following changes in banking regulations.

### **3 Data and summary statistics**

In this section, I describe my data in more detail. To examine whether the effects of bank loan growth on profitability and non-performing loans are significant and whether these effects are time varying, I first construct my sample by obtaining a list of all publicly listed commercial banks in all countries in Asia (including Australia and New Zealand) during the sample period spanning from 1990 to 2014 from Thompson Reuters Datastream. I exclude banks that were not listed by the end of 2010 from the sample in order to have at least a minimum of four annual observations for each bank in the sample for regression analyses.

I retrieve annual bank-level financial data over the sample period from Thomson Reuters Datastream and Worldscope. Based on the selection procedure discussed above, I have an initial sample of 366 commercial banks that are publicly listed in 21 countries in Asia. After excluding observations for which data on key variables, which will be discussed below<sup>5</sup>, were

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<sup>5</sup> A key challenge is to have an appropriate tradeoff between having a comprehensive specification that includes an extensive list of control variables but leads to a small sample size and having a parsimonious specification that leads to a larger sample size. Due to different banking regulations across countries, data on several variables

missing or not reported, I have the final sample of 3,059 bank-year observations, involving with 271 banks in 18 countries (consisting of 15 developing countries and 3 developed countries (Australia, Japan and Singapore)), for the main regression analyses. Appendix A shows the number of banks by country in the final sample. It should be noted that the number of banks for each country in my sample is quite similar to that of Beltratti and Stulz (2012).<sup>6</sup>

Following Chang et al. (2008), Banker et al. (2010), Festić et al. (2011), and Mayordomo et al. (2014), I measure the non-performing loans ratio as the ratio of non-performing loans to total loans (NPLTL). As an alternative measure of non-performing loans, I use the ratio of non-performing loans to total assets (NPLTA), which is used in recent studies such as Flannery and Giacomini (2015).

I compute a bank's loan growth rate (LOANGROWTH) as the first difference in the natural logarithm of a bank's total loans. To check the robustness of my findings, I use a bank's excess loan growth rate (LG) as an alternative proxy for the loan growth rate.

To control for other bank-specific factors that might determine levels of non-performing loans, I include a large set of bank-level control variables. Bank size (LNTA) is measured as the natural logarithm of total assets in millions USD. The loan-to-asset ratio (LOANTA) is measured as the ratio of total loans to total assets. The capitalization ratio (CAPTA) is measured as the ratio of total capital to total assets. The revenue diversification ratio (BRD)

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are not available for banks in all countries. A case in point is that for banks in Vietnam in the sample, values of non-performing loans are missing/unreported in the database but values of reserves for loan losses are available, resulting in the removal of all banks in Vietnam from the sample when bad loans are measured as non-performing loans. If reserves for loan losses, instead of non-performing loans, are used as a measure of bad loans (see e.g., Bikker and Metzmakers, 2005), banks in Vietnam will be included in the sample but several banks in other countries with missing values of reserves for loan losses will be excluded from the sample.

<sup>6</sup> Beltratti and Stulz (2012) examine stock returns of large banks during the global financial crisis of 2007-2008.

is computed as the ratio of non-interest income to net revenue. The cash-to-deposit ratio (CASHDEP), which is computed as the ratio of cash to total deposit, is used as a measure of liquidity against a run on banks. Banks with a high degree of liquidity will be more likely to withstand systemic shocks to the banking system. To measure a bank's profitability, I use return on assets (ROA), which is computed as the ratio of earnings before interest and taxes (EBIT) to total assets. Operating risk (SDROA), which is measured as the three-year moving standard deviation of ROA, captures a bank's (unobservable) ex ante risk-taking appetite. Banks that provide loans to riskier borrowers (or low credit-quality borrowers) are more likely to have larger variation in profitability than those that provide loans to high credit-quality firms. Stock price performance, which is measured as the first difference in the natural logarithm of stock prices, is a market-based measure of bank performance.

To control for country-level factors that affect non-performing loans of banks, I include three country-level variables: (1) the GDP growth rate (GDPRATE), which is computed as the first difference in the natural logarithm of real GDP in US dollar, (2) the inflation rate (INFLATION), which is the percentage year-on-year change in average consumer prices, and (3) the investment rate (INVESTMENT), which is the share of investment as a percentage of GDP. All three variables measure different aspects of economic conditions of a country.

[Insert Table 1 about here]

Table 1 presents summary statistics for a number of bank-specific variables used in the final sample of this study after winsorizing all variables at the 1% and 99% percentiles in order to minimize the effects of outliers and eliminate any data recording errors. Panel A of Table 1 reports summary statistics for the full sample period. The mean value of the ratio of non-performing loans to total loans (NPLTL) is 4.7%, which is slightly smaller than the mean

value of NPLTA of 6.7% for a sample of 224 banks in Europe over the period 1994-2005 reported by Lepetit et al. (2012). The mean value of the loan growth rate (LOANGROWTH) is 13.4%, while the mean value of the loan-to-assets ratio (LOANTA) is 64.8%, which is larger than the mean value of LOANTA of 61.8% for the European banks reported by Lepetit et al. (2012). There is a significant difference in non-performing loans of banks in developing countries and banks in developed countries; that is, the mean value of NPLTL for the developing countries sample is 5.7% while the mean value of NPLTL for the developed countries sample is 3.7%. The difference in the mean value of NPLTL is statistically significant ( $p$ -value  $< 0.001$ ). In addition, the mean value of LOANGROWTH for the developing countries sample is 14.5% while the mean value of LOANGROWTH for the developed countries sample is 2.3%; the difference in the mean value of LOANGROWTH is statistically significant ( $p$ -value  $< 0.001$ ).

Panels B and C of Table 1 present summary statistics for the Asian financial crisis (AFC) period (i.e., 1997-1998) and the global financial crisis (GFC) period (i.e., 2007-2009), respectively. The mean value of NPLTL for the AFC period and the GFC period is 3.5% and 4.1% respectively. The mean value of LOANGROWTH for the AFC period and the GFC period is 3.0% and 11.0%, respectively. One likely explanation for the higher loan growth rate during the GFC period relative to the AFC period is that during the GFC period firms draw down on credit lines committed by banks, forcing banks to involuntarily increasing their lending. This view is supported by the finding of Campello et al. (2012) who show that small and financially constrained firms in Europe used more funds from credit lines during the global financial crisis than large and less-financially-constrained firms.

Panel D of Table 1 presents summary statistics for the non-crisis period (i.e., 1992-1996, 1999-2006, and 2010-2014). The mean value of NPLTL for the non-crisis period is 4.9%, which is roughly similar to the mean value of NPLTL for the full sample period. However,

compared with the full sample period, the mean value of LOANGROWTH for the non-crisis period is smaller (7.9% vs. 13.4%). As expected, stock price performance of banks is poor during the crisis periods, relative to the non-crisis period. That is, the mean value of stock returns (RETURN) is -15.5% and -7.9% for the AFC period and the GFC period, respectively, whereas the mean value of RETURN is 7.2% during the non-crisis period.

To understand variation in loan growth and non-performing loans of Asian banks in the sample over time, I plot the time-series of the mean value of the loan growth rate (LOANGROWTH) and the ratio of non-performing loans to total loans (NPLTL) for the developing countries sample (DEV = 0) and the developed countries sample (DEV = 1) over the period 1993-2014 in Figure 1. The figure clearly shows that non-performing loans for banks in developing countries are much larger than those for banks in developed countries. The non-performing loans for the developing countries increase substantially during the Asian financial crisis and remain high until 2005. The loan growth rate is higher for the developing countries than for the developed countries throughout the sample period. One plausible interpretation of this figure is that given the substantially higher loan growth rate for the developing countries than for the developed countries, the non-performing loans for banks in the developing countries are higher than those in the developed countries but are lower than expected. There are at least two possible explanations for this pattern of the time-series. First, banks in developed countries have had better risk management activities than banks in developing countries. Second, the existence of zombie lending is more prevalent among banks in developing countries than banks in developed countries.

[Insert Table 2 about here]

[Insert Figure 1 about here]

Table 2 reports correlation coefficients of key bank-level variable in the final sample of 3,059 bank-year observations. NPLTL is negatively correlated with LOANGROWTH, LNTA, ROA, DEPTA, and BRD and is positively correlated with MBV, CAPTA, and SDROA. At this point, it is important to note that NPLTL is not correlated with LOANTA, implies that variation in non-performing loans is not associated with the level of total loans. The positive and significant correlation between LOANGROWTH and ROA is consistent with Becker and Ivashina (2014), who find that a bank's profitability tends to drive the supply of its loans.

#### 4 The short-run impact of loan growth on non-performing loans

##### 4.1 Empirical framework

In this section, I primarily test whether a bank's loan growth increases non-performing loans in the short run and whether financial crises affect this relationship. My empirical model of non-performing loans is largely consistent with those used in the empirical banking literature (e.g., Chang et al., 2008; Louzis et al., 2012). To evaluate the effect of loan growth on non-performing loans, I estimate several versions the following benchmark regression.

$$y_{i,j,t} = \alpha + \beta_1 LOANGROWTH_{i,j,t-1} + \gamma \mathbf{B}_{i,j,t-1} + \lambda \mathbf{C}_{j,t} + \eta_i + \nu_t + \varepsilon_{i,j,t}, \quad (1)$$

where the indices  $i, j$ , and  $t$  correspond to bank, country, and year, respectively. The outcome variable  $y_{i,j,t}$  is a measure of non-performing loans such as the ratio of non-performing loans to total loans (NPLTL).  $LOANGROWTH_{i,j,t-1}$  is the first difference in the natural logarithm of total loans for bank  $i$  at time  $t-1$ ;  $\mathbf{B}_{i,j,t-1}$  is a vector of bank-specific characteristics for bank  $i$

at time  $t-1$ ;  $\mathbf{C}_{j,t-1}$  is a vector of country-level control variables for country  $j$  at time  $t-1$ ;  $\eta_i$  represents the bank fixed effect;  $\nu_t$  represents the year fixed effect, and  $\varepsilon_{i,j,t}$  is the zero-mean disturbance term. Standard errors that are adjusted for heteroskedasticity and serial correlation are clustered at the bank level.

To assess the impact of a bank's loan growth on non-performing loans, I estimate a series of panel OLS regressions of non-performing loans on loan growth and a set of bank-specific and country-level variables. I include (1) bank fixed-effects to control for omitted time-invariant bank characteristics, (2) year fixed-effects to control for any unobserved time-variant global (business cycle) influence that affects all banks in the sample, (3) country fixed effects to control for omitted time-invariant country characteristics, and/or (4) country-year interactions to control for the differential impact of unobserved time-variant macroeconomic factors by country. I attempt to deal with the potential endogeneity problem by lagging all right-hand side variables by one period, which should address reverse-causality concerns (e.g., causal effects running from non-performing loans to independent variables).

If an increase in a bank's loan growth at time  $t-1$  results in an increase in its non-performing loans at time  $t$ , the estimated coefficient on LOANGROWTH in Equation (1) should be positive and statistically significant. Of course, an insignificant estimated coefficient on LOANGROWTH cannot rule out the impact of loan growth on non-performing loans; however, it will suggest that the loan growth rate has no direct short-run effect on non-performing loans.

To examine whether financial crises (i.e., the Asian financial crisis (AFC) of 1996-1997 and global financial crisis (GFC) of 2007-2009) moderate the relationship between loan growth and non-performing loans, I add the interaction term between LOANGROWTH and financial crisis dummies (i.e., AFC and GFC) in the specification as follows:

$$y_{i,j,t} = \alpha + \beta_{LOANGROWTH} LOANGROWTH_{i,j,t-1} + \beta_{AFC} AFC_{i,j,t-1} + \beta_{GFC} GFC_{i,j,t-1} + \gamma \mathbf{B}_{i,j,t-1} + \lambda \mathbf{C}_{j,t} + \eta_i + \varepsilon_{i,j,t}, \quad (2)$$

$$y_{i,j,t} = \alpha + \beta_{LOANGROWTH} LOANGROWTH_{i,j,t-1} + \beta_{AFC} AFC_{i,j,t-1} + \beta_{GFC} GFC_{i,j,t-1} + \beta_{LOANGROWTH \times AFC} LOANGROWTH_{i,j,t-1} AFC_{i,t-1} + \beta_{LOANGROWTH \times GFC} LOANGROWTH_{i,j,t-1} GFC_{i,t-1} + \gamma \mathbf{B}_{i,j,t-1} + \lambda \mathbf{C}_{j,t} + \eta_i + \varepsilon_{i,j,t}, \quad (3)$$

where  $AFC_{i,t}$  is the Asian financial crisis dummy variable, which takes a value of one during 1997-1998 and zero otherwise.  $GFC_{i,t}$  is the global financial crisis dummy variable, which takes a value of one during 2007-2009, and zero otherwise.

The statistically significant estimated coefficients  $\beta_{AFC}$  and  $\beta_{GFC}$  in Equation (2) would indicate the direct effect of the Asian financial crisis and the global financial crisis, respectively, on the non-performing loans. I expect the estimated coefficients  $\beta_{AFC}$  and  $\beta_{GFC}$  in Equation (2) to be positive and statistically significant, which will suggest an increase in the level of non-performing loans during the financial crisis period, relative to the non-crisis period. It should be noted that when the AFC dummy variable and the GFC dummy variable are included in Equation (2), the year fixed effects have to be removed from the specification.

If the financial crises alter the relation between loan growth and non-performing loans (thereby providing evidence for the time-varying effect of loan growth on non-performing loans), the coefficients on the interaction terms in Equation (3) should be statistically significant. When the estimated coefficient on LOANGROWTH is positive, a positive coefficient on the interaction term implies that the financial crises strengthen the positive effect of loan growth on non-performing loans, whereas a negative coefficient on the interaction term implies that the financial crises weaken the positive effect of loan growth on non-performing loans. We first estimate Equation (3) without year fixed effects and subsequently



estimate the modified specification of Equation (3) by dropping the direct effects of financial crises dummy variables and including year fixed effects.

#### 4.2 *Main empirical results*

Table 3 presents the results of OLS estimation of Equation (1). In column (1) of Table 3, I estimate the baseline OLS regression including only control variables, bank fixed effects, and year fixed effects over the full sample period.<sup>7</sup> The dependent variable is NPLTL, which is the ratio of non-performing loans to total loans. I regress NPLTL on the contemporaneous country-level variables and one-year lagged bank-level explanatory variables.

The results in column (1) show that the coefficients on all three country-level variables are statistically significant at the 5% level or better, indicating that the inflation rate is positively associated with non-performing loans and that the GDP growth rate and the investment rate are negatively associated with non-performing loans. The finding of the negative effect of the GDP growth rate is consistent with that of Louzis et al. (2012). I find that the market-to-book ratio (MBV), which measures a bank's growth opportunities, and operating risk (SDROA), which measures a bank's volatility in profitability, are positively associated with non-performing loans. Revenue diversification (BRD), profitability (ROA), stock price performance (RETURN) have a negative impact on non-performing loans. Interestingly, the coefficient on the loan-to-asset ratio (LOANTA) is statistically significant at only the 10% level, suggesting that the level of loans has no direct effect on the level of non-performing loans. In addition, the coefficient on CAPTA is statistically insignificant,

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<sup>7</sup> Hausman tests suggest that fixed-effect models are preferred to random-effect models.

suggesting that banks with lower capitalization do not have higher levels of non-performing loans. This finding is in line with Louzis et al. (2012).

[Insert Table 3 about here]

[Insert Table 4 about here]

To test the direct effect of loan growth on non-performing loans, I add LOANGROWTH in column (2) and find that the coefficient on LOANGROWTH is negative and statistically significant at the 1% level, suggesting the negative impact of loan growth on non-performing loans is counterintuitive. This finding is inconsistent with prior studies such as Foos et al. (2010), who find that abnormal loan growth has a positive effect on loan losses. The magnitude of the coefficients in column (2) is largely similar to that of column (1), suggesting the stability of the estimation. The coefficient on LOANTA is positive and statistically significant at the 1% level. This result is consistent with the literature (see e.g., Foos et al., 2010). In terms of the economic significance of the loan growth rate, given the estimated coefficient on the loan growth rate is -0.046 (see column (2)), a one-standard deviation (0.129) increase of the loan growth rate (LOANGROWTH) will lead to about a 12.6% ( $= 0.046 \times 0.129/0.087$ ) decrease in non-performing loans (NPLTL) at the mean.

To examine whether the finding is robust to controlling for unobservable time-invariant country effects, I replace bank fixed effects with country fixed effects in column (3). The basic finding that the loan growth rate has a negative effect on non-performing loans remains evident in column (3). I further test the robustness of my findings by replacing country fixed effects with interactions between country dummies and YEAR, which is a time trend variable, in column (4). The results in column (4) still indicate that the loan growth rate has a negative effect on non-performing loans, after controlling for a large set of the bank-specific

factors, the country-level variables, and the country-year interactions. I interpret this finding as empirical evidence for the existence of loan evergreening or zombie lending. Banks have incentives to keep providing credit to impaired/insolvent borrowers to avoid the realization of loan losses under some circumstances (see e.g., Bruche and Llobet, 2014; Caballero et al., 2008; Peek and Rosengren, 2005). In doing so, an increase in loans on banks' balance sheet is not associated with an increase in non-performing loans. If this practice is prevalent across banks, the relationship between loan growth and non-performing loans might even become negative. Holding the amount of non-performing loans constant (e.g., as a result of loan evergreening), an increase in total loans leads to a smaller value of the ratio of non-performing loans to total loans (NPLTL). Nevertheless, Figure 1 appears to suggest that although banks might engage in zombie lending in general, they (at least those in developing countries) were unable to avoid the recognition of problem loans during the Asian financial crisis.

Table 4 presents the estimation results of Equations (2) and (3). To test the direct impact of financial crises on non-performing loans, I replace year fixed effects with the one-period lagged AFC dummy variable and the one-period lagged GFC dummy variable in columns (1), (2), and (3) in Table 4. Looking across Table 4, I find that the coefficient on AFC is not statistically significant, while the coefficient on GFC is negative and statistically significant at the 1% level, suggesting that the Asian financial crisis seems to have no direct effect on non-performing loans of banks in Asia but the global financial crisis exerts a direct effect on non-performing loans of the banks in Asia.<sup>8</sup> One plausible for this explanation is that only a limited number of countries in Asia (e.g., Malaysia, Thailand, Indonesia, South Korea) had directly suffered from the Asian financial crisis, whereas the effects of the global financial

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<sup>8</sup> Using the contemporaneous value of AFC and GFC instead of using the one-year lag of AFC and GFC leads to similar results.

crisis were broader in scope. In a related study, Chen and Kao (2011) show that a financial reforms in Taiwan, which was introduced in 2001, substantially reduced the level of non-performing loans of banks in Taiwan.

In columns (3) and (4), I interact LOANGROWTH with each of the financial crisis dummies variables. The key difference between column (3) and column (4) in Table 4 is that AFC and GFC are included in column (3) to control for the direct impact of financial crises, while I replace both financial crisis variables with year fixed effects in column (4). Overall, the results in both columns (3) and (4) indicate that both financial crises weaken the negative effect of the loan growth rate on the non-performing loans since the coefficients on the interaction terms are positive and statistically significant.

In summary, the results in Tables 3 and 4 suggest that the loan growth rate has a negative short-run effect on non-performing loans after controlling for a large set of bank-specific and country-specific factors, which is surprising. This negative effect was weakened during the Asian financial crisis as well as the global financial crisis.

#### *4.3 The short-run impact of loan growth on non-performing loans: Developing and developed countries*

Since my sample includes banks based in developing and developed countries, it is possible that banks in developed counties behave differently to those of banks in developing countries due to, for example, different banking regulation. Therefore, I examine whether the basic finding that the bank growth rate has a negative effect on non-performing loans by (1) estimating the model that includes the interaction between LOANGROWTH and a developed country dummy variable (DEV), taking a one of one for a bank in a developed country (i.e., Australia, Japan, and Singapore) and zero otherwise, and (2) estimating the main

specifications separately for two subsamples: the developed countries sample and the developing countries sample. I report the estimation results in Table 5. The coefficient on the interaction between LOANGROWTH and DEV in column (1) is negative and statistically significant at the 1% level, implying that the negative effect of the loan growth rate on non-performing loans is weaker for banks in developed countries than those in developing countries. As can be seen in columns (2) and (3), while the coefficient on LOANGROWTH is negative and statistically significant at the 1% levels in both subsamples, the size of coefficient on LOANGROWTH for the developing countries sample is almost three times larger than the size of the coefficient on LOANGROWTH for the developed countries sample.

Overall, the results in Table 5 suggest that there is a negative relationship between loan growth and non-performing loans for banks in both developing and developed countries. Compared to banks in developed countries, this negative effect is stronger for banks in developing countries. If banks engage in loan evergreening and developing countries have weaker banking regulations/supervision than developed countries, the finding that the negative effect of loan growth on non-performing loans is stronger for banks in developing countries than for banks in developed countries is consistent with the interpretation that the prevalence of loan evergreening is more substantial in developing countries than in developed countries. This interpretation is based on the fact that prior studies (see e.g., Caballero et al., 2008) show the existence of loan evergreening in Japan in the 1990s.

[Insert Table 5 about here]

#### 4.4 *Robustness tests*

##### 4.4.1 *The short-run impact of excess loan growth on non-performing loans*

The basic finding in the previous sections suggests that a bank's loan growth rate has a negative effect on non-performing loans in the short run. Skeptical readers may be concerned with the contemporaneous relationship between my measure of the loan growth rate and other bank-specific characteristics. To address this issue, I apply the two-step methodology used by finance scholars such as García (2013), Christoffersen et al. (2013), Gopalan et al. (2014) and Lemmon et al. (2014). In the first-stage regression, I estimate the OLS regression of the loan growth rate (LOANGROWTH) on a set of contemporaneous bank-level and country-level variables as follows.

$$LOANGROWTH_{i,j,t} = \alpha + \gamma \mathbf{B}_{i,j,t} + \lambda \mathbf{C}_{j,t} + \eta_i + \nu_t + \varepsilon_{i,j,t}. \quad (4)$$

I use the residual obtained from the OLS estimation of Equation (4), which is orthogonal to all explanatory variables (including bank fixed effects and year fixed effects) in Equation (4), as the instrument for the loan growth rate in the second-stage regression estimation. Hence, in effect, I strip the loan growth rate of any contemporaneous relationship with key bank-specific factors, country-level factors, bank fixed effects, and year fixed effects.

Table 6 presents the results of first-stage least squares regression where the dependent variable is LOANGROWTH. Data for the entire sample period is used. The results in Table 6 indicate that the GDP growth rate (GDPRATE)<sup>9</sup>, the loan-to-assets ratio (LOANTA), profitability (ROA), and revenue diversification (BRD) are positively associated with the loan growth rate (LOANGROWTH), while the capital-to-asset ratio (CAPTA) is negatively

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<sup>9</sup> The positive relationship between the GDP growth rate and the loan growth rate is consistent with the literature, which suggests that banks' behaviors (e.g., lending standards) are influenced by macroeconomic conditions (see e.g., Maddaloni and Peydró, 2011).

associated with LOANGROWTH. The adjusted  $R^2$  of the first-stage regression is 41.6%, providing a reasonable level of confidence for the predictive power of the model. I refer to the unexplained variation in LOANGROWTH, that is the first-stage regression residual, LG.

[Insert Table 6 about here]

[Insert Table 7 about here]

[Insert Table 8 about here]

Using the orthogonalized loan growth measure (i.e., the residuals obtained from the OLS estimation of Equation (4)) as a proxy for the excess (unexplained) loan growth rate (LG) for each bank-year in the second-stage least squares regressions, I estimate regressions in Tables 3, 4 and 5 again and report the second-stage OLS regression results in Tables 7 and 8. The independent variable of interest is LG. I find that the pattern of the results remains largely unchanged. Precisely, the coefficient on LG is negative and statistically significant at the 1% level in all models. In addition, the coefficients on the interaction terms in columns (4) and (5) in Table 7 are positive and statistically significant. The results in Table 8 show that the negative effect of loan growth on non-performing loans is smaller for banks in developed countries, relative to banks in developing countries. Thus, the basic findings are robust to the different measures of the loan growth rate.

#### 4.4.2 *Additional robustness tests*

I have conducted a number of additional robustness checks for the short-run effect of loan growth on non-performing loans. In this subsection, I highlight some of the robustness

checks. First, in the main OLS and two-stage regression analyses, I use the ratio of non-performing loans to total loans (NPLTL) as a measure of non-performing loans in the estimates for the relationship between the loan growth rate and the non-performing loans. I examine whether the basic findings are robust to an alternative measure of the non-performing loans. Instead of scaling non-performing loans by total loans, I use total assets to scale non-performing loans. That is, the ratio of non-performing loans to total assets (NPLTA) is used as a proxy for problem loans. I estimate my main specifications in Table 3 again using NPLTA as the dependent variable. In untabulated results, I find that the coefficient on LOANGROWTH remains negative and statistically significant as before. While the coefficient on the interaction term between LOANGROWTH and GFC is still positive and statistically significant, the coefficient on the interaction term between LOANGROWTH and AFC is positive and statistically insignificant.

Second, I test whether the results are driven by global economic and credit conditions. I use US corporate bond credit spreads, computed as the difference Moody's seasoned BAA-rated US corporate bond yield and Moody's seasoned AAA-rated US corporate bond yield, as instruments for global credit conditions. Since low corporate bond credit spreads indicate strong credit conditions (e.g., credit markets are not under stress), the supply of credit in international markets is likely to be relatively abundant (assuming the relatively high degree of synchronization of business cycles across countries). Tight US credit markets (e.g., a supply shock to the US credit markets) typically coincide with tight credit markets in other countries where controls on capital flows are minimal. I also use US term spreads, computed as the difference between the 10-year treasury constant maturity rate and the 1-year treasury constant maturity rate to proxy for the expected global economic prospect. To conserve space, I do not tabulate the results. I find that the negative effect of the loan growth rate on



non-performing loans is robust to controlling for US corporate bond credit spreads and US term spreads.

Last but not least, I test whether the negative and significant effect of the loan growth rate on non-performing loans for the full sample period holds for different sub-periods. Thus far, we use year fixed effects to control for time-variant omitted global-level factors that affect all banks in the sample and bank fixed effects to control for time-invariant omitted bank-level factors. In some specifications, I use country fixed effects to control for time-variant omitted country-level factors. These approaches may not be adequate to control for potential structural shifts at the control level that occur at a certain point in time over the sample period. After the Asian financial crisis, there were major banking/financial reforms in crisis-hit countries such as Thailand and South Korea. Likewise, several countries introduce changes in banking/financial regulations in the aftermath of the global financial crisis of 2007-09. Hence, there could be sudden changes in unobservable omitted time-invariant bank-level and country-level factors. To address this issue, I divide the full sample period into three sub-periods: the pre-2000 period; the 2000-2010 period, and the 2011-2014 period. I estimate the main specification (i.e. column (2) of Table 3) for each of the three sub-periods. The untabulated results show that the effect of the loan growth on non-performing loans is negative and statistically insignificant for the pre-2000 period, is negative and statistically significant at the 5% level for the 2000-2010 period, and is negative and statistically significant at the 10% level for the 2011-2014 periods. In addition, the positive effect of the level of the loans-to-assets ratio (LOANTA) on non-performing loans is positive and statistically significant at the 1% level for the first two sub-periods and is positive and statistically significant for the last period. These findings appear to suggest that the loan growth rate has no effect on non-performing loans until the end of the Asian financial crisis. In the aftermath of the reforms occurring during/after the Asian financial crisis, the loan

growth rate has a negative effect on non-performing loans. This negative effect becomes insignificant after the global financial crisis, which might be attributable to changes in banking regulations introduced during and/or after the global financial crisis.

## 5 The long-run impact of loan growth on non-performing loans

Thus far, I have shown that a bank's loan growth rate has a negative short-run effect on non-performing loans. This negative relationship will naturally encourage banks to further increase their loans at the risk of having more bad loans in the long run. In this section, I examine whether a bank's loan growth has a positive long-run effect on non-performing loans. More specifically, I estimate the following regressions:

$$y_{i,j,t} = \alpha + \beta_1 LOANGROWTH_{i,j,t-1} + \beta_2 LOANGROWTH_{i,j,t-2} + \beta_3 LOANGROWTH_{i,j,t-3} + \gamma \mathbf{B}_{i,j,t-1} + \lambda \mathbf{C}_{j,t} + \eta_i + \nu_t + \varepsilon_{i,j,t}, \quad (5)$$

$$y_{i,j,t} = \alpha + y_{i,j,t-1} + \beta_1 LOANGROWTH_{i,j,t-1} + \beta_2 LOANGROWTH_{i,j,t-2} + \beta_3 LOANGROWTH_{i,j,t-3} + \gamma \mathbf{B}_{i,j,t-1} + \lambda \mathbf{C}_{j,t} + \eta_i + \nu_t + \varepsilon_{i,j,t}, \quad (6)$$

where all variables are defined as before. If the loan growth rate has a positive long-run effect on non-performing loans, the coefficients  $\beta_2$  and/or  $\beta_3$  should be positive and statistically significant. To control for a possibility that non-performing loans are persistent, I also estimate a simple dynamic OLS regression of Equation (6) where a one-period lag of the dependent variable is included as an explanatory variable.

Table 9 presents the results of panel OLS regressions of Equations (5) and (6), where the dependent variable is NPLTL. I estimate regressions in levels in columns (1) and (2) and in

first differences in columns (3) and (4). I use  $\Delta$  to denote the first difference operator (e.g.,  $\Delta NPLTL = NPLTL_t - NPLTL_{t-1}$ ). The results in column (1) provide evidence for the negative short-run effect and the negative long-run effect of the loan growth rate on non-performing loans as the coefficient on the one-year lag of LOANGROWTH is negative and statistically significant and the coefficient on the two-year lag of LOANGROWTH is negative and statistically significant. However, the coefficient on the three-year lag of LOANGROWTH is statistically insignificant. The simple dynamic OLS regression results in column (2) indicate that after controlling for a one-year lag of non-performing loans<sup>10</sup>, the negative short-run effect of the loan growth rate disappears. The coefficient on the two-year lag of LOANGROWTH is negative and statistically significant while the coefficient on the three-year lag of LOANGROWTH is positive and statistically significant, suggesting that the loan growth rate on non-performing loans is negative in the intermediate run and is positive in the long run. Results of first-difference regressions in columns (3) and (4) also reveal that the effect of the loan growth rate on non-performing loans is negative in the short- and intermediate-run.

[Insert Table 9 about here]

Overall, the results in this subsection suggest that the loan growth rate does not result in an increase in non-performing loans in the short run but may lead to a hike in non-performing loans in the long run.

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<sup>10</sup> A positive and statistically significant coefficient on the one-year lag of NPLTL implies that non-performing loans are persistent in the short-run (i.e., the partial adjustment process).

## 6 The short-run impact of loan growth on profitability

One important question that has been raised in the literature is whether a bank with higher loan growth is more profitable after controlling for risk. To address this question, I empirically test whether a lagged loan growth rate (i.e. LOANGROWTH at time  $t-1$ ) has a positive effect on profitability, measured as return on assets (ROA), after controlling for operating risk (SDROA), the level of the loan-to-asset ratio (LOANTA), and other factors. I use ROA as a measure of profitability in this study since banks' performance-based compensation scheme (e.g., bonuses) is generally based on profits. Accordingly, I estimate the following regression.

$$ROA_{i,j,t} = \alpha + \beta_{LOANGROWTH} LOANGROWTH_{i,j,t-1} + \gamma \mathbf{B}_{i,j,t-1} + \lambda \mathbf{C}_{j,t} + \eta_i + \nu_t + \varepsilon_{i,j,t}. \quad (7)$$

Table 10 presents the estimation results of Equation (7), where the dependent variable is return on assets (ROA). The results in column (1) reveal that the loan growth rate has a positive effect on profitability, given that the coefficient on LOANGROWTH is positive and statistically significant at the 1% level. Consistent with theory, the GDP growth rate and the investment rate have a positive effect on banks' profitability. Overall, the results in column (1) indicate that banks with better capitalization (CAPTA), more liquidity (CASHDEP), and better stock price performance (RETURN), and higher loan growth rate (LOANGROWTH) tend to be more profitable, while smaller banks with smaller assets (LNNTA) and banks with greater operating risk (SDROA) are more likely to be less profitable. Interestingly, the effect of revenue diversification on profitability is insignificant, indicating that the focus on non-interest income strategies (or lack thereof) has no direct effect on profitability of banks in Asia. This finding is in contrast to those of prior studies. For example, Demirgüç-Kunt and

Huizinga (2010) show that revenue diversification, measured as the share of non-interest income to total income, is positively associated with ROA. Furthermore, while prior studies such as Bolt et al. (2012) show that the level of loans positively affects profitability, I find that this effect of is LOANTA is insignificant, regardless of whether or not the loan growth rate is included in the regression.

[Insert Table 10 about here]

To test whether the finding that the loan growth rate has a positive effect on profitability is robust after controlling for potentially omitted time-invariant country-level factors, I replace bank fixed effects with country fixed effects in column (2), leading to virtually unchanged results.<sup>11</sup> That is, the effect of the loan growth rate on profitability is still positive and statistically significant. I test the non-linear effect of the loan growth rate on profitability by adding the squared term of LOANGROWTH in column (3). The coefficient on the squared term in column (3) is negative and statistically significant at the 1% level. The results in Table 10 suggest that the effect of the loan growth rate on profitability is positive and non-linear (i.e., inverted U-shaped).

## **7 Conclusion**

One of important questions related to financial institutions is whether expanding a bank's loans increases the level of non-performing loans. From banking supervision's perspective,

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<sup>11</sup> The fact that the results are generally insensitive to bank fixed effects or country fixed effects is supportive of the view of Beltratti and Stulz (2012), who find that there is no correlation between differences in banking regulations across countries and variation in bank performance during the global financial crisis of 2007-2008.

this question is crucial since a significant increase in non-performing loans poses a greater risk to the stability of banking/financial systems that might eventually cause a banking/financial crisis. While this question has been addressed extensively in the context of developed countries, empirical evidence for developing countries, especially those in Asia, is still limited. Hence, in this paper I revisit this question using a sample of publicly listed banks in Asia between 1990 and 2014.

The main focus of this paper is to study (1) the short- and long-run effects of the loan growth rate on non-performing loans and (2) the short-run effect of the loan growth rate on profitability. Overall, the results indicate that banks with higher loan growth rate tend to have smaller non-performing loans in the short run. In addition, this effect is stronger for banks in developing countries than for banks in developed countries. For this negative effect to occur, banks either have good risk management systems (resulting in high quality loan portfolios) or engage in loan evergreening. My results further show that the effect of the loan growth rate on non-performing loans is time varying. That is, the effect is insignificant prior to 2000 (i.e. before the end of the Asian financial crisis), is negative and significant during 2000-2010, and is negative and marginally significant during 2011-2014. The time-varying effects of the loan growth rate might be attributable to unobservable changes in banks' behaviors (e.g., lending standards) as a result of changes in banking regulations in the aftermath of financial crises. My analysis further reveals that the loan growth rate has a positive long-run effect on non-performing loans; however, this long-term effect is not robust. I also find that banks with higher loan growth rate tend to have higher profitability, measured as the return on asset (ROA), after accounting for bank-specific characteristics and country-level factors.

In summary, my findings highlight new and important insights into the short- and long-run implications of a bank's loan growth on non-performing loans. Given that an increase in the loan growth rate increases profitability and lowers, rather than increases, the level of non-

performing loans, banks ex ante have an incentive to expand their credit supply during good times, especially when they expect to be bailed out at the time of banking or financial crises.

## Appendix A

### Appendix A1. The number of banks by country

This table reports the number of banks for each country in the final sample.

Country No	Country	The number of banks
1	Australia	6
2	China	15
3	Hong Kong	7
4	India	39
5	Indonesia	24
6	Japan	82
7	Malaysia	9
8	Oman	2
9	Pakistan	15
10	Philippines	11
11	Qatar	5
12	Saudi Arabia	11
13	Singapore	3
14	South Korea	5
15	Sri Lanka	6
16	Taiwan	3
17	Thailand	10
18	United Arab Emirates	18
Total		271

## References

Acemoglu, D., Ozdaglar, A., Tahbaz-Salehi, A., 2015. Systemic risk and stability in financial networks. *American Economic Review* 105, 564-608.

Acharya, V., Naqvi, H., 2012. The seeds of a crisis: A theory of bank liquidity and risk taking over the business cycle. *Journal of Financial Economics* 106, 349-366.

Ağca, Ş., De Nicolò, G., Detragiache, E., 2013. Banking sector reforms and corporate leverage in emerging markets. *Emerging Markets Review* 17, 125-149.

- Allen, F., Babus, A., Carletti, E., 2012. Asset commonality, debt maturity and systemic risk. *Journal of Financial Economics* 104, 519-534.
- Banker, R.D., Chang, H., Lee, S.-Y., 2010. Differential impact of Korean banking system reforms on bank productivity. *Journal of Banking & Finance* 34, 1450-1460.
- Bannier, C.E., Feess, E., Packham, N., 2013. Competition, bonuses, and risk-taking in the banking industry. *Review of Finance* 17, 653-690.
- Becker, B., Ivashina, V., 2014. Cyclicity of credit supply: Firm level evidence. *Journal of Monetary Economics* 62, 76-93.
- Beltratti, A., Stulz, R.M., 2012. The credit crisis around the globe: Why did some banks perform better? *Journal of Financial Economics* 105, 1-17.
- Berger, A.N., Hancock, D., Humphrey, D.B., 1993. Bank efficiency derived from the profit function. *Journal of Banking & Finance* 17, 317-347.
- Bikker, J.A., Metzmakers, P.A.J., 2005. Bank provisioning behaviour and procyclicality. *Journal of International Financial Markets, Institutions and Money* 15, 141-157.
- Bolt, W., de Haan, L., Hoeberichts, M., van Oordt, M.R.C., Swank, J., 2012. Bank profitability during recessions. *Journal of Banking & Finance* 36, 2552-2564.
- Bolt, W., Humphrey, D., 2010. Bank competition efficiency in Europe: A frontier approach. *Journal of Banking & Finance* 34, 1808-1817.
- Brown, C.O., Dinç, I.S., 2011. Too many to fail? Evidence of regulatory forbearance when the banking sector is weak. *Review of Financial Studies* 24, 1378-1405.
- Bruche, M., Llobet, G., 2014. Preventing zombie lending. *Review of Financial Studies* 27, 923-956.
- Caballero, R.J., Hoshi, T., Kashyap, A.K., 2008. Zombie lending and depressed restructuring in Japan. *American Economic Review* 98, 1943-1977.



- Campello, M., Giambona, E., Graham, J.R., Harvey, C.R., 2012. Access to liquidity and corporate investment in Europe during the financial crisis. *Review of Finance* 16, 323-346.
- Chaigneau, P., 2013. Risk-shifting and the regulation of bank CEOs' compensation. *Journal of Financial Stability* 9, 778-789.
- Chan, S.G., Karim, M.Z.A., Burton, B., Aktan, B., 2014. Efficiency and risk in commercial banking: empirical evidence from East Asian countries. *The European Journal of Finance* 20, 1114-1132.
- Chang, E.J., Guerra, S.M., Lima, E.J.A., Tabak, B.M., 2008. The stability–concentration relationship in the Brazilian banking system. *Journal of International Financial Markets, Institutions and Money* 18, 388-397.
- Chen, A., Kao, L., 2011. Effect of collateral characteristics on bank performance: Evidence from collateralized stocks in Taiwan. *Journal of Banking & Finance* 35, 300-309.
- Christoffersen, S.E.K., Evans, R., Musto, D.K., 2013. What do consumers' fund flows maximize? Evidence from their brokers' incentives. *Journal of Finance* 68, 201-235.
- Cole, S., Kanz, M., Klapper, L., 2015. Incentivizing calculated risk-taking: Evidence from an experiment with commercial bank loan officers. *Journal of Finance* 70, 537-575.
- Dam, L., Koetter, M., 2012. Bank bailouts and moral hazard: Evidence from Germany. *Review of Financial Studies* 25, 2343-2380.
- Demirgüç-Kunt, A., Huizinga, H., 2010. Bank activity and funding strategies: The impact on risk and returns. *Journal of Financial Economics* 98, 626-650.
- Ellul, A., Yerramilli, V., 2013. Stronger risk controls, lower risk: Evidence from U.S. bank holding companies. *Journal of Finance* 68, 1757-1803.
- Farhi, E., Tirole, J., 2012. Collective moral hazard, maturity mismatch, and systemic bailouts. *American Economic Review* 102, 60-93.

- Feess, E., Hege, U., 2012. The Basel Accord and the Value of Bank Differentiation. *Review of Finance* 16, 1043-1092.
- Festić, M., Kavkler, A., Repina, S., 2011. The macroeconomic sources of systemic risk in the banking sectors of five new EU member states. *Journal of Banking & Finance* 35, 310-322.
- Flannery, M.J., Giacomini, E., 2015. Maintaining adequate bank capital: An empirical analysis of the supervision of European banks. *Journal of Banking & Finance* 59, 236-249.
- Foos, D., Norden, L., Weber, M., 2010. Loan growth and riskiness of banks. *Journal of Banking & Finance* 34, 2929-2940.
- Freixas, X., Parigi, B.M., Rochet, J.-C., 2000. Systemic risk, interbank relations, and liquidity provision by the central bank. *Journal of Money, Credit and Banking* 32, 611-638.
- García, D., 2013. Sentiment during recessions. *Journal of Finance* 68, 1267-1300.
- Gauthier, C., Lehar, A., Souissi, M., 2012. Macroprudential capital requirements and systemic risk. *Journal of Financial Intermediation* 21, 594-618.
- Gopalan, R., Milbourn, T., Song, F., Thakor, A.V., 2014. Duration of executive compensation. *Journal of Finance* 69, 2777-2817.
- Hakenes, H., Schnabel, I., 2014. Bank bonuses and bailouts. *Journal of Money, Credit and Banking* 46, 259-288.
- John, K., Mehran, H., Qian, Y., 2010. Outside monitoring and CEO compensation in the banking industry. *Journal of Corporate Finance* 16, 383-399.
- Lee, C.-C., Hsieh, M.-F., 2014. Bank reforms, foreign ownership, and financial stability. *Journal of International Money and Finance* 40, 204-224.
- Lemmon, M., Liu, L.X., Mao, M.Q., Nini, G., 2014. Securitization and capital structure in nonfinancial firms: An empirical investigation. *Journal of Finance* 69, 1787-1825.

- Lepetit, L., Strobel, F., Dickinson, D.G., 2012. Does uncertainty matter for loan charge-offs? *Journal of International Financial Markets, Institutions and Money* 22, 264-277.
- Louzis, D.P., Vouldis, A.T., Metaxas, V.L., 2012. Macroeconomic and bank-specific determinants of non-performing loans in Greece: A comparative study of mortgage, business and consumer loan portfolios. *Journal of Banking & Finance* 36, 1012-1027.
- Luo, X., 2003. Evaluating the profitability and marketability efficiency of large banks: An application of data envelopment analysis. *Journal of Business Research* 56, 627-635.
- Maddaloni, A., Peydró, J.-L., 2011. Bank risk-taking, securitization, supervision, and low interest rates: Evidence from the Euro-area and the U.S. lending standards. *Review of Financial Studies* 24, 2121-2165.
- Mayordomo, S., Rodriguez-Moreno, M., Peña, J.I., 2014. Derivatives holdings and systemic risk in the U.S. banking sector. *Journal of Banking & Finance* 45, 84-104.
- Morrison, A.D., White, L., 2005. Crises and capital requirements in banking. *American Economic Review* 95, 1548-1572.
- Murphy, K.J., 2013. Regulating banking bonuses in the European Union: A case study in unintended consequences. *European Financial Management* 19, 631-657.
- Onali, E., 2014. Moral Hazard, Dividends, and Risk in Banks. *Journal of Business Finance & Accounting* 41, 128-155.
- Peek, J., Rosengren, E.S., 2005. Unnatural selection: Perverse incentives and the misallocation of credit in Japan. *American Economic Review* 95, 1144-1166.
- Pesola, J., 2011. Joint effect of financial fragility and macroeconomic shocks on bank loan losses: Evidence from Europe. *Journal of Banking & Finance* 35, 3134-3144.

Figure 1: The time-series of loan growth and non-performing loans

This figure illustrates the time-series pattern of the mean value of loan growth (LOANGROWTH) and non-performing loans (NPLTL) for the developing countries sample (DEV = 0) and the developed countries sample (DEV = 1). LOANGROWTH is computed as the first difference in the natural logarithm of total loans. NPLTL is measured as the ratio of non-performing loans to total loans.

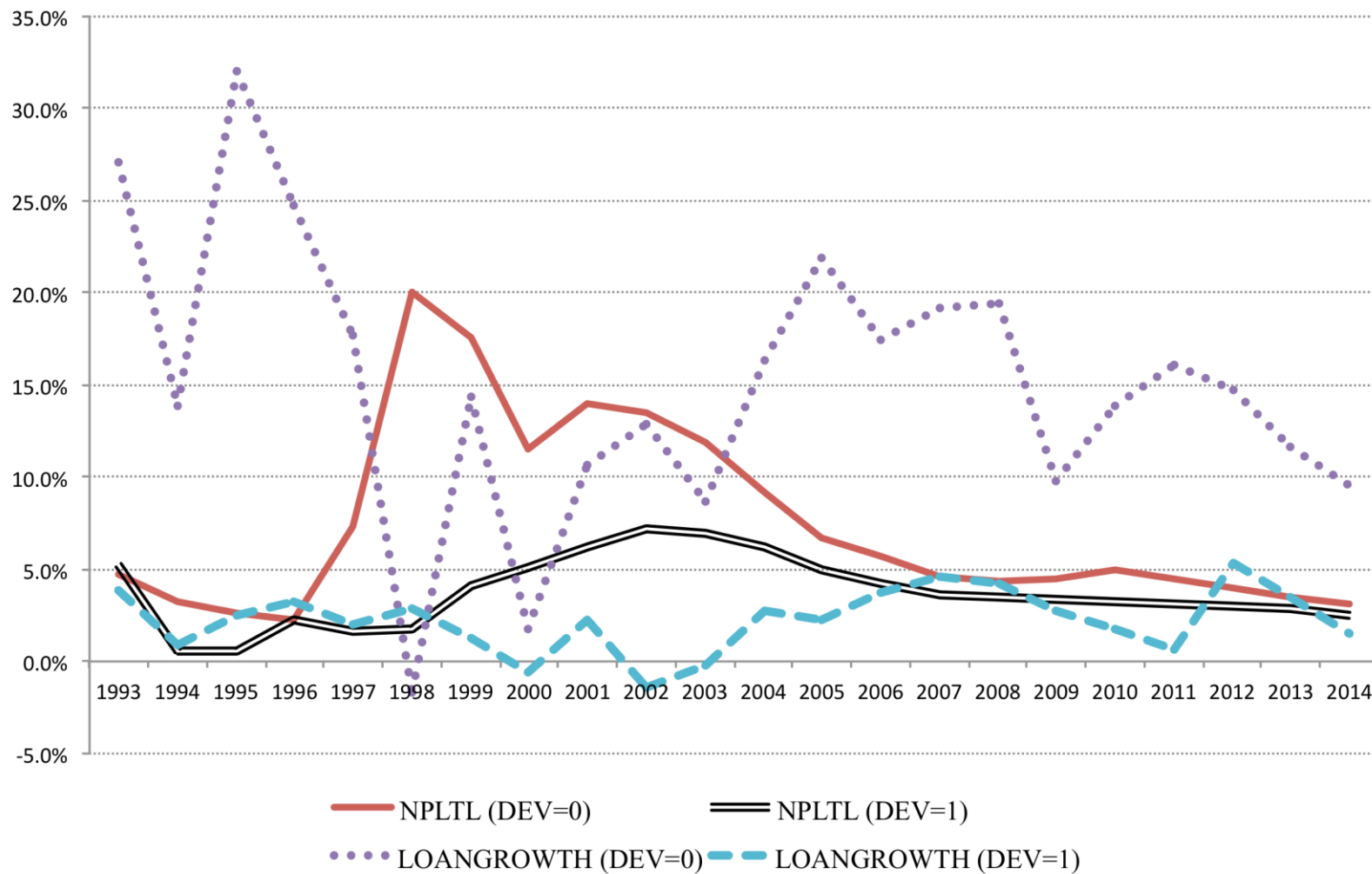


Table 1: Summary statistics of key variables

This table displays summary statistics for variables in the full sample period during 1992-2014. The number of banks and the number of bank-year observations for each country in the sample are reported in Appendix A. Panel A reports summary statistics for the full sample period. Panel B displays summary statistics for the Asian financial crisis period (i.e., 1997-1998). Panel C displays summary statistics for the global financial crisis period (i.e., 2007-2009). Panel D displays summary statistics for the non-crisis period (i.e., 1992-1996, 1999-2006 and 2010-2014). The non-performing loans ratio (NPLTL) is computed as the non-performing loans over total loans. Loan growth (LOANGROWTH) is measured as the first difference in total loans. The loan-to-asset ratio (LOANTA) is computed as the ratio of total loans to total assets. LNTA denotes the natural logarithm of total assets in millions USD. MBV is the market-to-book ratio. The return on assets ratio (ROA) is measured as the ratio of EBIT to total assets. The capitalization ratio (CAPTA) is measured as the ratio of total capital to total assets. The cash-to-deposit ratio (CASHDEP) is computed as the ratio of cash to total deposits. The revenue diversification ratio (BRD) is computed as the ratio of non-interest income to net revenue. Operating risk (SDROA) is measured as the 3-year moving standard deviation of ROA. Stock price performance (RETURN) is computed as the first difference in year-end stock prices.  $N$  indicates the number of bank-year observations.

	Mean	Median	Min	Max	S.D.	$N$
Panel A: Full sample period						
NPLTL	0.047	0.032	0.000	0.370	0.054	3,059
LOANGROWTH	0.082	0.042	-0.222	0.705	0.129	3,059
LOANTA	0.664	0.671	0.316	0.920	0.108	3,059
LNTA	9.889	9.928	3.746	14.083	1.495	3,059
BRD	0.205	0.190	0.011	0.559	0.108	3,059
CAPTA	0.107	0.080	0.028	0.747	0.079	3,059
CASHDEP	0.073	0.059	0.010	0.426	0.057	3,059
MBV	2.618	1.100	-0.115	79.777	10.031	3,059
ROA	0.011	0.008	-0.056	0.093	0.014	3,059
SDROA	0.004	0.002	0.000	0.046	0.006	3,059
RETURN	0.030	0.019	-1.223	1.115	0.376	3,059
Panel B: AFC period						
NPLTL	0.035	0.016	0.000	0.370	0.066	165
LOANGROWTH	0.030	0.020	-0.222	0.359	0.073	165
LOANTA	0.738	0.737	0.520	0.920	0.066	165
LNTA	9.628	9.704	7.008	13.087	0.991	165
BRD	0.123	0.115	0.011	0.294	0.057	165
CAPTA	0.065	0.055	0.028	0.604	0.054	165
CASHDEP	0.051	0.039	0.010	0.241	0.042	165
MBV	1.155	1.110	-0.115	3.220	0.483	165
ROA	0.001	0.003	-0.056	0.037	0.012	165
SD_ROA	0.004	0.001	0.000	0.043	0.007	165
RETURN	-0.155	-0.090	-1.223	0.584	0.339	165
Panel C: GFC period						
NPLTL	0.041	0.031	0.000	0.370	0.042	594
LOANGROWTH	0.110	0.070	-0.222	0.705	0.139	594
LOANTA	0.658	0.651	0.316	0.920	0.102	594

LNTA	9.822	9.901	4.139	14.083	1.581	594
BRD	0.208	0.195	0.011	0.559	0.098	594
CAPTA	0.116	0.090	0.028	0.578	0.078	594
CASHDEP	0.072	0.060	0.010	0.386	0.053	594
MBV	2.908	1.025	-0.115	79.777	10.395	594
ROA	0.013	0.012	-0.056	0.082	0.015	594
SD_ROA	0.004	0.003	0.000	0.046	0.006	594
RETURN	-0.079	-0.086	-1.223	1.115	0.548	594
Panel D: non-crisis period						
NPLTL	0.049	0.033	0.000	0.370	0.056	2,300
LOANGROWTH	0.079	0.040	-0.222	0.705	0.128	2,300
LOANTA	0.660	0.670	0.316	0.920	0.110	2,300
LNTA	9.924	9.953	3.746	14.083	1.500	2,300
BRD	0.210	0.195	0.011	0.559	0.111	2,300
CAPTA	0.108	0.080	0.028	0.747	0.080	2,300
CASHDEP	0.075	0.060	0.010	0.426	0.059	2,300
MBV	2.648	1.120	-0.115	79.777	10.285	2,300
ROA	0.011	0.008	-0.056	0.093	0.014	2,300
SD_ROA	0.004	0.002	0.000	0.046	0.006	2,300
RETURN	0.072	0.047	-1.223	1.115	0.309	2,300

Table 2: Correlation coefficients

This table reports correlation coefficient for the sample of 3,059 bank-year observations over the period 1992-2014. The non-performing loans ratio (NPLTL) is computed as the non-performing loans over total loans. Loan growth (LOANGROWTH) is measured as the first difference in total loans. The loan-to-asset ratio (LOANTA) is computed as the ratio of total loans to total assets. LNTA denotes the natural logarithm of total assets in millions USD. MBV is the market-to-book ratio. The return on assets ratio (ROA) is measured as the ratio of earnings before interest and taxes (EBIT) to total assets. The cash-to-deposit ratio (CASHDEP) is computed as the ratio of cash to total deposits. The capitalization ratio (CAPTA) is measured as the ratio of total capital to total assets. The revenue diversification ratio (BRD) is computed as the ratio of non-interest income to net revenue. Operating risk (SDROA) is measured as the 3-year moving standard deviation of ROA. Stock price performance (RETURN) is computed as the first difference in year-end stock prices. Symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5% and 10% levels, respectively.

	1	2	3	4	5	6	7	8	9	10
1. NPLTL	1.000									
2. LOANGROWTH	-0.140***	1.000								
3. LOANTA	-0.020	-0.028	1.000							
4. LNTA	-0.330***	-0.153***	-0.077***	1.000						
5. BRD	-0.030	-0.130***	-0.198***	0.339***	1.000					
6. CAPTA	0.090***	0.228***	-0.019	-0.169***	0.062***	1.000				
7. CASHDEP	0.013	0.206***	-0.382***	-0.056***	-0.008	0.310***	1.000			
8. MBV	0.031	0.101***	0.023	-0.114***	-0.076***	0.101***	0.130***	1.000		
9. ROA	-0.177***	0.361***	-0.141***	-0.169***	-0.001	0.664***	0.366***	0.146***	1.000	
10. SDROA	0.466***	0.016	0.045**	-0.262***	-0.052***	0.199***	0.047***	0.140***	-0.076***	1.000
11. RETURN	-0.013	0.073***	-0.139***	-0.032*	0.045**	0.079***	0.093***	0.036**	0.198***	-0.079***

Table 3: OLS regressions of non-performing loans.

This table presents the results of panel OLS regressions of non-performing loans for a sample of publicly listed banks in 18 countries in Asia. The dependent variable is the non-performing loans ratio (NPLTL), which is computed as the ratio of non-performing loans over total loans. Loan growth (LOANGROWTH) is measured as the first difference in total loans. YEAR is a time trend variable. The loan-to-asset ratio (LOANTA) is computed as the ratio of total loans to total assets. LNTA denotes the natural logarithm of total assets in millions USD. MBV is the market-to-book ratio. The return on assets ratio (ROA) is measured as the ratio of EBIT to total assets. The capitalization ratio (CAPTA) is measured as the ratio of total capital to total assets. The cash-to-deposit ratio (CASHDEP) is computed as the ratio of cash to total deposits. The revenue diversification ratio (BRD) is computed as the ratio of non-interest income to net revenue. Operating risk (SDROA) is measured as the 3-year moving standard deviation of ROA. Stock price performance (RETURN) is computed as the first difference in year-end stock prices. The GDP growth rate (GDPRATE) is computed as the first difference in the natural logarithm of real GDP in US dollar. The inflation rate (INFLATION) is the percentage year-on-year change in average consumer prices. The investment rate (INVESTMENT) is the share of investment as a percentage of GDP. Standard errors, which are reported in parentheses, are robust to heteroskedasticity and serial correlation and are clustered at the bank level. Symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)
Intercept	0.134*** (0.041)	0.123*** (0.040)	0.070*** (0.021)	0.687 (1.524)
GDPRATE <sub>t</sub>	-0.003*** (0.000)	-0.003*** (0.000)	-0.003*** (0.000)	-0.002*** (0.000)
INFLATION <sub>t</sub>	0.001** (0.000)	0.001*** (0.000)	0.001* (0.000)	0.001** (0.000)
INVESTMENT <sub>t</sub>	-0.002*** (0.000)	-0.002*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
LNTA <sub>t-1</sub>	-0.005 (0.004)	-0.005 (0.004)	-0.003** (0.001)	0.011*** (0.004)
CAPTA <sub>t-1</sub>	0.019 (0.029)	0.008 (0.029)	0.054** (0.022)	-0.015 (0.025)
BRD <sub>t-1</sub>	-0.034** (0.016)	-0.027* (0.016)	0.006 (0.014)	0.009 (0.014)
CASHDEP <sub>t-1</sub>	0.027 (0.026)	0.027 (0.025)	0.036 (0.024)	0.021 (0.022)
MBV <sub>t-1</sub>	0.001*** (0.000)	0.001*** (0.000)	0.000 (0.000)	0.001*** (0.000)
ROA <sub>t-1</sub>	-0.925*** (0.106)	-0.850*** (0.104)	-1.100*** (0.101)	-0.616*** (0.096)
SDROA <sub>t-1</sub>	1.258*** (0.194)	1.264*** (0.190)	1.683*** (0.193)	0.849*** (0.176)
RETURN <sub>t-1</sub>	-0.009*** (0.002)	-0.009*** (0.002)	-0.012*** (0.002)	-0.008*** (0.002)
LOANTA <sub>t-1</sub>	0.030* (0.017)	0.050*** (0.018)	0.030** (0.014)	0.072*** (0.016)
LOANGROWTH <sub>t-1</sub>		-0.046***	-0.057***	-0.046***



		(0.007)	(0.007)	(0.006)
Bank fixed effects	Yes	Yes	No	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	No	No	Yes	No
Country dummies $\times$ YEAR	No	No	No	Yes
Adjusted $R^2$	0.606	0.613	0.518	0.694
$F$ -statistic	16.306***	16.746***	62.70***5	22.295***
No. of banks	262	262	262	262
No. of observations	2,928	2,928	2,928	2,928

Table 4: OLS regressions of non-performing loans.

This table presents the results of panel OLS regressions of non-performing loans for a sample of publicly listed banks in 18 countries in Asia. The dependent variable is the non-performing loans ratio (NPLTL), which is computed as the ratio of non-performing loans over total loans. Loan growth (LOANGROWTH) is measured as the first difference in total loans. The loan-to-asset ratio (LOANTA) is computed as the ratio of total loans to total assets. YEAR is a time trend variable. See Table 3 for variable definitions. Standard errors, which are reported in parentheses, are robust to heteroskedasticity and serial correlation and are clustered at the bank level. Symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)
Intercept	0.287*** (0.031)	4.193*** (0.707)	0.278*** (0.030)	0.119*** (0.039)
GDPRATE <sub>t</sub>	-0.001*** (0.000)	-0.001* (0.000)	-0.001*** (0.000)	-0.003*** (0.000)
INFLATION <sub>t</sub>	0.001 (0.000)	0.000 (0.000)	0.000 (0.000)	0.001** (0.000)
INVESTMENT <sub>t</sub>	-0.003*** (0.000)	-0.003*** (0.000)	-0.003*** (0.000)	-0.002*** (0.000)
LNTA <sub>t-1</sub>	-0.020*** (0.003)	-0.003 (0.003)	-0.019*** (0.003)	-0.004 (0.004)
CAPTA <sub>t-1</sub>	0.044 (0.031)	0.006 (0.026)	0.053* (0.030)	0.017 (0.029)
BRD <sub>t-1</sub>	0.012 (0.013)	0.072*** (0.015)	0.012 (0.013)	-0.028* (0.016)
CASHDEP <sub>t-1</sub>	0.001 (0.026)	-0.010 (0.024)	-0.009 (0.026)	0.019 (0.025)
MBV <sub>t-1</sub>	0.001** (0.000)	0.001*** (0.000)	0.001** (0.000)	0.001*** (0.000)
ROA <sub>t-1</sub>	-1.063*** (0.108)	-0.838*** (0.102)	-1.078*** (0.107)	-0.870*** (0.104)
SDROA <sub>t-1</sub>	1.631*** (0.202)	1.168*** (0.190)	1.657*** (0.199)	1.294*** (0.189)
RETURN <sub>t-1</sub>	-0.006*** (0.002)	-0.005*** (0.002)	-0.005*** (0.002)	-0.009*** (0.002)
LOANTA <sub>t-1</sub>	0.053*** (0.018)	0.065*** (0.017)	0.051*** (0.018)	0.049*** (0.017)
LOANGROWTH <sub>t-1</sub>	-0.052*** (0.007)	-0.049*** (0.007)	-0.071*** (0.008)	-0.065*** (0.008)
LOANGROWTH <sub>t-1</sub> × AFC <sub>t-1</sub>			0.189*** (0.046)	0.190*** (0.046)
LOANGROWTH <sub>t-1</sub> × GFC <sub>t-1</sub>			0.070*** (0.012)	0.066*** (0.011)
AFC <sub>t-1</sub>	-0.005 (0.004)	-0.005 (0.003)	-0.011** (0.004)	
GFC <sub>t-1</sub>	-0.012*** (0.002)	-0.008*** (0.002)	-0.019*** (0.002)	

Bank fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	Yes
Country fixed effects	No	No	No	No
Country dummies $\times$ YEAR	No	Yes	No	No
Adjusted $R^2$	0.568	0.651	0.577	0.621
$F$ -statistic	14.957***	19.663***	15.350***	17.174***
No. of banks	262	262	262	262
No. of observations	2,928	2,928	2,928	2,928

Table 5: OLS regressions of non-performing loans.

This table presents the results of panel OLS regressions of non-performing loans for a sample of publicly listed banks in 18 countries in Asia. The dependent variable is the non-performing loans ratio (NPLTL), which is computed as the ratio of non-performing loans over total loans. Loan growth (LOANGROWTH) is measured as the first difference in total loans. See Table 3 for variable definitions. Standard errors, which are reported in parentheses, are robust to heteroskedasticity and serial correlation and are clustered at the bank level. Symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5% and 10% levels, respectively.

	(1) Full sample	(2) DEV=0	(3) DEV=1
Intercept	0.122*** (0.040)	-0.081 (0.082)	0.028 (0.034)
GDPRATE <sub>t</sub>	-0.003*** (0.000)	-0.001 (0.001)	0.001 (0.000)
INFLATION <sub>t</sub>	0.001*** (0.000)	0.002** (0.001)	-0.004*** (0.001)
INVESTMENT <sub>t</sub>	-0.002*** (0.000)	-0.001* (0.001)	0.000 (0.001)
LNTA <sub>t-1</sub>	-0.005 (0.004)	0.016* (0.009)	-0.002 (0.004)
CAPTA <sub>t-1</sub>	0.006 (0.029)	-0.002 (0.043)	-0.031 (0.032)
BRD <sub>t-1</sub>	-0.027* (0.016)	-0.076** (0.033)	0.014 (0.010)
CASHDEP <sub>t-1</sub>	0.029 (0.025)	0.014 (0.042)	0.027 (0.022)
MBV <sub>t-1</sub>	0.001*** (0.000)	0.001*** (0.000)	-0.001 (0.001)
ROA <sub>t-1</sub>	-0.846*** (0.104)	-0.792*** (0.180)	-0.592*** (0.091)
SDROA <sub>t-1</sub>	1.278*** (0.190)	1.005*** (0.313)	1.365*** (0.181)
RETURN <sub>t-1</sub>	-0.009*** (0.002)	-0.006 (0.004)	-0.003* (0.002)
LOANTA <sub>t-1</sub>	0.053*** (0.018)	0.072** (0.028)	0.026 (0.017)
LOANGROWTH <sub>t-1</sub>	-0.056*** (0.008)	-0.064*** (0.011)	-0.023*** (0.006)
LOANGROWTH <sub>t-1</sub> × DEV	0.045*** (0.016)		
Bank fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Adjusted R <sup>2</sup>	0.615	0.609	0.770
F-statistic	16.768***	11.602***	42.841***
No. of banks	262	172	90
Observation	2,928	1,391	1,537

Table 6: The first-stage OLS regression of loan growth (LOANGROWTH).

This table presents the results of first-stage panel OLS regressions of non-performing loans for a sample of publicly listed banks in 18 countries in Asia. The dependent variable is the loan growth rate (LOANGROWTH), which is measured as the first difference in total loans. The development dummy variable (DEV) takes a value of one for banks in a developed country and zero otherwise. See Table 3 for variable definitions. Standard errors are robust to heteroskedasticity and serial correlation and are clustered at the bank level. Symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5% and 10% levels, respectively.

	(1)
Intercept	-0.234*** (0.084)
GDPRATE <sub>t</sub>	0.004*** (0.001)
INFLATION <sub>t</sub>	0.002 (0.001)
INVESTMENT <sub>t</sub>	-0.002* (0.001)
LNTA <sub>t-1</sub>	0.002 (0.009)
CAPTA <sub>t-1</sub>	-0.189*** (0.072)
BRD <sub>t-1</sub>	0.148*** (0.039)
CASHDEP <sub>t-1</sub>	0.025 (0.064)
MBV <sub>t-1</sub>	-0.002* (0.001)
ROA <sub>t-1</sub>	1.577*** (0.287)
SDROA <sub>t-1</sub>	0.171 (0.497)
RETURN <sub>t-1</sub>	-0.001 (0.007)
LOANTA <sub>t-1</sub>	0.442*** (0.041)
Bank fixed effects	Yes
Year fixed effects	Yes
Adjusted $R^2$	0.416
$F$ -statistic	8.090***
No. of banks	262
No. of observations	2,928

Table 7: The second-stage OLS regressions of non-performing loans.

This table presents the results of second-stage panel OLS regressions of non-performing loans for a sample of publicly listed banks in 18 countries in Asia. The dependent variable is the non-performing loans ratio (NPLTL), which is computed as the ratio of non-performing loans over total loans. LG is the residuals obtained from the estimation of the first-stage OLS regression in Table 6. YEAR is a time trend variable. See Table 3 for variable definitions. Standard errors, which are reported in parentheses, are robust to heteroskedasticity and serial correlation and are clustered at the bank level. Symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
Intercept	0.132*** (0.040)	0.078*** (0.021)	4.018*** (0.708)	0.290*** (0.030)	0.132*** (0.039)
GDPRATE <sub>t</sub>	-0.003*** (0.000)	-0.003*** (0.000)	0.000 (0.000)	-0.001*** (0.000)	-0.002*** (0.000)
INFLATION <sub>t</sub>	0.001*** (0.000)	0.001 (0.000)	0.000 (0.000)	0.000 (0.000)	0.001*** (0.000)
INVESTMENT <sub>t</sub>	-0.002*** (0.000)	-0.001*** (0.000)	-0.003*** (0.000)	-0.003*** (0.000)	-0.002*** (0.000)
LNTA <sub>t-1</sub>	-0.005 (0.004)	-0.003** (0.001)	-0.003 (0.003)	-0.019*** (0.003)	-0.005 (0.004)
CAPTA <sub>t-1</sub>	0.017 (0.029)	0.058*** (0.022)	0.017 (0.026)	0.060** (0.030)	0.022 (0.029)
BRD <sub>t-1</sub>	-0.034** (0.016)	-0.002 (0.014)	0.066*** (0.015)	0.008 (0.013)	-0.032** (0.016)
CASHDEP <sub>t-1</sub>	0.026 (0.025)	0.037 (0.024)	-0.010 (0.024)	-0.004 (0.026)	0.020 (0.025)
MBV <sub>t-1</sub>	0.001*** (0.000)	0.000 (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
ROA <sub>t-1</sub>	-0.924*** (0.105)	-1.167*** (0.102)	-0.936*** (0.103)	-1.191*** (0.109)	-0.952*** (0.105)
SDROA <sub>t-1</sub>	1.252*** (0.191)	1.692*** (0.196)	1.177*** (0.191)	1.639*** (0.202)	1.266*** (0.190)
RETURN <sub>t-1</sub>	-0.009***	-0.012***	-0.005***	-0.005***	-0.008***

	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
LOANTA <sub>t-1</sub>	0.031*	0.017	0.044***	0.030*	0.029*
	(0.017)	(0.014)	(0.017)	(0.018)	(0.017)
LG <sub>t-1</sub>	-0.044***	-0.044***	-0.041***	-0.064***	-0.063***
	(0.007)	(0.007)	(0.007)	(0.009)	(0.008)
LG <sub>t-1</sub> × AFC <sub>t-1</sub>				0.290***	0.241***
				(0.053)	(0.054)
LG <sub>t-1</sub> × GFC <sub>t-1</sub>				0.063***	0.058***
				(0.016)	(0.015)
AFC <sub>t-1</sub>			-0.005	-0.004	
			(0.003)	(0.004)	
GFC <sub>t-1</sub>			-0.008***	-0.012***	
			(0.002)	(0.002)	
Bank fixed effects	Yes	No	Yes	Yes	Yes
Year fixed effects	Yes	Yes	No	No	Yes
Country fixed effects	No	Yes	No	No	No
Country dummies x YEAR	No	No	Yes	No	No
Adjusted $R^2$	0.613	0.512	0.649	0.573	0.619
$F$ -statistic	16.703***	61.143***	19.434***	15.127***	16.979***
No. of banks	262	262	262	262	262
No. of observations	2,928	2,928	2,928	2,928	2,928

Table 8: The second-stage OLS regressions of non-performing loans.

This table presents the results of second-stage panel OLS regressions of non-performing loans for a sample of publicly listed banks in 18 countries in Asia. The dependent variable is the non-performing loans ratio (NPLTL), which is computed as the ratio of non-performing loans over total loans. LG is the residuals obtained from the estimation of the first-stage OLS regression in Table 6. See Table 3 for variable definitions. Standard errors, which are reported in parentheses, are robust to heteroskedasticity and serial correlation and are clustered at the bank level. Symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5% and 10% levels, respectively.

	(1) Full sample	(2) DEV=0	(3) DEV=1
Intercept	0.132*** (0.040)	-0.071 (0.082)	0.034 (0.034)
GDPRATE <sub>t</sub>	-0.003*** (0.000)	-0.001 (0.001)	0.001 (0.000)
INFLATION <sub>t</sub>	0.001*** (0.000)	0.002** (0.001)	-0.004*** (0.001)
INVESTMENT <sub>t</sub>	-0.002*** (0.000)	-0.001* (0.001)	0.001 (0.001)
LNTA <sub>t-1</sub>	-0.005 (0.004)	0.016* (0.009)	-0.002 (0.004)
CAPTA <sub>t-1</sub>	0.016 (0.029)	0.010 (0.043)	-0.026 (0.032)
BRD <sub>t-1</sub>	-0.031* (0.016)	-0.086*** (0.033)	0.010 (0.010)
CASHDEP <sub>t-1</sub>	0.027 (0.025)	0.012 (0.042)	0.027 (0.022)
MBV <sub>t-1</sub>	0.001*** (0.000)	0.001*** (0.000)	-0.001 (0.001)
ROA <sub>t-1</sub>	-0.925*** (0.105)	-0.894*** (0.181)	-0.630*** (0.091)
SDROA <sub>t-1</sub>	1.268*** (0.190)	0.988*** (0.314)	1.360*** (0.182)
RETURN <sub>t-1</sub>	-0.009*** (0.002)	-0.006 (0.004)	-0.003* (0.002)
LOANTA <sub>t-1</sub>	0.033* (0.017)	0.045* (0.027)	0.016 (0.016)
LG <sub>t-1</sub>	-0.053*** (0.008)	-0.063*** (0.011)	-0.024*** (0.006)
LG <sub>t-1</sub> × DEV	0.038** (0.017)		
Bank fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Adjusted R <sup>2</sup>	0.613	0.608	0.770
F-statistic	16.695***	11.589***	42.854***
No. of banks	262	172	90
No. of observations	2,928	1,391	1,537



Table 9: OLS regressions of non-performing loans.

This table presents the results of panel OLS regressions of non-performing loans for a sample of publicly listed banks in 18 countries in Asia. The dependent variable is the non-performing loans ratio (NPLTL), which is computed as the ratio of non-performing loans over total loans. Loan growth (LOANGROWTH) is measured as the first difference in total loans. See Table 3 for variable definitions. Regressions are performed in levels in columns (1) and (2) and in first differences in columns (3) and (4). Standard errors, which are reported in parentheses, are robust to heteroskedasticity and serial correlation and are clustered at the bank level. Symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	Level regression	Level regression	First difference regression	First difference regression
Intercept	0.057 (0.041)	-0.011 (0.024)	-0.003*** (0.001)	-0.003 (0.001)
NPLTL <sub>t-1</sub>		0.490*** (0.019)		-0.225*** (0.023)
GDPRATE <sub>t</sub>	-0.001** (0.000)	-0.001 (0.000)	0.000 (0.000)	-0.001 (0.000)
INFLATION <sub>t</sub>	0.001 (0.000)	0.000 (0.000)	-0.001** (0.000)	-0.001 (0.000)
INVESTMENT <sub>t</sub>	-0.001* (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
LNTA <sub>t-1</sub>	0.001 (0.004)	0.004* (0.003)	0.016** (0.007)	0.014 (0.007)
CAPTA <sub>t-1</sub>	0.038 (0.029)	0.006 (0.021)	-0.115*** (0.026)	-0.097 (0.025)
BRD <sub>t-1</sub>	-0.017 (0.014)	-0.010 (0.010)	-0.005 (0.013)	-0.006 (0.013)
CASHDEP <sub>t-1</sub>	-0.004 (0.025)	0.004 (0.018)	0.024 (0.025)	0.022 (0.024)
MBV <sub>t-1</sub>	0.001** (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
ROA <sub>t-1</sub>	-0.854*** (0.118)	-0.354*** (0.104)	0.162 (0.103)	0.058** (0.094)
SDROA <sub>t-1</sub>	0.904*** (0.208)	0.489*** (0.152)	0.359* (0.205)	0.433 (0.198)
RETURN <sub>t-1</sub>	-0.002 (0.002)	-0.001 (0.002)	0.002 (0.002)	0.002 (0.002)
LOANTA <sub>t-1</sub>	0.007 (0.018)	0.012 (0.012)	0.056** (0.023)	0.056 (0.022)
LOANGROWTH <sub>t-1</sub>	-0.030*** (0.007)	-0.006 (0.006)	-0.017** (0.008)	-0.022*** (0.008)
LOANGROWTH <sub>t-2</sub>	-0.037*** (0.007)	-0.015*** (0.006)	-0.015** (0.008)	-0.018* (0.008)
LOANGROWTH <sub>t-3</sub>	-0.006	0.011**	-0.003	-0.006

	(0.006)	(0.005)	(0.006)	(0.006)
Bank fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Adjusted $R^2$	0.674	0.764	0.069	0.117
$F$ -statistic	18.475***	28.374***	1.600***	2.073***
No. of banks	237	237	221	221
No. of observations	2,287	2,287	2,050	2,050

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Table 10: OLS regressions of profitability (ROA).

This table presents the results of panel OLS regressions of the return on asset (ROA), which is a measure of profitability, for a sample of publicly listed banks in 18 countries in Asia. The dependent variable is the return on assets (ROA), which is computed as the ratio of the ratio of EBIT to total assets. Loan growth (LOANGROWTH) is measured as the first difference in total loans. See Table 3 for variable definitions. Standard errors, which are reported in parentheses, are robust to heteroskedasticity and serial correlation and are clustered at the bank level. Symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)
Intercept	0.024*** (0.007)	-0.001 (0.005)	0.023*** (0.007)
GDPRATE <sub>t</sub>	0.000*** (0.000)	0.001*** (0.000)	0.000*** (0.000)
INFLATION <sub>t</sub>	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
INVESTMENT <sub>t</sub>	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
LNTA <sub>t-1</sub>	-0.003*** (0.001)	0.000 (0.000)	-0.003*** (0.001)
CAPTA <sub>t-1</sub>	0.038*** (0.005)	0.073*** (0.004)	0.038*** (0.005)
BRD <sub>t-1</sub>	-0.001 (0.003)	0.001 (0.003)	-0.001 (0.003)
CASHDEP <sub>t-1</sub>	0.014*** (0.005)	0.017*** (0.005)	0.013** (0.005)
MBV <sub>t-1</sub>	0.000** (0.000)	0.000 (0.000)	0.000* (0.000)
SDROA <sub>t-1</sub>	-0.194*** (0.039)	-0.366*** (0.041)	-0.192*** (0.039)
RETURN <sub>t-1</sub>	0.004*** (0.000)	0.005*** (0.001)	0.004*** (0.000)
LOANTA <sub>t-1</sub>	-0.004 (0.003)	-0.004 (0.003)	-0.005 (0.003)
LOANGROWTH <sub>t-1</sub>	0.003*** (0.001)	0.003** (0.001)	0.005*** (0.001)
Squared LOANGROWTH <sub>t-1</sub>			-0.002*** (0.001)
Bank fixed effects	Yes	No	Yes
Year fixed effects	Yes	Yes	Yes
Country fixed effects	No	Yes	No
Adjusted R <sup>2</sup>	0.736	0.626	0.737
F-statistic	28.810***	97.299***	28.784***
No. of banks	256	256	256
No. of observations	2,872	2,872	2,872