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Loan loss provisions and lending behavior of banks: Do information sharing and borrower legal rights matter?

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Abstract

In this paper, we examine the role of information sharing and borrower legal rights in affecting the procyclical effect of bank loan loss provisions. Based on a sample of Asian banks, our empirical results highlight that higher non-discretionary provisions reduce loan growth and hence, non-discretionary provisions are procyclical. A closer investigation suggests that better information sharing through public credit registries managed by central banks, but not private credit bureaus managed by the private sector, might substitute the role of a dynamic provisioning system in mitigating the procyclicality of non-discretionary provisions. We also document that higher discretionary provisions in countries with stronger legal rights of borrowers may temper the procyclical effect of non-discretionary provisions. However, these findings only hold for small banks. This suggests that the implementation of a dynamic provisioning system to mitigate the procyclicality of non-discretionary provisions is more crucial for large banks, because such procyclicality cannot be offset by strengthening credit market environments through better information sharing and legal rights of borrowers.

Key words: Loan loss provisions, loan growth, information sharing, borrower legal rights

JEL classification: G10, G14, G21, G28

1. Introduction

During the last three decades, financial crises in both developed and developing countries were mostly preceded by strong macroeconomic performance in an environment with poor bank risk management (e.g., the 1980 US saving and loan crisis, the 1994/1995 Mexican crisis, the 1997/1998 Asian crisis, the 1998 Russian crisis, and the 2008 credit crisis that led to a prolonged global economic downturn). Such developments suggest the increasing need for a sound credit risk management in banking to limit the riskiness of banks and prevent a procyclical effect during economic downturns. The procyclical effect of credit risk management mainly occurs due to the fact that banks tend to underestimate credit risk during cyclical upturns, but overestimate it during cyclical downturns (Altman, 2005). Consequently, these actions reduce loan availability and deepen economic recessions.

Likewise, overcoming the procyclicality of bank credit risk management has become one of the key issues in the new Basel Accords, particularly related to bank capital regulation. Meanwhile, studies of banks' procyclical behavior have been conducted through two major research avenues. The first strand of literature focuses on the impact of macroeconomic fluctuations on bank capital buffers to examine whether capital buffers are procyclical over the business cycle. In this regard, banks are substantially required to fulfill minimum capital adequacy ratios in order to cope with credit risk. Since capital requirements are based on risk, banks tend to increase capital buffers and reduce loans during a cyclical downturn when impaired loans materialize. The second strand of literature explores the effect of macroeconomic fluctuations on loan loss provisions and how provisioning affects bank lending behavior.

In spite of a growing literature focusing on the first strand (e.g., Ayuso et al., 2004; Borio et al., 2001; Estrella, 2004; Jokipii and Milne, 2008), very limited attention has been given to the second strand of research, particularly regarding the link between loan loss provisions and bank lending. Several studies highlight the presence of the procyclicality of loan loss provisions over the business cycle (e.g. Laeven and Majnoni, 2003; Bikker and Metzmakers, 2005; Craig et al., 2006), but only Bouvatier and Lepetit (2008) and Bouvatier and Lepetit (2012) assess how provisioning affects bank lending. While Bouvatier and Lepetit (2008) focus on European banks, Bouvatier and Lepetit

(2012) extend their previous study by incorporating a sample of banks from emerging markets. By partitioning loan loss provisions into discretionary and non-discretionary loan loss provisions, Bouvatier and Lepetit (2008) document that non-discretionary loan loss provisions exacerbate a procyclical effect because higher non-discretionary provisions reduce bank loan growth. In contrast, discretionary loan loss provisions – particularly related to income smoothing behavior – have no significant impact on bank loan growth. In this sense, the adoption of a dynamic provisioning system is desirable, because it allows banks to generate higher statistical provisions under a dynamic provisioning systems to complement discretionary provisions, which cannot directly offset the procyclical effect of non-discretionary loan loss provisions. Moreover, Bouvatier and Lepetit (2012) further document that the procyclicality of non-discretionary loan loss provisions in banking is more pronounced in emerging markets.

In parallel, another strand of literature advocates greater information sharing activities to strengthen financial intermediation. Higher lending activities and lower credit risk can be observed in countries where public and private credit bureaus are of better quality (Jappelli and Pagano, 2002). Love and Mylenko (2003) also highlight the role of private credit bureaus and public credit registries in reducing firms' financing constraints. Specifically, private credit bureaus have greater contribution than public credit to alleviate firms' financing constraints. Brown et al. (2009) also document that higher information sharing increases bank lending through a reduction in intermediation cost. Houston et al. (2010) further find that stronger creditor legal rights are associated with higher economic growth. Against this backdrop, our contribution is twofold.

Firstly, given that better information sharing and legal rights might strengthen financial intermediation, this paper is the first to explore whether information sharing and strength of borrower legal rights can mitigate the procyclicality of bank loan loss provisions. Hence, we highlight whether the adoption of a dynamic provisioning system can be substituted by better credit information sharing and borrower legal rights. Secondly, we specifically assess whether the procyclicality of loan loss provisions, as well as the role of information sharing and legal rights in affecting such procyclicality, differs between large and small banks. Bank size is an important dimension in bank credit risk management because large banks are more prone to be “too big to fail” and to have

moral hazard problems (Mishkin, 2006; Kane, 2000). During economic boom periods, large banks can arguably generate lower loan loss provisions to anticipate unexpected credit risk, because they believe that the government can rescue them in case of failure. As such, the role of bank size in affecting the procyclicality of loan loss provisions warrants further examination.

To assess these issues, we focus on emerging markets in Asia for at least three reasons. First, bank credit is the predominant source of financing for private sector businesses in Asian countries and, therefore, unsound credit risk management in banking can exacerbate financial disintermediation during a cyclical downturn (Adams, 2008; Angkomkiew et al., 2009). Second, conflicts of interest between bank regulators and investors are also apparent in Asian banks when banks rely on loan loss reserves to cope with credit risks. Agusman et al. (2009) document that higher loan loss reserves reduce bank stock returns. In other words, bank regulations related to loan loss reserves and provisioning are subject to conflicts of interest between investors and bank regulators, at least in the Asian context. Hence, assessing the issue of loan loss provisions in Asian banks is relevant to examine how bank regulations and investors' interests might be harmonized, particularly regarding the adoption of a dynamic provisioning system that increases loan loss provisions during economic boom periods. Third, the loan loss provisioning system varies across Asian countries. Although the procyclicality of loan loss provisions became a major issue after the 1997 crisis, the implementation of the dynamic provisioning system are still limited in Asian countries.¹

The rest of this paper is structured as follows. Section 2 reviews the existing literature on the use of loan loss provisions for bank credit risk management and its implications. Section 3 describes our data and research method. Section 4 discusses our empirical results and presents the robustness checks, while Section 5 concludes the paper.

2. Related review of literature and research focus

Banks focus on the use of loan loss provisions as a prudential device to manage credit risk. However, loan loss provisions can be procyclical with the business cycle

¹ See Angklomkiew et al. (2009) for further discussion on the current loan loss provisioning system in various Asian countries in order to respond the 1997/1998 financial crisis.

because loans are likely to default during a cyclical downturn. This, in turn, increases banks' risk aversion that boosts loan loss provisions (Altman, 2005). From an accounting perspective, there are two types of provisions for bank credit risk: specific and general provisions (Cortavaria et al., 2000). While specific provisions address identified impaired loans through an increase in loan loss reserves, general provisions are associated with a broad assessment of possible future losses on the entire bank portfolio. As banks need to estimate general provisions, such provisions may be influenced by subjective judgements related to managers' discretionary behavior.

The literature documents that general provisions can be further partitioned into non-discretionary and discretionary components. On the one hand, non-discretionary provisions cover expected credit risks and are considered as a backward-looking component (Whalen, 1994; Beaver and Engel, 1996). On the other hand, the discretionary component is associated with the use of loan loss provisions for managerial objectives. Specifically, the discretionary component is linked to three discretionary actions comprising capital management, income smoothing and signalling (Ahmed et al., 1999; Lobo and Yang, 2001; Kanagaretnam et al., 2003, 2004 & 2005; Anandarajan et al., 2007; Hasan and Wall, 2004).

The Basel definition of capital has emphasized that part of general provisions counts as capital. When loan losses are excessive during a cyclical downturn, increases in specific provisions can be inadequate to cover expected loan losses. Such loan losses can erode bank capital and may, in turn, adversely affect banks' incentive to grant new loans, exacerbating a cyclical downturn. This situation is often referred to as "capital crunch" and has been documented in the literature related to bank capital requirements (e.g., Bernanke and Lown, 1991; Peek and Rosengren, 1995).

Prior studies have documented that the bank provisioning system is procyclical in general. Laeven and Majnoni (2003) point out that the procyclicality of loan loss provisions can be shown by a negative impact on loan loss provisions of higher loan growth, economic growth, or earnings. In a cross-country setting, Cavallo and Majnoni (2002) also find a negative link between economic growth and loan loss provisions. Bikker and Metzmakers (2005) document similar evidence for OECD countries. In a single country setting, Arpa et al. (2001) document the procyclicality of bank loan loss

provisions over the business cycle in Austria, while Fernandez de Lis et al. (2001) and Pain (2003) document similar results for Spanish and UK banks, respectively. Only Packer and Zhu (2012), Angklomkiew et al. (2009) and Craig et al. (2006) focus on Asian banks and, again, report identical results. Nevertheless, to the best of our knowledge, no prior research examines how loan loss provisions affect bank lending behavior in the Asian context.

Another strand of literature advocates a sound provisioning system in any regulations on bank capital requirements (Cavallo and Majnoni, 2002; Banque de France, 2001). This is because a sound provisioning system can avoid credit risk miscalculation in a cyclical downturn due to disaster myopia (Guttentag and Herring, 1984), herd behavior (Rajan, 1994), or institutional memory hypothesis (Berger and Udell, 2003). Fernandez de Lis et al. (2001) propose a dynamic or statistical provisioning system that may solve procyclicality issues for Spanish banks. The statistical provisions are not intended to substitute a specific provision, but to complement the loan loss provisioning system. Specific and general provisions are estimated in line with traditional procedures, while the statistical provisions are calculated from the difference between expected loan losses and specific provisions (Bouvatier and Lepetit, 2008).

As the statistical provisions are estimated to anticipate risks due to business cycle fluctuations, the statistical provisions tend to increase during a cyclical upturn to anticipate a cyclical downturn in the future. Although the statistical provisions increase in a cyclical downturn, the funds obtained from “reserves” generated by the statistical provisions in the earlier period of economic boom can smooth bank profits and losses. Consequently, incorporating the statistical provisions into a bank provisioning system can mitigate banks’ incentives to grant new loans when expected credit risks are underestimated, particularly during a cyclical upturn. As long as banks can improve credit risk evaluation and profit management in their provisioning system, Borio et al. (2001), Mann and Michael (2002), and Jiménez and Saurina (2005) support Fernandez de Lis et al.’s (2001) contention that the procyclicality of bank loan provisions can be resolved.

In order to assess the importance of implementing a dynamic provisioning system for European countries such as Spain, Bouvatier and Lepetit (2008) examine the impact of

non-discretionary and discretionary provisions on bank loan growth in several stages. In the first stage, they examine the determinants of bank loan loss provisions (LLP). In doing so, they create a LLP model in which loan loss provisions are regressed on backward-looking indicators related to problem loans (e.g., non-performing loans, loan-to-asset ratio, and annual GDP growth), and forward-looking indicators depicting capital management, income smoothing and signalling activities of banks. In the second stage, bank loan loss provisions are subsequently grouped into discretionary and non-discretionary components. The discretionary component is computed as the fitted values of the LLP model in which forward-looking indicators become explanatory variables. In parallel, the non-discretionary component is computed as the fitted values of the LLP model in which backward-looking indicators become explanatory variables. In the third stage, they create a regression model to examine the impact of estimated discretionary and non-discretionary provisions on bank loan growth. They show that non-discretionary provisions negatively affect bank loan growth, while discretionary provisions have no statistically significant impact on bank loan growth. Hence, only non-discretionary provisions exacerbate the procyclical effect of loan loss provisions over the business cycle.

Building on their previous study, Bouvatier and Lepetit (2012) modify the procedure to estimate non-discretionary provisions by incorporating an indicator of income smoothing. They argue that loan loss provisions might be used to smooth income as part of bank discretionary behavior, and this behavior might be important to offset a negative impact of non-discretionary provisions on bank loan growth. Their empirical results reveal that greater income smoothing only tempers the negative impact of non-discretionary provisions on bank loan growth, but such a negative impact remains apparent. In this regard, the use of a statistical provision or a dynamic provisioning system is desirable because greater income smoothing is not enough to mitigate the procyclicality of non-discretionary provisions.

Despite the importance of a dynamic provisioning system, different characteristics of banks (such as bank size) may determine a bank's capacity to implement a dynamic provisioning system. Similarly, each country also has different macroeconomic and institutional environments and, thus, the capacity to adopt a dynamic provisioning system

may vary substantially from one country to another. For such reasons, the current study is the first to extend prior research on the link between loan loss provisions and bank lending behavior by considering bank size to account for bank-specific characteristics, as well as information sharing and legal rights to account for country-specific factors. Information sharing and legal rights are relevant because the issues of financial intermediation are conditional on the extent to which information systems and legal rights are of better quality (e.g., Jappelli and Pagano, 2002; Love and Mylenko, 2003; Brown et al., 2009; Houston et al., 2010).

With regards to the influence of legal rights on the link between loan loss provisions and bank loan growth, we consider the influence of the legal rights of borrowers instead of creditor legal rights as in Houston et al. (2010), because we examine the impact of loan loss provisions on bank loan growth from the demand side. Arguably, stronger legal rights of borrowers may increase borrowers' confidence in the banking sector. This in turn reduces the procyclical effect of loan loss provisions on bank loan growth, particularly during economic downturns.

Although we divide loan loss provisions into discretionary and non-discretionary components, our method differs from Bouvatier and Lepetit (2008 and 2012). Specifically, we do not distinguish the type of discretionary purposes, i.e., whether income smoothing, capital management or signalling purposes. In this sense, we allow for different types of discretionary behavior to simultaneously offset the procyclicality of non-discretionary provisions, rather than focusing merely on the use of income smoothing as emphasized in Bouvatier and Lepetit (2012). We therefore follow Kanagaretnam et al. (2009) in grouping loan loss provisions into discretionary and non-discretionary provisions, which is explained in the next section.

3. Data, methodology and econometric specifications

3.1. Data source

From BankScope Fitch IBCA, we construct an unbalanced panel of annual bank-level data from 528 commercial banks in 11 countries in the Asia-Pacific region covering the 2002-2012 period. These countries include China (153), Hong Kong (39), India (60), Indonesia (72), Malaysia (31), South Korea (17), Taiwan (38), Thailand (18), Pakistan

(23), Philippines (31), and Vietnam (46).² Moreover, we incorporate country-specific data such as real gross domestic product (*RGDP*) and short-term interest rate (*SHRATE*) retrieved from Thomson Reuters Datastream International.

As this study also assesses the influence of credit information sharing and legal rights of borrowers on the link between loan loss provisions and bank lending, we also retrieve data country-level data regarding credit reporting system and legal rights strength for each country. These data are collected from the Doing Business database provided by the World Bank. Doing Business 2004-2014 provides data on a country's credit reporting system for January 2003 to January 2013. Hence, such information reflects the situation at the end of each year from 2002 to 2012.

To account for the quality of credit information sharing, we consider the degree of credit information covered by private credit bureau (*PRIVBUR*) and public credit registry (*PUBREG*) following Tsai et al. (2011). *PRIVBUR* and *PUBREG* describe the proportion of individuals and firms listed by a private credit bureau and a public credit registry, respectively. Information covered by these credit registries includes repayment history, unpaid debts and credit outstanding. Higher *PRIVBUR* and *PUBREG* are associated with better credit information sharing.

However, the information coverage of private credit bureaus is usually greater than that of public credit registries (Love and Mylenko, 2003). Private credit registries are more likely to collect information from various sources including non-bank creditors, and store more detailed information on the borrowers. On the other hand, public credit registries tend to collect information only from supervised institutions and the coverage of information is rather limited (Love and Mylenko, 2003).

We also consider the legal rights strength index (*LEGAL*) from Doing Business 2004-2014 to account for borrowers' rights protection. Considering the influence of the legal rights of borrowers in examining the relation between loan loss provisions and bank loan growth is relevant for the following reasons. It is widely perceived that stronger depositor protection through deposit insurance can reduce incentives for depositors to discipline bank risk taking (Barth et al., 2006). Arguably, higher borrower protection may also exacerbate entrepreneurial moral hazard, particularly in the presence of information

² The numbers in parentheses represent the number of banks in our sample for each country.

asymmetry on the credit market. As the loan loss provisioning system is part of prudential regulations that aim to cope with bank credit risk, increased borrowers' moral hazard due to stronger borrowers' legal rights may cause risk-shifting from borrowers to banks *a la* Stiglitz and Weiss (1981). As such, the role of loan loss provisions in mitigating credit risk and procyclical effects can be outweighed by stronger legal rights for borrowers. On the other hand, Houston et al. (2010) emphasize that stronger protection of creditor rights is detrimental to financial stability, because it may increase incentives for creditors to undertake excessive risk taking. In this paper, we emphasize the strength of legal rights of borrowers and how it impacts the procyclical effect of loan loss provisions on growth in bank lending. To the best of our knowledge, no prior studies have examined how the legal rights of borrowers affect financial intermediation or stability.

3.2. Method

As stated earlier, the objective of our study is threefold. First, we examine the link between loan loss provisions and bank loan growth in order to highlight whether loan loss provisions are procyclical over the business cycle. Second, we examine whether information sharing and legal rights offset the procyclical effect of loan loss provisions, and substitute for the need for a dynamic provisioning system. Third, in examining these issues we consider the effect of bank size (i.e., large and small banks) to address the “too-big-to-fail” issues related to bank risk taking through lending activities.

In doing so, we initially identify the determinants of loan loss provisions for all banks. We then estimate discretionary and non-discretionary loan loss provisions. In the second step, we examine the effect of both discretionary and non-discretionary loan loss provisions on bank loan growth. In the third step, a closer investigation is undertaken to examine the influence of information sharing and legal rights on the link between loan loss provisions and loan growth in banking. Finally, in order to better understand the effect of bank size on these relationships, we repeat our tests for subsamples of large banks and small banks. These steps are explained further in the next section.

3.3. The determinants of bank loan loss provisions

In order to disentangle the discretionary and non-discretionary components of the loan loss provisions, we initially estimate a loan loss provisions model with the ratio of loan loss provisions to total loans (LLPL) as the dependent variable following Kanagaretnam et al. (2009). We also use the ratio of total loan loss provisions to total assets (LLPTA) as the dependent variable in our tests. Specifically, we estimate the following equations:

$$LLPL_{i,t} = \alpha_0 + \alpha_1 TIER1_{i,t-1} + \alpha_2 CAR_{i,t-1} + \alpha_3 CHLOAN_{i,t} + \alpha_4 LLRTA_{i,t-1} + \alpha_5 EBTPS_{i,t-1} + \alpha_6 NPLTA_{i,t-1} + \alpha_7 CHNPL_{i,t-1} + \alpha_7 CHOFFTA_{i,t-1} + \varepsilon_{i,t} \quad (1a)$$

$$LLPTA_{i,t} = \alpha_0 + \alpha_1 TIER1_{i,t-1} + \alpha_2 CAR_{i,t-1} + \alpha_3 CHLOAN_{i,t} + \alpha_4 LLRTA_{i,t-1} + \alpha_5 EBTPS_{i,t-1} + \alpha_6 NPLTA_{i,t-1} + \alpha_7 CHNPL_{i,t-1} + \alpha_7 CHOFFTA_{i,t-1} + \varepsilon_{i,t} \quad (1b)$$

Eq. (1a) and Eq. (1b) represent the loan loss provision models for our two measures of loan loss provisions (LLPL and LLPTA). *TIER1* is defined as Tier 1 risk adjusted capital, while *CAR* is total risk adjusted capital. *CHLOAN* denotes change in total outstanding loans and *LLRTA* is loan loss allowance. *EBTPS* reflects earnings before tax, loan loss provisions, and special items. *NPL* and *CHNPL* represent total non-performing loans and change in total non-performing loans, respectively. Finally, *LCO* represents net loan charge-offs (write-offs). Because we consider both listed and non-listed banks in our sample, all of these variables are scaled by bank total assets rather than market value of equity as in Kanagaretnam et al. (2009).

We compute the estimated values of discretionary and non-discretionary provisions in period t based on either Eq. (1a) or Eq. (1b). We follow Kanagaretnam et al. (2009) where non-discretionary provisions in period t are calculated by the fitted values of the LLP equation, while discretionary provisions in period t are represented by the residuals of the LLP equation. We specify *NDISCL* and *NDISCTA* to reflect the non-discretionary loan loss provisions estimated from the *LLPL* and *LLPTA* models in Eq. (1a) and Eq.

(1b), respectively. Likewise, *DISCL* and *DISCTA* are discretionary provisions calculated from the *LLPL* and *LLPTA* models, respectively.

3.3. Bank loan loss provisions and loan growth

Once the estimated discretionary and non-discretionary provisions have been estimated, we assess the impact of non-discretionary and discretionary provisions on bank loan growth. Following Bouvatier and Lepetit (2008), bank loan growth (*DLOAN*) is defined as the actual change in the ratio of total loans to total assets. More precisely, bank loan growth is measured as:

$$DLOAN_{i,t} = (L_{i,t} - L_{i,t-1}) / 0.5(TA_{i,t} + TA_{i,t-1}).$$

L is total loans. To test for robustness, we also use the simple annual growth of total loans (*LOANG*) as the dependent variable. *LOANG* is calculated as the difference between total loans in period *t* and total loans in period *t* – 1, divided by total outstanding loans in period *t* – 1.

Bank loan growth is regressed against our variables of interest and several control variables that may affect bank loan growth using the following equations following Bouvatier and Lepetit (2008):

$$DLOAN_{i,t} = \alpha_0 + \alpha_1 DISC_{i,t} + \alpha_2 NDISC_{i,t} + \alpha_3 EQTA_{i,t} + \alpha_4 DTA_{i,t} + \alpha_5 SIZE_{i,t} + \alpha_6 LRGDP_{i,t} + \alpha_7 SHRATE_{i,t} + \varepsilon_{i,t} \quad (2a)$$

$$LOANG_{i,t} = \alpha_0 + \alpha_1 DISC_{i,t} + \alpha_2 NDISC_{i,t} + \alpha_3 EQTA_{i,t} + \alpha_4 DTA_{i,t} + \alpha_5 SIZE_{i,t} + \alpha_6 LRGDP_{i,t} + \alpha_7 SHRATE_{i,t} + \varepsilon_{i,t} \quad (2b)$$

In Eq. (2a) and Eq. (2b), both *DISC* and *NDISC* are measured using either *LLPL* as in Eq. (1.a), or *LLPTA* as in the Eq. (1b).

To control for bank-specific factors in Eq. (2a) and Eq. (2b), we include several bank-specific variables. The ratio of total equity to total assets (*EQTA*) is considered as a control variable, because higher capitalization is expected to enhance a bank's capacity to grant new loans as described in the "capital crunch" literature (e.g., Bernanke and Lown, 1991; Peek and Rosengren, 1995). Building on Olivero et al. (2011), we consider the

impact of bank liquidity and the “too-big-to-fail” effects on bank loan growth. However, we measure bank liquidity using the ratio of total deposits and short-term funding to total assets (*DTA*) instead of the ratio of liquid assets to total assets as in Olivero et al. (2011) due to data availability reasons. We expect a positive relation between *DTA* and loan growth because banks with a greater funding base have greater liquidity and more capacity to boost lending activities. Because larger banks tend to behave imprudently due to the “too-big-to-fail” effects (Beck and Laeven, 2006), larger banks might boost loan growth to generate profits. To account for bank size, we use the logarithm of bank total assets (*SIZE*).

Given that our sample of banks comes from different countries, controlling for country-specific factors is necessary. Following Olivero et al. (2011), we include the logarithm of real gross domestic product (*LRGDP*) and short-term interest rate (*SHRATE*) to account for the degree of economic development and the impact of monetary policy, respectively. The role of monetary policy in bank lending has been widely discussed in which higher short-term interest rates can temper bank loan growth.

3.4. Information sharing, legal rights of borrowers, and the procyclicality of loan loss provisions

In the next stage, we augment the analysis by assessing whether the procyclicality of loan loss provisions is conditional on credit information sharing and strength of the legal rights of borrowers. Our focus is to examine the joint-impact of discretionary provisions and these country-specific factors. From these results, we can ascertain whether the procyclical effect of non-discretionary provisions, if any, can be offset by the countercyclical effect of discretionary provisions, which is also conditional on the extent to which credit information sharing and borrower legal rights are of better quality. In case that the countercyclical effect of discretionary provisions – which is dependent on the quality of credit information sharing and borrower legal rights – can offset the procyclical effect of non-discretionary loan loss provisions, then statistical provisions generated from a dynamic provisioning system might not be necessary.

In examining the effect of information sharing on bank loan growth, we distinguish between the influence of private credit bureaus and public credit registries instead of

investigating the influence of information sharing in general following Brown et al. (2009). Our approach in defining information sharing therefore follows Tsai et al. (2011). This enables us to determine the type of information sharing mechanism that matters for economic growth and financial stability in overcoming the procyclicality of non-discretionary loan loss provisions.

For this purpose, we modify Eq. (2a) and Eq. (2b) to incorporate the interaction term between discretionary loan loss provisions and country-specific factors representing information sharing and borrower legal rights, as shown in Eq. (3), Eq. (4) and Eq. (5)³.

$$\begin{aligned}
DLOAN_{i,t} = & \alpha_0 + \alpha_1 DISC_{i,t} + \alpha_2 NDISC_{i,t} + \alpha_3 EQTA_{i,t} + \alpha_4 DTA_{i,t} \\
& + \alpha_5 SIZE_{i,t} + \alpha_6 LRGDP_t + \alpha_7 SHRATE_t \\
& + \alpha_8 PRIVBUR_t + \alpha_9 DISC * PRIVBUR_{i,t} + \varepsilon_{i,t}
\end{aligned} \tag{3}$$

$$\begin{aligned}
DLOAN_{i,t} = & \alpha_0 + \alpha_1 DISC_{i,t} + \alpha_2 NDISC_{i,t} + \alpha_3 EQTA_{i,t} + \alpha_4 DTA_{i,t} \\
& + \alpha_5 SIZE_{i,t} + \alpha_6 LRGDP_t + \alpha_7 SHRATE_t \\
& + \alpha_8 PUBREG_t + \alpha_9 DISC * PUBREG_{i,t} + \varepsilon_{i,t}
\end{aligned} \tag{4}$$

$$\begin{aligned}
DLOAN_{i,t} = & \alpha_0 + \alpha_1 DISC_{i,t} + \alpha_2 NDISC_{i,t} + \alpha_3 EQTA_{i,t} + \alpha_4 DTA_{i,t} \\
& + \alpha_5 SIZE_{i,t} + \alpha_6 LRGDP_t + \alpha_7 SHRATE_t \\
& + \alpha_8 LEGAL_t + \alpha_9 DISC * LEGAL_{i,t} + \varepsilon_{i,t}
\end{aligned} \tag{5}$$

The above equations are also estimated using *LOANG* as an alternative measure of bank loan growth to replace *DLOAN*. Moreover, both *DISC* and *NDISC* also comprise two different measures depending on the definition of loan loss provisions as stated earlier, from Eq. (1a) and Eq. (1b).

³ We interact each variable representing country-specific credit market environments (i.e. private credit bureaus, public credit registries, and borrower legal rights) with discretionary provisions instead of non-discretionary provisions, because only discretionary provisions can be adjusted by bank managers for capital management, signaling, or income smoothing purposes. Arguably, credit market environments at the country level can affect the extent to which capital management, signaling or income smoothing plays a role, so that bank managers increases bank loan loss provisions. On the other hand, non-discretionary provisions cannot be easily adjusted due to credit market environments, because non-discretionary provisions are merely dependent on the degree of non-performing loans.

3.5. Information sharing, legal rights of borrowers, and the procyclicality of loan loss provisions: Large banks vs. small banks

In the final step, we examine whether large banks and small banks behave differently in terms of their lending behavior in responding to higher loan loss provisions. In order to identify large banks and small banks, we calculate the average of the logarithm of total assets for each bank in the whole period of observation (2002-2012). We then use the 75th percentile of these average values as a cut-off point. A bank is considered a large bank if its average logarithm of total assets exceeds its 75th percentile and a bank is considered a small bank if its average logarithm of total assets is less than its 75th percentile. We construct a dummy variable (*DSIZE*), taking a value of 1 if a bank is classified as a large bank and 0 otherwise. In turn, we re-estimate Eq. (2a), Eq (2b), Eq. (3), Eq. (4), and Eq. (5) for large and small bank sample separately.

4. Empirical results

4.1. Descriptive statistics and correlation structure

Table 1 reports the descriptive statistics of all variables used in this study. Descriptive statistics for all variables are also reported separately for large and small banks. The descriptive statistics indicate that small banks exhibit higher loan loss provisions on average (*LLPTA* and *LLPL*) than large banks. Small banks also exhibit higher average loan growth than large banks (*DLOAN* and *LOANG*). These initial observations highlight differences between small and large banks in terms of their lending behavior and procyclicality. Overall, all of the average values of bank-specific variables for small banks are higher than those for large banks.

[Insert Table 1 here]

Table 2 reports the Pearson correlation coefficients for all bank-specific and country-specific variables used in this study. The correlations suggest that multicollinearity is not likely to be an issue because none of the independent variables are highly correlated.

[Insert Table 2 here]

4.2. Regression results

4.2.1. The determinants of bank loan loss provisions

In this stage, we estimate Eq. (1) to obtain coefficients related to factors affecting bank loan loss provisions. Table 3 reports our estimation outputs. Non-performing loans (*NPLTA*), change in non-performing loans (*CHNPL*) and net loan charge-offs (*CHOFFTA*) are associated with higher loan loss provisions measured by both *LLPTA* and *LLPL*. Meanwhile, the Tier-1 capital ratio (*RTIER1*) has a significant and positive association with *LLPTA* but no significant association with *LLPL*. Changes in total loans (*CHLOAN*) and loan loss reserves (*LLRTA*) have a negative association with both measures of loan loss provisions (*LLPTA* and *LLPL*). The negative association between *CHLOAN* and loan loss provisions (*LLPTA* and *LLPL*) indicates that loan loss provisions are procyclical because increased loan activities reflecting economic boom periods tend to reduce loan loss provisions. This finding is consistent with Asea and Blomberg (1998) and Bouvatier and Lepetit (2008) who analyze US banks and European banks, respectively.

However, Kanagaretnam et al. (2009) show that the coefficient of *CHLOAN* in the loan loss provision regression is positive, suggesting that banks in their sample behave prudently by building up loan loss provisions to cover default risk exposure following the expansion of lending activities. This also indicates that procyclicality of the loan loss provisioning system is less likely to occur in their bank sample.

We also find that the earning variable (*EBTPS*) has no clear impact on loan loss provisions as reflected in a negative association with *LLPTA* while having a positive association with *LLPL*. This result asserts that banks in our sample tend to use loan loss provisions for non-discretionary purposes, particularly to deal with higher non-performing loans and charge-offs. In other words, banks will increase loan loss provisions, because their expected credit risk also increase.

[Insert Table 3 here]

4.2.2. Bank loan loss provisions and loan growth

In this section, we differentiate the effects of non-discretionary and discretionary loan loss provisions on bank lending. Specifically, we aim to assess what types of provisions amplify business cycle fluctuations through bank lending.

[Insert Table 4 here]

The results reported in Table 4 indicate that only non-discretionary loan loss provisions amplify procyclical effects because higher non-discretionary loan loss provisions tend to reduce bank loan growth. This result is robust to our different measures of non-discretionary loan loss provisions and bank loan growth. The bank capital ratio (*EQTA*) is negatively linked to bank loan growth measured by *LOANG*, while the deposits-to-assets ratio (*DTA*) exhibits no significant association with bank loan growth. Bank size (*SIZE*) has a significant and positive association with bank loan growth. This follows the notion that bank risk taking – which might come from higher lending activities – increases due the “too-big-to-fail” effects, as the asset size of banks increases (Beck and Laeven, 2006; Mishkin, 2006; Kane, 2000).

With regards to country-specific control variables, only short-term interest (*SHRATE*) is significant and it has a negative association with bank loan growth. This result suggests that the bank lending channel occurs in Asian banks following Olivero et al. (2011).

4.2.3. Information sharing, legal rights of borrowers, and the procyclicality of loan loss provisions

To test whether information sharing and borrower legal rights offset the procyclical effect of non-discretionary loan loss provisions, we estimate Eq. (3) to Eq. (5). Table 5 presents our results when the effect of private credit bureaus is taken into consideration, while Tables 6 and 7 report our results regarding the influence of public credit registries and borrower legal rights, respectively.

Consistent with our previous results, the results reported in Table 5 initially indicate that non-discretionary loan loss provisions exhibit a procyclical effect, because of the

negative link between non-discretionary provisions (*NDISCTA* and *NDISCL*) and bank loan growth (*DLOAN* and *LOANG*). This procyclical effect cannot be offset by discretionary provisions measured by *DISCTA* or *DISCL*, as discretionary provisions do not have a significant association with bank loan growth. In this respect, there is no countercyclical effect of discretionary provisions to offset the procyclicality of non-discretionary provisions.

[Insert Table 5 here]

In the next turn, we examine the influence of information sharing measured by the quality of private credit bureaus (*PRIVBUR*) and public credit registries (*PUBREG*) on the link between discretionary provisions and loan growth. Our aim is to test whether the quality of information sharing strengthens or deteriorates the countercyclical effect of discretionary provisions that may in turn offset the procyclicality of non-discretionary provisions.

Table 5 documents the significant and negative interactions between discretionary loan loss provisions (*DISCTA* or and *DISCL*) and private credit bureaus (*PRIVBUR*). Moreover, we find that the negative coefficients of *NDISCTA* (or *NDISCL*) are higher than the sum of the coefficients of *DISCTA* (or *DISCL*) and *DISCTA*PRIVBUR* (or *DISCL*PRIVBUR*). In this case, the presence of private credit bureaus is less beneficial to overcome the procyclicality of loan loss provisions, because discretionary provisions also become procyclical. In other words, for countries with better private credit bureaus, the procyclicality of non-discretionary provisions shown by the negative sign of *NDISCTA* or *NDISCL* is aggravated by the procyclicality of discretionary provisions.

In contrast, the interaction terms between discretionary loan loss provisions (*DISCTA* and *DISCL*) and public credit registries (*PUBREG*) reported in Table 6 exhibit a positive and significant association with bank loan growth. Moreover, the sum of the coefficients of *DISCTA* (or *DISCL*) and such interaction terms are higher than the coefficients of non-discretionary provisions (*NDISCTA* and *NDISCL*). Hence, higher discretionary provisions in countries with better public credit registries in sharing credit information might offset the procyclical impact of non-discretionary provisions on bank loan growth.

As such, a dynamic provisioning system to cope with the procyclicality of non-discretionary provisions might be replaced by the role of public credit registries.

[Insert Table 6 here]

In Table 7, we examine the effect of interaction terms between discretionary provisions (*DISCTA* or *DISCL*) and borrower legal rights (*LEGAL*) on bank loan growth. Meanwhile, higher discretionary provisions in countries with stronger legal rights of borrowers (*DISCTA*LEGAL* or *DISCL*LEGAL*) exhibit a positive impact on bank loan growth. However, the positive sign related to the sum of the coefficients of discretionary provisions and such interaction terms with borrower legal rights are smaller than the negative coefficients of non-discretionary provisions. Accordingly, stronger legal rights of borrowers combined with higher discretionary provisions can only temper the procyclicality of non-discretionary provisions on bank loan growth.

[Insert Table 7 here]

4.2.4. Information sharing, legal rights of borrowers, and the procyclicality of loan loss provisions: Large banks vs. small banks

In this section, we differentiate the effect of information sharing and legal rights of borrowers on the procyclical impact of loan loss provisions with respect to bank size. Table 8 initially shows that both non-discretionary and discretionary loan loss provisions have a procyclical impact on bank lending for large banks, because both discretionary and non-discretionary provisions are negatively associated with bank loan growth.

[Insert Table 8 here]

In Table 9, we document that for large banks, the coefficients of the interaction terms between discretionary loan loss provisions and private credit bureaus (*DISCL*PRIVBUR*) are higher than the coefficients of discretionary loan loss provisions (*DISCL*). This

indicates that better private credit bureaus strengthen the positive impact of discretionary provisions on bank loan growth. In this regard, discretionary loan loss provisions for large banks are countercyclical, especially for countries with better private credit bureaus. Nevertheless, the countercyclicality of discretionary provisions in large banks cannot offset the procyclicality of non-discretionary provisions measured by *NDISCL*, because the negative coefficients of *NDISCL* are higher than the sum of the coefficients of *DISCL* and *DISCL*PRIVBUR*.

[Insert Table 9 here]

In Table 10, the coefficients for the interaction terms between discretionary loan loss provisions and public credit registries (*DISCTA*PUBREG* or *DISCL*PUBREG*) are not statistically significant for our sample of large banks. Whereas, both discretionary and non-discretionary provisions are negatively associated with bank loan growth. These results highlight that both types of provisions are procyclical, while such procyclical effects cannot be offset by the role of public credit registries.

[Insert Table 10 here]

In Table 11, we report that the degree of borrower legal rights has no significant effect on the procyclicality of loan loss provisions. We also find that both discretionary and non-discretionary provisions are procyclical. Overall, we find that the procyclicality of non-discretionary provisions for large banks cannot be offset by discretionary provisions or by the quality of private credit bureaus, private credit registries and borrower legal rights. For large banks, a dynamic provisioning system may be therefore necessary to increase statistical provisions in order to cope with the procyclicality of non-discretionary provisions that amplify business cycle fluctuations.

[Insert Table 11 here]

Moreover, Tables 12 to 15 report the results from re-estimating Eq. (2) to Eq. (5) for our sample of small banks. As reported in Table 12, only non-discretionary provisions (*NDISCTA* and *NDISCL*) have a significant and negative association with bank loan growth (*DLOAN* and *LOANG*). In Table 13, we document that higher information sharing by private credit bureaus exacerbates the procyclicality of non-discretionary provisions in small banks, because the sum of coefficients of the interaction terms (*DISCTA*PRIVBUR* and *DISCL*PRIVBUR*) and discretionary provisions (*DISCTA* and *DISCL*) are negative, increasing a negative magnitude of the coefficients of non-discretionary provisions.

[Insert Table 12, 13, 14, and 15 here]

Tables 14 and 15 present our results when we take into account the effect of public credit registries and borrower legal rights, respectively. We find strong evidence that better public credit registries and stronger borrower legal rights combined with higher discretionary provisions offset the procyclicality of non-discretionary loan loss provisions. On the whole, we find that using discretionary loan loss provisions is sufficient for small banks in countries with better quality public credit bureaus and stronger legal rights of borrowers, in order to offset the procyclicality of non-discretionary loan loss provisions. In other words, a dynamic provisioning system that increases statistical provisions might not be crucial for small banks, if public credit registries and borrower legal rights are of better quality. Strengthening public credit registries and borrower legal rights might therefore be an option to cope with the procyclicality of non-discretionary provisions, instead of forcing small banks to implement a dynamic provisioning system.

5. Conclusion

This study examines the effect of loan loss provisions on the lending behavior of banks by considering the influence of credit information sharing and legal rights of borrowers. In general, we show that non-discretionary loan loss provisions of Asian banks are procyclical because higher non-discretionary loan loss provisions are significantly associated with a decline in bank loan growth. This procyclical effect for

non-discretionary loan loss provisions occurs in both large and small banks. For large banks, we also find that discretionary loan loss provisions exhibit a procyclical effect, as discretionary loan loss provisions in large banks are negatively associated with loan growth.

Furthermore, we generally document that for all banks, credit information sharing and borrower legal rights may reduce the procyclicality of non-discretionary loan loss provisions. Specifically, higher discretionary loan loss provisions of banks in countries with better quality public credit registries (but not private credit bureaus) and stronger legal rights of borrowers may offset, or at least temper, the negative impact of non-discretionary loan loss provisions on bank loan growth. However, these results only hold for our sample of small banks.

In other words, we find evidence that small banks in countries with better public credit registries and stronger legal rights of borrowers can simply use discretionary loan loss provisions to offset the procyclicality of non-discretionary loan loss provisions. For small banks, higher discretionary loan loss provisions – combined with better quality public credit registries or borrower legal rights – are significantly associated with an increase in loan growth. This positive effect for discretionary loan loss provisions is greater than the negative effect of non-discretionary loan loss provisions on loan growth. Small banks in countries with better public credit registries and stronger legal rights of borrowers are the ones that do not require a dynamic provisioning system to overcome their procyclical behavior, although we do not discourage small banks from implementing a dynamic provisioning system.

On the other hand, we do not find that high quality private credit bureaus, public credit registries, and legal rights of borrowers offset the procyclicality of non-discretionary loan loss provisions in large banks. In this regard, the implementation of a dynamic provisioning system is more important for large banks than small banks. Hence, bank regulators need to pay closer attention to large banks with respect to the implementation of a dynamic provisioning system. This is because higher non-discretionary loan loss provisions in large banks reduce loan growth and such a reduction cannot simply be offset by discretionary loan loss provisions, although the quality of credit information sharing and legal rights of borrowers are strengthened.

Overall, this study identifies conditions where a dynamic provisioning system may mitigate the procyclical behavior of Asian banks. This study is important in the sense that Asian banks do not all have the same capacity to implement a dynamic provisioning system. Similarly, the procyclical effect of loan loss provisions, notably the non-discretionary provisions may vary from country to country depending on the strength of public credit registries and the legal rights of borrowers. In this respect, each country may have different macroeconomic environments, which, in turn, may determine the effectiveness of the dynamic provisioning system.

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Table 1. Descriptive statistics

| Variables | All banks | | | Large banks | | | Small banks | | |
|---|-----------|---------|-----------|-------------|---------|-----------|-------------|---------|-----------|
| | Mean | Median | Std. Dev. | Mean | Median | Std. Dev. | Mean | Median | Std. Dev. |
| <i>Loan loss provisions</i> | | | | | | | | | |
| <i>LLPL</i> | 0.0081 | 0.0057 | 0.0316 | 0.0080 | 0.0055 | 0.0096 | 0.0081 | 0.0058 | 0.0365 |
| <i>LLPTA</i> | 0.0049 | 0.0030 | 0.0232 | 0.0045 | 0.0031 | 0.0058 | 0.0050 | 0.0029 | 0.0268 |
| <i>LLRTA</i> | 0.0196 | 0.0107 | 0.0521 | 0.0148 | 0.0096 | 0.0175 | 0.0214 | 0.0114 | 0.0597 |
| <i>Capital adequacy ratios</i> | | | | | | | | | |
| <i>RTIER1</i> | 0.1636 | 0.1100 | 0.2594 | 10.3096 | 9.7250 | 3.3961 | 19.1613 | 11.9000 | 30.8939 |
| <i>CAR</i> | 0.1931 | 0.1381 | 0.2483 | 0.1345 | 0.1308 | 0.0400 | 0.2172 | 0.1441 | 0.2905 |
| <i>EQTA</i> | 0.1144 | 0.0789 | 0.1210 | 0.0680 | 0.0645 | 0.0274 | 0.1308 | 0.0898 | 0.1361 |
| <i>Loan growth</i> | | | | | | | | | |
| <i>DLOAN</i> | 0.1013 | 0.0934 | 0.1214 | 0.0881 | 0.0870 | 0.0751 | 0.1061 | 0.0963 | 0.1341 |
| <i>LOANG</i> | 0.2224 | 0.2035 | 0.2202 | 0.1871 | 0.1826 | 0.1571 | 0.2360 | 0.2123 | 0.2389 |
| <i>CHLOAN</i> | 0.0856 | 0.0853 | 0.1065 | 0.0790 | 0.0802 | 0.0660 | 0.0881 | 0.0881 | 0.1178 |
| <i>Non-performing loans</i> | | | | | | | | | |
| <i>NPLTA</i> | 0.0256 | 0.0128 | 0.0438 | 0.0206 | 0.0097 | 0.0315 | 0.0276 | 0.0143 | 0.0476 |
| <i>CHNPL</i> | -0.0413 | -0.0080 | 1.9045 | -0.1404 | -0.0224 | 1.2089 | -0.0009 | -0.0005 | 2.1227 |
| <i>CHOFFTA</i> | 0.0034 | 0.0012 | 0.0095 | 0.0034 | 0.0015 | 0.0068 | 0.0034 | 0.0010 | 0.0106 |
| <i>Information sharing</i> | | | | | | | | | |
| <i>PRIVBUR</i> | 0.1736 | 0.0000 | 0.3039 | 0.3161 | 0.1020 | 0.3805 | 0.1286 | 0.0000 | 0.2660 |
| <i>PUBREG</i> | 0.1244 | 0.0080 | 0.1873 | 0.1344 | 0.0000 | 0.2511 | 0.1222 | 0.0460 | 0.1620 |
| <i>Legal rights of borrowers</i> | | | | | | | | | |
| <i>LEGAL</i> | 0.0594 | 0.0500 | 0.0213 | 0.0626 | 0.0500 | 0.0235 | 0.0582 | 0.0500 | 0.0206 |
| <i>Control variables</i> | | | | | | | | | |
| <i>EBTPS</i> | 0.0180 | 0.0167 | 0.0275 | 0.0164 | 0.0157 | 0.0084 | 0.0186 | 0.0174 | 0.0317 |
| <i>DTA</i> | 0.8115 | 0.8510 | 0.1410 | 0.8490 | 0.8681 | 0.0993 | 0.7981 | 0.8430 | 0.1509 |
| <i>SIZE</i> | 15.1578 | 15.2605 | 1.9815 | 17.4306 | 17.1988 | 1.1503 | 14.3517 | 14.5815 | 1.5387 |
| <i>LG DPR</i> | 13.1775 | 14.1097 | 2.0738 | 12.9685 | 13.3533 | 2.1604 | 13.2521 | 14.2056 | 2.0420 |
| <i>SHRATE</i> | 0.0507 | 0.0390 | 0.0354 | 0.0361 | 0.0317 | 0.0245 | 0.0548 | 0.0447 | 0.0371 |

Table 2. Correlation coefficients

| Variables | <i>LLPL</i> | <i>LLPTA</i> | <i>DLOAN</i> | <i>LOANG</i> | <i>RTIER1</i> | <i>CAR</i> | <i>CHLOAN</i> | <i>LLRTA</i> | <i>EBTPS</i> | <i>NPLTA</i> | <i>CHNPL</i> |
|----------------|-------------|--------------|--------------|--------------|---------------|------------|---------------|--------------|--------------|--------------|--------------|
| <i>LLPL</i> | 1.0000 | | | | | | | | | | |
| <i>LLPTA</i> | 0.6447 | 1.0000 | | | | | | | | | |
| <i>DLOAN</i> | 0.0040 | -0.0286 | 1.0000 | | | | | | | | |
| <i>LOANG</i> | -0.0508 | -0.0526 | 0.9048 | 1.0000 | | | | | | | |
| <i>RTIER1</i> | -0.2496 | -0.1030 | -0.1284 | -0.0138 | 1.0000 | | | | | | |
| <i>CAR</i> | -0.2743 | -0.1066 | -0.1211 | 0.0088 | 0.9881 | 1.0000 | | | | | |
| <i>CHLOAN</i> | 0.0227 | -0.0172 | 0.9484 | 0.8889 | -0.1508 | -0.1421 | 1.0000 | | | | |
| <i>LLRTA</i> | 0.0416 | 0.0748 | -0.1470 | -0.1310 | 0.0885 | 0.0034 | -0.1557 | 1.0000 | | | |
| <i>EBTPS</i> | 0.0732 | -0.0049 | -0.0161 | 0.0485 | -0.0039 | 0.0300 | -0.0015 | 0.0972 | 1.0000 | | |
| <i>NPLTA</i> | 0.1560 | 0.1943 | -0.1830 | -0.1838 | 0.1109 | -0.0264 | -0.1856 | 0.7914 | 0.0318 | 1.0000 | |
| <i>CHNPL</i> | 0.2160 | 0.3658 | 0.0506 | 0.0285 | -0.1082 | -0.1456 | 0.0416 | 0.0483 | -0.0889 | 0.1596 | 1.0000 |
| <i>CHOFFTA</i> | 0.2802 | 0.1428 | -0.1110 | -0.0813 | -0.0210 | 0.0376 | -0.1010 | 0.1426 | 0.0783 | 0.1360 | -0.3791 |
| <i>EQTA</i> | -0.0878 | -0.1289 | -0.0852 | -0.0093 | 0.6952 | 0.6788 | -0.1346 | 0.0805 | 0.0799 | 0.1082 | -0.1588 |
| <i>DTA</i> | 0.0936 | 0.0650 | 0.1200 | 0.0445 | -0.5589 | -0.5395 | 0.1604 | -0.1919 | -0.1552 | -0.1582 | 0.0623 |
| <i>SIZE</i> | 0.0594 | 0.0263 | -0.0622 | -0.0908 | -0.4222 | -0.4282 | -0.0195 | -0.1696 | -0.0220 | -0.2379 | 0.0326 |
| <i>LG DPR</i> | 0.0317 | 0.0392 | -0.1029 | -0.1584 | 0.0423 | 0.0420 | -0.1142 | 0.1207 | -0.0109 | 0.1587 | 0.0782 |
| <i>SHRATE</i> | 0.0437 | 0.0315 | 0.0072 | -0.0099 | -0.1012 | -0.0247 | 0.0075 | 0.0753 | 0.0750 | 0.0721 | 0.1337 |
| <i>PRIVBUR</i> | -0.0217 | -0.0139 | -0.1961 | -0.2193 | 0.1119 | 0.0893 | -0.2013 | -0.0579 | -0.0907 | -0.0954 | -0.0239 |
| <i>PUBREG</i> | -0.0845 | -0.0159 | 0.0095 | 0.0230 | 0.0754 | 0.0735 | 0.0116 | -0.1028 | 0.0110 | -0.1660 | 0.0116 |
| <i>LEGAL</i> | -0.0346 | -0.0484 | -0.0863 | -0.0625 | 0.1226 | 0.1371 | -0.1013 | -0.0876 | -0.0099 | -0.1368 | 0.0058 |

| Variables | <i>CHOFFTA</i> | <i>EQTA</i> | <i>DTA</i> | <i>SIZE</i> | <i>LG DPR</i> | <i>SHRATE</i> | <i>PRIVBUR</i> | <i>PUBREG</i> | <i>LEGAL</i> |
|----------------|----------------|-------------|------------|-------------|---------------|---------------|----------------|---------------|--------------|
| <i>CHOFFTA</i> | 1 | | | | | | | | |
| <i>EQTA</i> | 0.0531 | 1 | | | | | | | |
| <i>DTA</i> | -0.0734 | -0.8543 | 1 | | | | | | |
| <i>SIZE</i> | -0.0539 | -0.5165 | 0.4206 | 1 | | | | | |
| <i>LG DPR</i> | 0.0209 | 0.1384 | -0.1808 | -0.1740 | 1 | | | | |
| <i>SHRATE</i> | -0.0160 | -0.0307 | -0.0369 | -0.1743 | 0.2476 | 1 | | | |
| <i>PRIVBUR</i> | 0.0239 | 0.1388 | -0.1336 | 0.0950 | 0.3118 | -0.3852 | 1 | | |
| <i>PUBREG</i> | -0.1321 | -0.0092 | -0.0104 | 0.0817 | 0.0056 | 0.0713 | 0.0389 | 1 | |
| <i>LEGAL</i> | -0.1258 | 0.1106 | -0.1364 | 0.0063 | 0.1653 | 0.1149 | 0.4621 | 0.2961 | 1 |

Table 3. The determinants of loan loss provisions in banking

| Explanatory variables | <i>LLPTA</i> | | <i>LLPL</i> | |
|-----------------------|--------------|-------------|-------------|-------------|
| | Coefficient | t-Statistic | Coefficient | t-Statistic |
| <i>RTIER1(-1)</i> | 0.0343* | 1.9605 | -0.0027 | -0.3402 |
| <i>CAR(-1)</i> | -0.0115 | -0.5596 | -0.0371*** | -3.9739 |
| <i>CHLOAN</i> | -0.0212** | -2.3828 | -0.0114*** | -2.8172 |
| <i>LLRTA(-1)</i> | -1.1603*** | -13.417 | -0.2716*** | -6.4866 |
| <i>EBTPS</i> | -1.1700*** | -15.0759 | 0.1728*** | 4.3119 |
| <i>NPLTA(-1)</i> | 0.3459*** | 5.8196 | 0.2171*** | 7.9951 |
| <i>CHNPL</i> | 0.0104*** | 17.2648 | 0.0047*** | 16.1862 |
| <i>CHOFFTA</i> | 1.4453*** | 11.2494 | 0.8738*** | 14.5973 |
| Observations | 1299 | | 1298 | |
| R-squared | 0.7089 | | 0.3938 | |
| F-statistic | 7.2331*** | | 104.6929*** | |

Notes: *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of Eq. (1a) and Eq. (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of Eq. (1a) and Eq. (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LGDP* is the logarithm of real gross domestic products. *SHRATE* is short-term interest rate proxied by the central bank policy rate. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. *** indicates significant at the 1 percent level, while ** and * indicate significant at the 5 percent and 10 percent levels, respectively.

Table 4. Loan loss provisions and loan growth for all banks

| Explanatory variables | <i>DLOAN</i> | | <i>LOANG</i> | | <i>DLOAN</i> | | <i>LOANG</i> | |
|-----------------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|
| | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic |
| <i>DISCTA</i> | -0.0299 | -0.2471 | -0.0936 | -0.4024 | | | | |
| <i>NDISCTA</i> | -0.3032*** | -2.7095 | -0.5797*** | -2.6704 | | | | |
| <i>DISCL</i> | | | | | -0.4718 | -1.1127 | -0.6834 | -1.3709 |
| <i>NDISCL</i> | | | | | -2.1512*** | -3.7347 | -4.1589*** | -6.2076 |
| <i>EQTA</i> | -0.2017 | -1.1051 | -0.4795* | -1.7903 | -0.1843 | -0.8372 | -0.4052 | -1.5336 |
| <i>DTA</i> | -0.0789 | -0.8518 | -0.1373 | -0.8993 | -0.1240 | -1.1799 | -0.1644 | -1.0946 |
| <i>SIZE</i> | 0.0711*** | 3.8038 | 0.1004*** | 3.4140 | 0.0806*** | 3.5319 | 0.1163*** | 3.9901 |
| <i>LGDPR</i> | -0.0969 | -1.5707 | -0.0303 | -0.2559 | -0.1300 | -1.6424 | -0.0883 | -0.7577 |
| <i>SHRATE</i> | -1.0425*** | -5.5349 | -2.2065*** | -6.0711 | -1.0176*** | -4.6068 | -2.1692*** | -6.0741 |
| Observations | 1298 | | 1272 | | 1297 | | 1271 | |
| R-squared | 0.5807 | | 0.5519 | | 0.5983 | | 0.5674 | |
| F-statistic | 4.1425*** | | 3.5993*** | | 4.4496*** | | 3.8295*** | |

Notes: *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of Eq. (1a) and Eq. (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of Eq. (1a) and Eq. (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LGDPR* is the logarithm of real gross domestic products. *SHRATE* is short-term interest rate proxied by the central bank policy rate. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. *** indicates significant at the 1 percent level, while ** and * indicate significant at the 5 percent and 10 percent levels, respectively.

Table 5. Loan loss provisions and loan growth for all banks: Do private credit bureaus matter?

| Explanatory variables | <i>DLOAN</i> | | <i>LOANG</i> | | <i>DLOAN</i> | | <i>LOANG</i> | |
|-----------------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|
| | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic |
| <i>DISCTA</i> | 0.1128 | 0.8156 | 0.1546 | 0.6465 | | | | |
| <i>NDISCTA</i> | -0.3977*** | -2.9725 | -0.7574*** | -2.7448 | | | | |
| <i>DISCL</i> | | | | | -0.1110 | -0.3692 | 0.1077 | 0.1695 |
| <i>NDISCL</i> | | | | | -2.1508*** | -6.8336 | -4.0790*** | -6.0902 |
| <i>EQTA</i> | -0.1698 | -1.1329 | -0.4619** | -1.9873 | -0.1762 | -1.5080 | -0.4125 | -1.5484 |
| <i>DTA</i> | -0.0537 | -0.4989 | -0.1133 | -0.4561 | -0.0899 | -1.2377 | -0.1423 | -0.9247 |
| <i>SIZE</i> | 0.0762*** | 3.6855 | 0.1084** | 2.5786 | 0.0843*** | 5.9946 | 0.1254*** | 4.2748 |
| <i>LGDPR</i> | -0.0699 | -0.8925 | 0.0013 | 0.0079 | -0.1009* | -1.7233 | -0.0645 | -0.5347 |
| <i>SHRATE</i> | -1.0373*** | -2.6429 | -2.1887*** | -2.6485 | -1.0420*** | -5.9289 | -2.2129*** | -6.1983 |
| <i>PRIVBUR</i> | 0.0453 | 1.5816 | 0.0609 | 0.8408 | 0.0425** | 2.0341 | 0.0511 | 1.1575 |
| <i>DISCTA*PRIVBUR</i> | -1.3869* | -1.6604 | -2.6228** | -1.7394 | | | | |
| <i>DISCL*PRIVBUR</i> | | | | | -1.4558* | -1.8971 | -3.3121** | -2.0066 |
| Observations | 1298 | | 1272 | | 1297 | | 1271 | |
| R-squared | 0.5847 | | 0.5545 | | 0.6015 | | 0.5699 | |
| F-statistic | 4.1767*** | | 3.6095*** | | 4.4731*** | | 3.8370*** | |

Notes: *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of Eq. (1a) and Eq. (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of Eq. (1a) and Eq. (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LGDPR* is the logarithm of real gross domestic products. *SHRATE* is short-term interest rate proxied by the central bank policy rate. *PRIVBUR* is the proportion of individuals and firms listed by a private credit bureau. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. *** indicates significant at the 1 percent level, while ** and * indicate significant at the 5 percent and 10 percent levels, respectively.

Table 6. Loan loss provisions and loan growth for all banks: Do public credit registries matter?

| Explanatory variables | <i>DLOAN</i> | | <i>LOANG</i> | | <i>DLOAN</i> | | <i>LOANG</i> | |
|-----------------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|
| | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic |
| <i>DISCTA</i> | -0.3619* | -1.6632 | -0.5826 | -0.9283 | | | | |
| <i>NDISCTA</i> | -0.4567*** | -3.4218 | -0.8186*** | -2.9803 | | | | |
| <i>DISCL</i> | | | | | -0.7819*** | -2.7717 | -1.1705** | -2.0993 |
| <i>NDISCL</i> | | | | | -2.1697*** | -6.8640 | -4.1665*** | -4.8293 |
| <i>EQTA</i> | -0.1885*** | -1.6035 | -0.4759*** | -2.5399 | -0.1813 | -1.5697 | -0.3919*** | -2.9474 |
| <i>DTA</i> | -0.0877 | -1.2254 | -0.1589 | -0.6466 | -0.1289* | -1.8321 | -0.1783 | -0.7932 |
| <i>SIZE</i> | 0.0782*** | 5.3323 | 0.1124*** | 2.6199 | 0.0841*** | 5.8333 | 0.1241*** | 3.3402 |
| <i>LGDP</i> | -0.0916 | -1.5759 | -0.0171 | -0.0809 | -0.1244** | -2.1829 | -0.0844 | -0.3928 |
| <i>SHRATE</i> | -1.0288*** | -5.7241 | -2.1857*** | -2.6988 | -1.0199*** | -5.7944 | -2.1686*** | -2.8685 |
| <i>PUBREG</i> | -0.0699 | -1.4405 | -0.1213 | -0.8566 | -0.0427 | -0.8987 | -0.0804 | -0.5641 |
| <i>DISCTA*PUBREG</i> | 2.1265** | 1.8456 | 3.1589* | 0.8874 | | | | |
| <i>DISCL*PUBREG</i> | | | | | 3.5615** | 2.0675 | 6.5730** | 2.3258 |
| Observations | 1298 | | 1272 | | 1297 | | 1271 | |
| R-squared | 0.5830 | | 0.5533 | | 0.6004 | | 0.5689 | |
| F-statistic | 4.1478*** | | 3.5909*** | | 4.4522*** | | 3.8213*** | |

Notes: *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of Eq. (1a) and Eq. (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loss provisions calculated from the fitted values of Eq. (1a) and Eq. (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LGDP* is the logarithm of real gross domestic products. *SHRATE* is short-term interest rate proxied by the central bank policy rate. *PUBREG* is the proportion of individuals and firms listed by a public credit registry. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. *** indicates significant at the 1 percent level, while ** and * indicate significant at the 5 percent and 10 percent levels, respectively.

Table 7. Loan loss provisions and loan growth for all banks: Do borrower legal rights matter?

| Explanatory variables | <i>DLOAN</i> | | <i>LOANG</i> | | <i>DLOAN</i> | | <i>LOANG</i> | |
|-----------------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|
| | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic |
| <i>DISCTA</i> | -0.0389 | -0.0713 | -2.3017*** | -2.7017 | | | | |
| <i>NDISCTA</i> | -0.2902*** | -2.7208 | -0.5031** | -2.3780 | | | | |
| <i>DISCL</i> | | | | | -3.1598*** | -7.7593 | -8.1523*** | -5.4426 |
| <i>NDISCL</i> | | | | | -2.1996*** | -6.8869 | -4.2818*** | -5.3143 |
| <i>EQTA</i> | -0.1949* | -1.6528 | -0.4959** | -2.4985 | -0.1347 | -1.3035 | -0.4142*** | -3.0302 |
| <i>DTA</i> | -0.0838 | -1.1665 | -0.1304 | -0.5398 | -0.1176 | -1.2358 | -0.1537 | -0.7339 |
| <i>SIZE</i> | 0.0747*** | 5.1287 | 0.1018** | 2.4265 | 0.0796*** | 4.1059 | 0.1146*** | 2.8792 |
| <i>LG DPR</i> | -0.1346** | -2.0373 | -0.0594 | -0.2447 | -0.1246 | -1.1455 | -0.0596 | -0.2340 |
| <i>SHRATE</i> | -1.0686*** | -5.8972 | -2.2395*** | -2.8789 | -1.0111*** | -3.0959 | -2.1220*** | -2.9244 |
| <i>LEGAL</i> | 0.0113 | 1.1724 | 0.0129 | 0.6954 | 0.0007 | 0.0691 | -0.0052 | -0.2542 |
| <i>DISCTA*LEGAL</i> | 0.0019 | 0.0184 | 0.4251*** | 2.8051 | | | | |
| <i>DISCL*LEGAL</i> | | | | | 0.4829*** | 5.8487 | 1.3854*** | 5.3672 |
| Observations | 1298 | | 1272 | | 1297 | | 1271 | |
| R-squared | 0.5813 | | 0.5539 | | 0.6028 | | 0.5738 | |
| F-statistic | 4.1187*** | | 3.5988*** | | 4.4976*** | | 3.8993*** | |

Notes: *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of Eq. (1a) and Eq. (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of Eq. (1a) and Eq. (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LG DPR* is the logarithm of real gross domestic products. *SHRATE* is short-term interest rate proxied by the central bank policy rate. *LEGAL* is the strength of borrowers legal rights developed by the Doing Business database. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. *** indicates significant at the 1 percent level, while ** and * indicate significant at the 5 percent and 10 percent levels, respectively.

Table 8. Loan loss provisions and loan growth for large bank sample

| Explanatory variables | <i>DLOAN</i> | | <i>LOANG</i> | | <i>DLOAN</i> | | <i>LOANG</i> | |
|-----------------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|
| | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic |
| <i>DISCTA</i> | -2.6547*** | -3.6877 | -4.7344*** | -3.2464 | | | | |
| <i>NDISCTA</i> | -2.5661*** | -3.7126 | -4.5915*** | -3.2917 | | | | |
| <i>DISCL</i> | | | | | -1.4626* | -1.7393 | -2.2603** | -2.2973 |
| <i>NDISCL</i> | | | | | -2.8158** | -2.4237 | -5.8621*** | -4.3522 |
| <i>EQTA</i> | -0.2059 | -0.6861 | 0.5247 | 0.8489 | -0.2901 | -0.6302 | 0.2191 | 0.3538 |
| <i>DTA</i> | -0.2049 | -1.2825 | -0.2259 | -0.7057 | -0.2296 | -0.7712 | -0.2656 | -0.8406 |
| <i>SIZE</i> | 0.1432*** | 5.3932 | 0.1973*** | 3.4568 | 0.1479*** | 5.9142 | 0.2177*** | 3.8657 |
| <i>LGDPR</i> | -0.1479* | -1.7953 | -0.0601 | -0.3540 | -0.1441 | -1.0707 | -0.0650 | -0.3879 |
| <i>SHRATE</i> | -1.1256*** | -3.4242 | -2.3136*** | -3.5221 | -1.1818* | -2.2693 | -2.4619*** | -3.7893 |
| Observations | 481 | | 478 | | 481 | | 478 | |
| R-squared | 0.3037 | | 0.3380 | | 0.3188 | | 0.3544 | |
| F-statistic | 2.9211*** | | 3.2347*** | | 3.0614*** | | 3.4029*** | |

Notes: *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of Eq. (1a) and Eq. (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of Eq. (1a) and Eq. (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LGDPR* is the logarithm of real gross domestic products. *SHRATE* is short-term interest rate proxied by the central bank policy rate. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. *** indicates significant at the 1 percent level, while ** and * indicate significant at the 5 percent and 10 percent levels, respectively.

Table 9. Loan loss provisions and loan growth for large bank sample: Do private credit bureaus matter?

| Explanatory variables | <i>DLOAN</i> | | <i>LOANG</i> | | <i>DLOAN</i> | | <i>LOANG</i> | |
|-----------------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|
| | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic |
| <i>DISCTA</i> | -2.7338*** | -3.5601 | -4.7818*** | -3.0670 | | | | |
| <i>NDISCTA</i> | -2.5161*** | -3.6469 | -4.5319*** | -3.2390 | | | | |
| <i>DISCL</i> | | | | | -2.7393*** | -3.3736 | -6.1875*** | -3.7755 |
| <i>NDISCL</i> | | | | | -3.3731*** | -4.7521 | -7.6799*** | -5.2858 |
| <i>EQTA</i> | -0.1107 | -0.3684 | 0.6119 | 0.9879 | -0.1279 | -0.4248 | 0.6346 | 1.0206 |
| <i>DTA</i> | -0.2068 | -1.2988 | -0.2341 | -0.7287 | -0.2031 | -1.2923 | -0.1707 | -0.5439 |
| <i>SIZE</i> | 0.1459*** | 5.5253 | 0.2075*** | 3.6037 | 0.1519*** | 5.8711 | 0.2272*** | 4.0834 |
| <i>LGDPR</i> | -0.0591 | -0.6652 | 0.0450 | 0.2480 | -0.0597 | -0.6807 | 0.0394 | 0.2225 |
| <i>SHRATE</i> | -1.2276*** | -3.7335 | -2.4454*** | -3.7014 | -1.1299*** | -3.4171 | -2.1129*** | -3.1892 |
| <i>PRIVBUR</i> | 0.1095** | 2.5142 | 0.1484* | 1.6659 | 0.1164*** | 2.7162 | 0.1730** | 1.9932 |
| <i>DISCTA*PRIVBUR</i> | 0.8618 | 0.8274 | 0.9369 | 0.4044 | | | | |
| <i>DISCL*PRIVBUR</i> | | | | | 3.8699** | 2.0807 | 12.3646*** | 3.0703 |
| Observations | 481 | | 478 | | 481 | | 478 | |
| R-squared | 0.3130 | | 0.3397 | | 0.3351 | | 0.3727 | |
| F-statistic | 2.9707*** | | 3.2111*** | | 3.1794*** | | 3.5534*** | |

Notes: *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of Eq. (1a) and Eq. (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of Eq. (1a) and Eq. (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LGDPR* is the logarithm of real gross domestic products. *SHRATE* is short-term interest rate proxied by the central bank policy rate. *PRIVBUR* is the proportion of individuals and firms listed by a private credit bureau. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. *** indicates significant at the 1 percent level, while ** and * indicate significant at the 5 percent and 10 percent levels, respectively.

Table 10. Loan loss provisions and loan growth for large bank sample: Do public credit registries matter?

| Explanatory variables | <i>DLOAN</i> | | <i>LOANG</i> | | <i>DLOAN</i> | | <i>LOANG</i> | |
|-----------------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|
| | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic |
| <i>DISCTA</i> | -2.4464*** | -3.5441 | -4.8505*** | -3.2048 | | | | |
| <i>NDISCTA</i> | -2.4715*** | -5.2810 | -4.4946*** | -3.6715 | | | | |
| <i>DISCL</i> | | | | | -1.3760*** | -2.7166 | -2.2354** | -2.1128 |
| <i>NDISCL</i> | | | | | -2.7542*** | -4.0707 | -5.5879*** | -4.0624 |
| <i>EQTA</i> | -0.2309 | -0.4939 | 0.3698 | 0.3376 | -0.3210 | -1.0737 | 0.1548 | 0.2515 |
| <i>DTA</i> | -0.2824 | -1.0146 | -0.4088 | -0.8586 | -0.3026* | -1.8840 | -0.4299 | -1.3413 |
| <i>SIZE</i> | 0.1423*** | 4.9985 | 0.1966** | 2.4953 | 0.1478*** | 5.6806 | 0.2158*** | 3.8565 |
| <i>LGDPR</i> | -0.0760 | -0.5157 | 0.0569 | 0.1758 | -0.0794 | -0.9315 | 0.0691 | 0.3958 |
| <i>SHRATE</i> | -1.0438** | -2.0522 | -2.1135** | -2.0655 | -1.0748*** | -3.2857 | -2.2530*** | -3.4541 |
| <i>PUBREG</i> | -0.1527** | -2.0972 | -0.3248*** | -2.6401 | -0.1483** | -2.4489 | -0.3157*** | -2.6156 |
| <i>DISCTA*PUBREG</i> | -1.7936 | -0.3292 | 5.7263 | 1.1293 | | | | |
| <i>DISCL*PUBREG</i> | | | | | -2.4895 | -0.6133 | -1.7347 | -0.2099 |
| Observations | 481 | | 478 | | 481 | | 478 | |
| R-squared | 0.3122 | | 0.3497 | | 0.3263 | | 0.3628 | |
| F-statistic | 2.9629*** | | 3.3106*** | | 3.0945*** | | 3.4473*** | |

Notes: *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of Eq. (1a) and Eq. (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of Eq. (1a) and Eq. (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LGDPR* is the logarithm of real gross domestic products. *SHRATE* is short-term interest rate proxied by the central bank policy rate. *PUBREG* is the proportion of individuals and firms listed by a public credit registry. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. *** indicates significant at the 1 percent level, while ** and * indicate significant at the 5 percent and 10 percent levels, respectively.

Table 11. Loan loss provisions and loan growth for large bank sample: Do borrower legal rights matter?

| Explanatory variables | <i>DLOAN</i> | | <i>LOANG</i> | | <i>DLOAN</i> | | <i>LOANG</i> | |
|-----------------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|
| | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic |
| <i>DISCTA</i> | -2.2932*** | -1.8412 | -5.2622*** | -2.7008 | | | | |
| <i>NDISCTA</i> | -2.5085*** | -3.4616 | -4.5227*** | -3.3881 | | | | |
| <i>DISCL</i> | | | | | -2.7271 | -1.1069 | -6.1891 | -1.3808 |
| <i>NDISCL</i> | | | | | -2.7415*** | -2.6865 | -5.6859*** | -2.6964 |
| <i>EQTA</i> | -0.2001 | -0.5666 | 0.4818 | 0.7184 | -0.3004 | -0.9499 | 0.1975 | 0.3338 |
| <i>DTA</i> | -0.2131 | -0.8130 | -0.2269 | -0.4743 | -0.2347 | -0.8808 | -0.2698 | -0.5504 |
| <i>SIZE</i> | 0.1434*** | 3.5939 | 0.1986** | 2.3122 | 0.1498*** | 3.8243 | 0.2223*** | 2.6181 |
| <i>LGDPR</i> | -0.1604 | -1.5919 | -0.0786 | -0.4197 | -0.1596 | -1.5703 | -0.0942 | -0.4929 |
| <i>SHRATE</i> | -1.1378*** | -3.7820 | -2.3347*** | -3.8466 | -1.1575*** | -3.8925 | -2.3722*** | -3.9187 |
| <i>LEGAL</i> | 0.4855 | 0.2998 | 0.5043 | 0.1573 | 0.2645 | 0.1644 | 0.2534 | 0.0799 |
| <i>DISCTA*LEGAL</i> | -6.0469 | -0.2828 | 12.0482 | 0.4142 | | | | |
| <i>DISCL*LEGAL</i> | | | | | 24.9243 | 0.5191 | 76.4717 | 0.8891 |
| Observations | 481 | | 478 | | 481 | | 478 | |
| R-squared | 0.3005 | | 0.3348 | | 0.3167 | | 0.3540 | |
| F-statistic | 2.8576*** | | 3.1627*** | | 3.0041*** | | 3.3549*** | |

Notes: *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of Eq. (1a) and Eq. (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of Eq. (1a) and Eq. (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LGDPR* is the logarithm of real gross domestic products. *SHRATE* is short-term interest rate proxied by the central bank policy rate. *LEGAL* is the strength of borrowers legal rights developed by the Doing Business database. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. *** indicates significant at the 1 percent level, while ** and * indicate significant at the 5 percent and 10 percent levels, respectively.

Table 12. Loan loss provisions and loan growth for small bank sample

| Explanatory variables | <i>DLOAN</i> | | <i>LOANG</i> | | <i>DLOAN</i> | | <i>LOANG</i> | |
|-----------------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|
| | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic |
| <i>DISCTA</i> | 0.0537 | 0.4058 | 0.0105 | 0.0381 | | | | |
| <i>NDISCTA</i> | -0.3532*** | -2.8634 | -0.6955*** | -2.6839 | | | | |
| <i>DISCL</i> | | | | | -0.1626 | -0.5680 | -0.2189 | -0.3574 |
| <i>NDISCL</i> | | | | | -2.3166*** | -6.0646 | -4.1564*** | -5.0061 |
| <i>EQTA</i> | -0.1999 | -1.4749 | -0.6045* | -1.9061 | -0.1592 | -1.1982 | -0.4569 | -1.4576 |
| <i>DTA</i> | -0.0330 | -0.3944 | -0.0651 | -0.3543 | -0.0932 | -1.1322 | -0.1104 | -0.6107 |
| <i>SIZE</i> | 0.0543*** | 3.0962 | 0.0811** | 2.2364 | 0.0635*** | 3.6761 | 0.0949*** | 2.6373 |
| <i>LGDPR</i> | -0.1528* | -1.7803 | -0.1936 | -1.0881 | -0.2132** | -2.5305 | -0.3021* | -1.7147 |
| <i>SHRATE</i> | -1.1078*** | -4.9251 | -2.2342*** | -4.8611 | -1.0835*** | -4.9379 | -2.2036*** | -4.8772 |
| Observations | 817 | | 794 | | 816 | | 793 | |
| R-squared | 0.4818 | | 0.4147 | | 0.5069 | | 0.4341 | |
| F-statistic | 4.2992*** | | 3.4533*** | | 4.6425*** | | 3.6533*** | |

Notes: *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of Eq. (1a) and Eq. (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of Eq. (1a) and Eq. (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LGDPR* is the logarithm of real gross domestic products. *SHRATE* is short-term interest rate proxied by the central bank policy rate. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. *** indicates significant at the 1 percent level, while ** and * indicate significant at the 5 percent and 10 percent levels, respectively.

Table 13. Loan loss provisions and loan growth for small bank sample: Do private credit bureaus matter?

| Explanatory variables | <i>DLOAN</i> | | <i>LOANG</i> | | <i>DLOAN</i> | | <i>LOANG</i> | |
|-----------------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|
| | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic |
| <i>DISCTA</i> | 0.1911 | 1.2811 | 0.2469 | 0.8601 | | | | |
| <i>NDISCTA</i> | -0.4462*** | -3.3611 | -0.8710*** | -3.4622 | | | | |
| <i>DISCL</i> | | | | | 0.2509 | 0.5589 | 0.8659 | 0.7837 |
| <i>NDISCL</i> | | | | | -2.3364*** | -4.7392 | -4.1274*** | -4.8387 |
| <i>EQTA</i> | -0.1774 | -1.2983 | -0.5989 | -1.6061 | -0.1703 | -0.8856 | -0.4892 | -1.3183 |
| <i>DTA</i> | -0.0189 | -0.2148 | -0.0365 | -0.1500 | -0.0712 | -0.6993 | -0.0996 | -0.4154 |
| <i>SIZE</i> | 0.0606*** | 3.4235 | 0.0920** | 2.1408 | 0.0688*** | 3.6111 | 0.1098*** | 2.6252 |
| <i>LGDP</i> | -0.1363 | -1.5463 | -0.1672 | -0.8863 | -0.2000** | -2.2930 | -0.2986* | -1.6629 |
| <i>SHRATE</i> | -1.0856*** | -4.8335 | -2.1935*** | -3.8738 | -1.0751*** | -4.7233 | -2.1857*** | -3.9874 |
| <i>PRIVBUR</i> | 0.0309 | 1.1740 | 0.0526 | 0.8475 | 0.0259 | 1.1602 | 0.0367 | 0.6054 |
| <i>DISCTA*PRIVBUR</i> | -1.4731** | -2.0282 | -2.7274* | -1.8608 | | | | |
| <i>DISCL*PRIVBUR</i> | | | | | -1.8905** | -2.3426 | -4.9161** | -2.5713 |
| Observations | 817 | | 794 | | 816 | | 793 | |
| R-squared | 0.4844 | | 0.4163 | | 0.5096 | | 0.4389 | |
| F-statistic | 4.3051*** | | 3.4489*** | | 4.6512*** | | 3.6819*** | |

Notes: *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of Eq. (1a) and Eq. (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of Eq. (1a) and Eq. (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LGDP* is the logarithm of real gross domestic products. *SHRATE* is short-term interest rate proxied by the central bank policy rate. *PRIVBUR* is the proportion of individuals and firms listed by a private credit bureau. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. *** indicates significant at the 1 percent level, while ** and * indicate significant at the 5 percent and 10 percent levels, respectively.

Table 14. Loan loss provisions and loan growth for small bank sample: Do public credit registries matter?

| Explanatory variables | <i>DLOAN</i> | | <i>LOANG</i> | | <i>DLOAN</i> | | <i>LOANG</i> | |
|-----------------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|
| | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic |
| <i>DISCTA</i> | -0.2113 | -0.7748 | -0.0201 | -0.0345 | | | | |
| <i>NDISCTA</i> | -0.4558*** | -2.9749 | -0.7069** | -2.1187 | | | | |
| <i>DISCL</i> | | | | | -0.4868* | -1.7101 | -0.7394 | -0.8408 |
| <i>NDISCL</i> | | | | | -2.3535*** | -10.1207 | -4.2152*** | -6.8236 |
| <i>EQTA</i> | -0.1905 | -1.3890 | -0.6130* | -1.9035 | -0.1630 | -0.9884 | -0.4728** | -2.0979 |
| <i>DTA</i> | -0.0346 | -0.4119 | -0.0640 | -0.3471 | -0.0907 | -0.7138 | -0.1095 | -0.3849 |
| <i>SIZE</i> | 0.0582*** | 3.0802 | 0.0792** | 2.0259 | 0.0646*** | 3.2073 | 0.0945** | 2.1791 |
| <i>LG DPR</i> | -0.1527* | -1.7779 | -0.1939 | -1.0879 | -0.2114** | -2.3798 | -0.3103 | -1.3569 |
| <i>SHRATE</i> | -1.1046*** | -4.9077 | -2.2337*** | -4.8511 | -1.0823*** | -3.3289 | -2.1940*** | -2.9573 |
| <i>PUBREG</i> | -0.0235 | -0.3013 | 0.0249 | 0.1539 | -0.0025 | -0.0274 | 0.0439 | 0.2198 |
| <i>DISCTA*PUBREG</i> | 1.5881** | 1.1326 | 0.1512 | 0.0499 | | | | |
| <i>DISCL*PUBREG</i> | | | | | 3.2664** | 1.8659 | 6.0932** | 1.4283 |
| Observations | 817 | | 794 | | 816 | | 793 | |
| R-squared | 0.4813 | | 0.4126 | | 0.5073 | | 0.4336 | |
| F-statistic | 4.2633*** | | 3.4116*** | | 4.6177*** | | 3.6250*** | |

Notes: *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of Eq. (1a) and Eq. (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of Eq. (1a) and Eq. (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LG DPR* is the logarithm of real gross domestic products. *SHRATE* is short-term interest rate proxied by the central bank policy rate. *PUBREG* is the proportion of individuals and firms listed by a public credit registry. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. *** indicates significant at the 1 percent level, while ** and * indicate significant at the 5 percent and 10 percent levels, respectively.

Table 15. Loan loss provisions and loan growth for small bank sample: Do borrower legal rights matter?

| Explanatory variables | <i>DLOAN</i> | | <i>LOANG</i> | | <i>DLOAN</i> | | <i>LOANG</i> | |
|-----------------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|
| | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic | Coefficient | t-Statistic |
| <i>DISCTA</i> | 0.2292 | 0.3070 | -2.2657 | -1.1187 | | | | |
| <i>NDISCTA</i> | -0.3540*** | -2.7741 | -0.6109*** | -2.6528 | | | | |
| <i>DISCL</i> | | | | | -2.9525*** | -3.0522 | -8.2554*** | -2.9595 |
| <i>NDISCL</i> | | | | | -2.3918*** | -4.6287 | -4.3927*** | -4.7290 |
| <i>EQTA</i> | -0.1924 | -0.9151 | -0.6332* | -1.7061 | -0.1120 | -0.6141 | -0.4933 | -1.3875 |
| <i>DTA</i> | -0.0373 | -0.3773 | -0.0526 | -0.2213 | -0.0834 | -0.8668 | -0.0892 | -0.3987 |
| <i>SIZE</i> | 0.0565*** | 2.6917 | 0.0758* | 1.7246 | 0.0596*** | 2.9677 | 0.0852** | 1.9941 |
| <i>LG DPR</i> | -0.1742* | -1.7416 | -0.1327 | -0.6646 | -0.1762* | -1.8119 | -0.1837 | -0.9499 |
| <i>SHRATE</i> | -1.1234*** | -4.5354 | -2.1965*** | -3.8244 | -1.0807*** | -4.6708 | -2.1445*** | -3.8691 |
| <i>LEGAL</i> | 0.5606 | 0.3960 | -0.7147 | -0.2402 | -0.3695 | -0.2701 | -2.2142 | -0.7542 |
| <i>DISCTA*LEGAL</i> | -3.3136 | -0.2399 | 43.1925 | 1.1136 | | | | |
| <i>DISCL*LEGAL</i> | | | | | 49.1530*** | 3.0735 | 146.8840*** | 2.6871 |
| Observations | 817 | | 794 | | 816 | | 793 | |
| R-squared | 0.4803 | | 0.4147 | | 0.5117 | | 0.4423 | |
| F-statistic | 4.2502*** | | 3.4319 | | 4.6820*** | | 3.7189*** | |

Notes: *DLOAN* is the change in the ratio of total loans to total assets calculated from Bouvatier and Lepetit (2008). *LOANG* is the annual loan growth rate. *DISCL* and *DISCTA* represent discretionary loan loss provisions calculated from the residuals of Eq. (1a) and Eq. (1b), respectively. *NDISCL* and *NDISCTA* represent non-discretionary loan loss provisions calculated from the fitted values of Eq. (1a) and Eq. (1b), respectively. *EQTA* is the ratio of total equity to total assets. *DTA* is the ratio of deposits and short-term funds to total assets. *SIZE* is the logarithm of total assets. *LG DPR* is the logarithm of real gross domestic products. *SHRATE* is short-term interest rate proxied by the central bank policy rate. *LEGAL* is the strength of borrowers legal rights developed by the Doing Business database. Estimations are carried out using Panel Least Squares controlling for both cross-sectional and period fixed effects. *** indicates significant at the 1 percent level, while ** and * indicate significant at the 5 percent and 10 percent levels, respectively.